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Executive Analysis of Fire Service Operations in Emergency Management

Operational Considerations for the First Operational Period Following a Tornado for the

North Kansas City Fire Department

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**CERTIFICATION STATEMENT**

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: \_\_\_\_\_

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Abstract

The problem is the lack of direction in the aftermath of a tornado within the North Kansas City Fire Department (NKCFD). The purpose of this research was to identify challenges and objectives in the first operational period following a tornado touchdown. This action research utilized literature review, interviews, and questionnaires to identify potential challenges for responders following a tornado; to learn what guidelines other departments have developed to assist suppression personnel; and to develop a job aid for members of the NKCFD.

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## Introduction

The modern fire service is charged with confronting many different response challenges. The common responses include residential and commercial fires, industrial and vehicular accidents, and emergency medical responses. Some departments have specialty areas that might include high angle rescue, confined space rescue, hazardous materials response, swift water rescue, aircraft fire response, and urban search and rescue. Additionally, fire departments may be compelled to prepare for mass casualty incidents or terrorist events. Not every fire department will prepare for or face all of these challenges. However, every department may, at some point, face a natural disaster and must be prepared to respond.

Natural disasters take on many different forms. Every department may face any number of these events depending on their location. Many communities in the United States have to prepare for and respond to hurricane emergencies. In other parts of the country, wild fires are common and seasonal, and present significant challenges for responders. In other areas, significant snow storms can tax the response capabilities of firefighters. Across the country, many communities face the unnerving potential of a significant earthquake. Some communities have even faced active volcanoes. And, while primarily concentrated in the Midwest, almost every American community can be threatened with a tornado.

Tornadoes have proven to be the most pervasive and destructive weather phenomenon on the planet. They have no boundaries and can strike anywhere unlike the other weather phenomenon mentioned. "Tornadoes can develop quickly, often without warning, and cause complete havoc for emergency responders"(Mosier, 2002, p. 47). It is

imperative that emergency responders (particularly those in areas prone to tornado outbreaks) plan for these events and their aftermath. Effective planning for a tornado disaster can help mitigate the consequences to a community in the aftermath of an event. The problem is the North Kansas City Fire Department (NKCFD) does not have a tornado response plan to address the complexities of disaster response in the aftermath of a tornado.

The purpose of this research was to develop and produce the components of a tornado response plan for the first operational period for the NKCFD immediately after a tornado touchdown in the city. This was an action methodology design that guided the following research questions: a) What are the hazards and complexities commonly presented to fire departments in the immediate aftermath of a tornado disaster?; b) What guidelines do other agencies in North Kansas City have to respond to a tornado disaster in the city?; c) What guidelines have other departments who have experienced a tornado established for their personnel to follow in the immediate aftermath of a tornado?; d) What are the necessary components for a tornado response plan for the NKCFD?

## Background & Significance

The City of North Kansas City is a small city in northwestern Missouri. North Kansas City sits along the northern bank of the Missouri River and is approximately 4.2 square miles. The city is primarily an industrial center with a small residential population of approximately 5,000 residents (United States Census Bureau, 2000 [Electronic Version]). As an industrial city, the daytime population swells to over 25,000 people

(City of North Kansas City [NKC], 2006). The city is serviced by several government agencies including the North Kansas City Fire Department.

The North Kansas City Fire Department is a career fire department with sixty-two members. The administrative staff consists of a Chief, a Deputy Chief, a Fire Marshal (an Assistant Chief position), and a Training Chief. Suppression forces are divided among three shifts with nineteen personnel per shift. Each shift has one battalion chief, four company officers (Captains), four driver positions, and ten firefighters (NKC, 2006). These are the forces that would be summoned by the fire department to respond to a tornado disaster in North Kansas City.

While tornadoes cannot be predicted, it is safe to say that the area of the country wherein North Kansas City lies has seen its fair share of tornadoes and is likely to see additional tornadoes in the future. This is because the city lies in the center of an area of the country known as Tornado Alley. This region of the country gets “proportionately more tornadoes than anywhere else” (National Climate Data Center [NCDC], 2008). Preparing for natural disasters is every community’s responsibility. In North Kansas City, that responsibility falls to the city’s emergency management director, Fire Chief Dave Williams. While the city has never experienced a direct hit from a tornado, the Chief believes that such an event would be devastating on many levels. In addition to the potential for injuries and loss of life, the economic impact of a devastating tornado on the city would be a formidable challenge for the city to overcome. The potential destruction that could occur in an urban environment could be fairly significant. Because North Kansas City is largely an industrial city, the economic impact of lost jobs, lost equipment, interruption in processing and manufacturing can stifle its economy. Additionally,

businesses that are destroyed would lose their ability to pay their taxes, which would have a direct impact on the city's general fund.

Tornado touchdowns in a single area are generally considered a low frequency event. They simply do not occur in any single location with any regularity. However, they are a high risk event because of the potential for massive devastation and loss of life. It is precisely these types of low-frequency/high-risk events that have the greatest potential for major disaster (National Fire Academy [NFA], 2004). The National Fire Academy's Executive Analysis of Fire Service Operations in Emergency Management course was the basis for this research effort. During this course, the researcher was able to gain an understanding of the need to develop a basic framework for response to a tornado disaster. The researcher felt this response framework could be the basis for addressing several of the United States Fire Administration's (USFA) operational objectives. The objectives address the reduction in the loss of life in several categories and a comprehensive, multi-hazard risk-reduction plan (National Fire Academy [NFA], 2004). By gaining an understanding of the critical components of a tornado response plan, the NKCFD can position itself to respond more effectively to reduce the loss of life and develop an all-hazard response plan for all disasters.

## Literature Review

In conducting research for this paper, the researcher intended to answer several questions. One of the questions to be researched was, what are the hazards and complexities commonly presented to fire departments in the immediate aftermath of a tornado disaster? As one might imagine, the hazards and complexities presented to

firefighters are numerous in the aftermath of a tornado. One of the initial problems responders will be faced with will be downed trees and ruptured gas mains (Garlock, p. 82). Downed trees will block roads for fire and EMS personnel attempting to reach areas impacted by the storm. While some of the trees may be small and easily moved, larger trees will pose a more significant challenge. Further complicating this problem is the fact that many of these trees will be entangled in downed power lines presenting an additional hazard for responders (Millsap, p. 28). Further complicating the response will be the large number of ruptured gas mains (Eichelberger, p.29). Ruptured lines will allow gas fumes to permeate the affected area leading to potential fires, fueling existing fires, and generating numerous calls for fire service personnel.

While some tornadoes are more destructive than others, a moderate to severe tornado can wreck havoc in an urban environment. A tornado's intensity is measured relative to its wind speed (see Appendix A). A strong tornado is not only capable of uprooting trees and destroying homes, but dispersing the debris over a wide area. This debris can block or include street signs, rendering them useless. Without street signage and readily identifiable structures, navigation through the affected area will become difficult. It will be challenging enough for those companies responding to their first due districts; but it will be nearly impossible for outside agencies that respond from out of the area and have to rely on street maps to navigate the destroyed terrain. The researcher found agencies that experienced significant tornadoes were at a loss for simple navigation. An Emergency Medical Technician for the Spencer, South Dakota area summed up this notion after an F4 tornado slammed into his community: "The usual

landmarks we use to orient ourselves were simply gone” (Paules, p.50). This inability to identify streets and cross roads will invariably cause delays for emergency personnel.

One of the most recent and devastating tornadoes to strike the United States occurred in the small town of Greensburg, Kansas on May 4, 2007. On that day, an F5 tornado virtually wiped the small town off the map. What was most disturbing for fire officials was the fact that the town’s only fire station was destroyed along with all of the equipment, leaving firefighters limited in their capacity to offer aid initially to the townsfolk of that community (Gruver, p.20). This startling realization that fire crews can be incapacitated by the storm was the unfortunate reality in Greensburg. Fire stations are not unlike other buildings in any community in that they are subject to the same forces of nature every other building is subject to. There is a distinct possibility that fire crews could be left without the tools needed to perform their duties if their stations are impacted by the storm. This problem is exacerbated in smaller communities with a single fire station. As in the case of the Greensburg tornado, fire crews will then be forced to rely on outside aid for assistance.

Another complication that responders will likely face from debris strewn about will be nails and other sharp objects. These will not only be a hazard for responders, but can also incapacitate response equipment. “A seemingly nuisance-type thing like flat tires can immobilize and render useless even the biggest of pumpers” (Garlock, p.60).

Emergency response equipment is subject to the same road hazards as personal vehicles. Nails in the road or other potential piercing objects can significantly hamper the response abilities of responders.

Another problem responders could be forced to deal with in the aftermath of a tornado is falling debris, particularly glass. In an urban environment with many tall buildings, twisters will throw debris across the area and shatter many windows. Some of these windows will be in tall buildings and will be a threat to emergency workers below. Such was the case on March 28, 2000, when a tornado struck Fort Worth, Texas and damaged many structures including hi rise buildings. Many window panes were left dangling from offices of hi rise structures. A large portion of responders were forced to pull back and suspend non-essential functions until a safe area had been established (McEntire, p.373). This can be a time consuming problem for responders and significantly delay search and rescue efforts.

Depending on the time of day the storm hits, responders could face problems with darkness and lack of electricity. Damage to infrastructure may include electrical substations in addition to the usual downed power lines. Lack of power also affects water pumping stations and could disrupt water supply operations for fire crews. This problem is amplified if the event occurs at nightfall or during the overnight. Responders will be forced to operate in total darkness. Homes and buildings (including fire stations) that have no generators will be left in the dark and further complicate search and rescue efforts. Since many of these events occur in the spring and early summer, problems with excessive heat can become pervasive and further complicate the response effort. In addition, street lights and stop lights will be out and make travel in the area much more dangerous. Finally, there is always the possibility that additional storms could occur and be in the area producing rain, lightning, and additional tornadoes. These atmospheric conditions will only hamper response efforts.

Complexities of response are not limited to observable or tactile conditions. One common theme that the researcher encountered in literature was challenges associated with communications. Communication challenges can be manifested in several ways. A tornadic storm can simply wipe out local communication capabilities. Phone lines go down, cell towers get knocked out, and emergency communications capabilities can be knocked off line. Another possibility is the overload on communications. When responders go out and relay reports of damage at the same time dispatch is inundated with calls for help, radio frequencies can become overloaded with transmissions and hamper emergency responders. In addition, as outside resources arrive to assist in the emergency, responders will be faced with the challenge of trying to communicate over different frequencies (Garlock, p.116). These scenarios each pose significant challenges for responders. The inability to communicate effectively will undoubtedly hamper response capabilities for fire and EMS personnel and delay resources getting to those in need.

Another major challenge responders are likely to encounter in the aftermath of a tornado will be the overwhelming number of casualties in proportion to the number of rescuers involved in the initial response (Garlock, p.116). The focus of this research was the first operational period. As such, a review of the response capabilities of the NKCFD will yield a minimum of 15 suppression personnel manning six pieces of apparatus. A storm of any consequence will likely produce a casualty response that will quickly overwhelm initial responders until additional help arrives. This will mean that some needy individuals will not get the attention they require initially. Some emergencies will be bypassed in order for responders to tend to more significant problems. Prioritization of

resources and their allocation will be a significant challenge for command personnel during the first operational period.

A final and significant challenge that responders will face in the aftermath of a tornado will be the need for equipment. Equipment needs will run the gamut from the technical to the routine. There may be a need for specialized search and rescue equipment to locate persons in collapsed buildings. There will likely be a need for heavy equipment to clear streets and debris for emergency personnel (and, don't forget the need for knowledgeable personnel to operate that machinery) (Garlock, p. 60). There may be the need for shoring equipment in collapse scenarios. There will likely be a need for many chain saws to clear debris and streets for responders. In the residential area of North Kansas City, the streets are densely lined with large trees that could severely hamper response efforts of fire and EMS personnel. There will be a need for portable and fixed lighting systems particularly if the tornado occurs at dusk or during the evening (Garlock, p. 116). As previously mentioned, there will be a need for radio and communication equipment (both portable and fixed). Certainly there will be a need for generators, fuel, and mobile tire repair capabilities. While this is certainly not an all inclusive list of needed equipment, it surely represents needs common to firefighters dealing with the aftermath of a tornado.

The second question to be researched was, what guidelines do other agencies in North Kansas City have to respond to a tornado disaster in the city? In order to answer this, the researcher looked at the document that all North Kansas City agencies should defer to in significant emergencies in the city – the Emergency Operations Plan for the City of North Kansas City. This document identifies three other city agencies with

responsibilities in the aftermath of a tornado: the police department, the public works department, and the community center (NKC, 2005). This document identifies the responsibilities (both primary and support functions) for these agencies (as well as others outside the city).

The North Kansas City Police Department (NKCPD) is the other public safety agency in the city. The police department has its share of responsibilities identified in the Emergency Operations Plan (EOP). In a tornado disaster, the police chief has primary responsibility for law enforcement and evacuation (NKC, 2005). Law enforcement functions are common roles for police officers. However, in the aftermath of a tornado, the demands placed on police officers can be overwhelming. The need to provide for secure scenes for emergency workers would be taxing. It is common for spectators to arrive in the area of a disaster. These curiosity seekers can clog limited arteries being utilized by emergency workers. Additionally, providing for the security of citizens and their belongings that may be strewn about can further drain police resources.

Police officers will also play the lead role in evacuating citizens, directing displaced workers and families to collection points and shelters, and handling the logistical issues of identifying displaced persons and re-uniting them with family members (NKC, 2005). There is likely to be a lot of confusion in the aftermath of a tornado. Worried family members will try to locate those impacted by the storm. Those individuals unable to reach family members by phone may travel to the area and further complicate police functions of re-uniting families. It is likely that police resources will be severely taxed in the aftermath of a tornadic storm.

The NKCPD was one of several agencies within the city that participated in an exercise called “Operation Twister.” In May of 2006, the fire department held its first joint exercise with all other city department heads since Dave Williams became Fire Chief in 2002. The tabletop exercise, called “Operation Twister”, was designed to bring together all city agencies and government officials who would normally be involved in a tornado disaster. With the purpose of gaining an understanding of the potential problems associated with a tornado disaster, this exercise focused on the overall response and decision-making process by the participants under simulated conditions and was not a test of detailed response procedures. It was monitored by an Exercise/Evaluation Specialist who provided an After Action Report which addressed strengths and made recommendations for improvement, but gave no specific recommendations regarding the interaction of city agencies during a disaster. The exercise focused on a significant tornado impacting the community and surrounding areas causing major damage in different areas of the city. Since assistance from surrounding communities would be delayed, emphasis was placed on operations that would occur in the early stages of the disaster (NKC, 2006). While all city agencies participated in the exercise, no substantive follow up training or efforts towards tornado response has occurred.

The Public Works department also has functional responsibilities identified in the NKC EOP. The primary responsibility of the Public Works Director is in the area of resource and supply which includes maintaining a resource list of supplies and personnel that may be utilized in a disaster. They are to identify all potential requirements and see that gaps in those needs are addressed. Additionally, they are to assist in the stocking of shelters and the channeling of donations and services following a disaster. The Assistant

Public Works Director has primary responsibility then for public works functions as well as damage assessment duties. The Public Works department also shares functional responsibility in many other areas as well according to the NKC EOP. These include direction and control, evacuation, communications and warnings, reception and care, and response to acts of terrorism (NKC, 2005).

The researcher thought it was curious that primary responsibility for damage assessment was attributed to Public Works personnel (NKC, 2005). Damage assessment can be divided into two types: immediate and post-incident. Immediate damage assessment is conducted during the early stages of an event or incident to determine the amount of damage, or the probability of damage, that the event already has caused. This would include the impact on life and property in the incident area (National Fire Academy [NFA], 2007). This type of responsibility is largely similar to the size up process that occurs when fire units first arrive at emergency incidents. This is in contrast to post-incident damage assessment which would be conducted after the emergency response stage of the incident has passed (National Fire Academy [NFA], 2007).

The third city agency with functional responsibilities outlined in the Emergency Operations Plan for the city is the North Kansas City Community Center (NKCCC). The NKCCC would also play a role in response to a tornado disaster since it has the largest number of employees of any single agency within the city. The NKC EOP identifies the community center as one of three agencies with operational responsibility for reception and care. The NKCCC shares primary responsibility for reception and care in the aftermath of a tornado or similar disaster with the North Kansas City Library and the Red Cross. They also have support responsibility functions in the areas of direction and

control and emergency public information (NKC, 2005). It is expected that in the event of tornado, community center employees will provide for the reception and care of displaced persons, log and track their location for family reunification, attend to special needs citizens, and coordinate mass feedings with other agencies. This logistical burden is something that community center employees have planned for and feel confident they can overcome in a disaster setting.

The North Kansas City Emergency Operations Plan is the only document of record that provides guidelines for response to a tornado disaster in the city. The researcher was surprised at this finding, fully expecting there would be numerous directives, or standard operating procedures to be followed in the aftermath of a tornado. Additionally, the literature review did not support the establishment of an event specific response plan – in this case a tornado response plan. Quite to the contrary, the literature suggests an all hazard response plan be adopted. Tornado response protocols should be derived from this plan. Additionally, the research did indicate a number of potential problems the researcher did not anticipate in responding to tornado emergencies. Thus, in summary, the research did provide valuable information that will be useful in this effort though more was expected.

## Procedures

The procedures for this Applied Research Paper (ARP) started with a topic review during Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM) class at the National Fire Academy in Emmitsburg, Maryland. Peer interaction and instructor review helped in the development of the proposal for this ARP. Additionally, the researcher sought the subject matter approval of the NKCFD Fire Chief

Dave Williams. It was vital to get the support of the Fire Chief for the research of this topic. His support along with the support garnered by the NKCFD Special Operations Chief Mike Jenkins for the development of this proposal was considered critical if the recommendations of this ARP were ever to be considered for implementation.

The research portion for the Applied Research Paper (ARP) started with a literature search during the author's EAFSOEM course and a visit to the Learning Resource Center (LRC) at the National Fire Academy in Emmitsburg, Maryland. The on-line card catalog at the LRC was utilized to search for topics related to fire departments response to tornadic disasters. In addition, the author contacted the LRC via email upon return home to request a literature search of tornado responses in other communities. A compilation of numerous articles and online resources was mailed to the author for review. While many proved beyond the scope of this study, several articles provided helpful background information for this research.

The author made several trips to the public library in Smithville, Missouri to look up resources deemed relevant to this research. The public library in Smithville, Missouri was chosen because it is the home town of the researcher. Several sources utilized in this research project were identified in card catalog searches at the library. The library searches yielded vital information that was incorporated in the researcher's work. Additionally, numerous Internet searches were conducted to find relevant articles of interest. These searches provided helpful information to help direct the researcher to other areas and helped frame the research for this ARP.

The researcher reviewed the Emergency Operations Plan for the City of North Kansas City which was updated in September of 2005. It proved helpful in determining

the proposed plan for city departments to follow in the aftermath of a tornado. This document defined the roles and responsibilities of the NKCFD as well as other city agencies in the aftermath of a tornado.

A telephone interview was conducted with Major Jesse McClendon of the North Kansas City Police Department (NKCPD) on January 16, 2008. The purpose of this interview which lasted approximately twenty minutes was to gain an understanding of the capabilities and preparedness of the police department to respond to a tornado disaster. The NKCPD was chosen because it is the sister organization to the NKCFD providing public safety in a mutual jurisdiction. The researcher felt it would be prudent to have an understanding of their capabilities since the fire and police departments are organizationally very close. Major McClendon was chosen for the interview because of his position in the organization and familiarity with the capabilities of his officers. Major McClendon is the third most senior officer on the NKCPD. He was asked what training the NKCPD had done with other city agencies to prepare for a tornado disaster. He was asked what obstacles his organization would face in the aftermath of a tornado. The researcher inquired about the NKCPD's resources and what, if any, hazard planning had been done to mitigate a tornado disaster. Finally, he was asked to give an opinion as to whether or not his department was prepared to respond to a tornado disaster; and, if not, what was needed to prepare his members.

The researcher learned that the police department has not done any tornado planning aside from participating in the tabletop exercise - "Operation Twister." They have no specific guidelines in place for responding to tornado disasters other than what is outlined in the Emergency Operations Plan (J. McClendon, personal communication,

January 16, 2008). While the police department constantly trains its officers to respond to a myriad of different emergencies, tornado response is not among them. However, some of their more common responsibilities and training experiences would mimic some of the duties required in the aftermath of a tornado. So while there is little specific tornado response training, the police department conducts situational training and responds to calls that would be similar in a tornado disaster situation. These would include providing for protection of the public from unsafe scenes, coordinating the reunification of separated families, checking the welfare of citizens, and assisting in the notification of threats from severe weather (NKC, 2005).

On February 13, 2008, the researcher conducted an interview with Mr. Bear Kistler, Assistant Public Works Director. The purpose of the interview, which lasted approximately fifteen minutes, was to gain an understanding of how the city's Public Works department would respond to a tornado disaster and ascertain what resources were available to them for such a response. Mr. Kistler was chosen because of his position in the department and his many years of service with the city. He is very familiar with disaster response in the city since he has played a significant role in winter storm and flood responses in the city in the past. He was asked to what extent his department had done training with other city agencies to prepare for a tornado disaster. The researcher inquired if the Public Works department had done any training within the department to prepare for response to a tornado disaster. He was asked what resources were available in the public works department to utilize in the aftermath of a tornado. He was asked what hazard planning (if any) Public Works had done to mitigate such a disaster. Finally, the researcher asked Mr. Kistler his opinion as to whether or not Public Works personnel

were prepared to respond to a tornado disaster, and if not, what was needed to prepare them.

The public works department would certainly play a key role in the aftermath of a tornado. In the interview with Mr. Bear Kistler of North Kansas City Public Works (PW), the researcher learned that very little has been done with respect to specific planning for a tornado event (B. Kistler, personal communication, February 13, 2008). Mr. Kistler identified the “Operation Twister” exercise as the only training specifically addressing tornado response. He did indicate, however, that his personnel were prepared to respond to such an event but have no specific guideline wherewithal to respond.

In an effort to learn what capabilities and training had been conducted with NKC Community Center personnel, the researcher conducted an interview with Mr. Greg Hansen, NKCCC Director, on February 23, 2008. The purpose of the interview, which lasted approximately fifteen minutes, was to gain an understanding of how the city’s Community Center personnel would respond to a tornado disaster and ascertain what resources were available to them for such a response. Mr. Hansen was chosen because of his position as director for the Community Center. He was asked to what extent his department had done training with other city agencies to prepare for a tornado disaster. The researcher inquired if the Community Center had done any training within the department to prepare for response to a tornado disaster. He was asked what resources were available at his disposal to utilize in the aftermath of a tornado. He was asked what hazard planning (if any) Community Center employees had done to mitigate such a disaster. Finally, the researcher asked Mr. Hansen his opinion as to whether or not

Community Center personnel were prepared to respond to a tornado disaster, and if not, what was needed to prepare them.

The researcher learned that the responsibility of Community Center employees would be to provide shelter for displaced workers and residents (G. Hansen, personal communication, February 23, 2008). They have very specific plans and a defined set of functions for their key personnel to provide support to the other city agencies by setting up a shelter and collection point for civilians. Mr. Hansen indicated that their personnel have the ability to establish this shelter in a rapid fashion and thus alleviate the need for other city departments to perform this function. He further indicated that his staff was well versed in their responsibilities and able to operate independently for an extended period of time. He felt his staff was capable of responding to a tornado disaster.

The third question the researcher sought to answer was, what guidelines have other departments who have experienced a tornado established for their personnel to follow in the immediate aftermath of a tornado? In an effort to learn what other fire departments have with respect to tornado response procedures, a questionnaire was sent out to seventy-two departments across the United States. These departments (identified in Appendix B) were chosen because research derived from the National Climate Database indicated that they were involved in a tornado response within the past ten years. This research was based on data gathered from Internet database searches of the National Oceanic and Atmospheric Administration (NOAA), National Climate Database. This web search identified communities that experienced tornadoes with some measurable damage or casualties over the past ten years. The researcher queried both career and volunteer departments because the data sought was based on operational procedures and standard

operating guidelines and not status of the responder as career or volunteer. By surveying these departments, the researcher hoped to gauge all departments, large and small, in an effort to understand their practices with respect to tornado response. The purpose of the questionnaire was to ascertain their operational challenges in response to a tornado as well as identify established operational procedures prior to and subsequent to the storm in the department's respective community. The questionnaire was mailed out in the middle of November, 2007 with a requested return date of December 8, 2007. A self-addressed stamped envelope was provided for return of the questionnaire. Only sixteen (mostly anonymous) questionnaires were returned by mail on or about the requested due date. This is approximately a twenty-two percent return rate.

### Limitations

The results of the questionnaire do have some limitations. The fact that only sixteen questionnaires were returned means that the data compiled with respect to other fire departments' challenges and policies is limited in scope. Cost and time constraints associated with this research effort prevented the researcher from conducting a second inquiry of other departments. Because the questionnaires were designed to be anonymous, incomplete questionnaires or those which provided information that needed clarification could not be followed up on. Additionally, because the questionnaires were anonymous, the researcher does not know if the respondents truly represent both small and large departments.

### Results

This Applied Research Paper was written to answer several key questions. First, what are the hazards and complexities commonly presented to fire departments in the immediate aftermath of a tornado disaster? The research has shown that fire companies will face a host of hazards and complexities difficult to overcome in the aftermath of a tornado. The most obvious problem responders will face will be the potential of an overwhelming need for response coupled with limited resources. Depending on the severity of the tornado, responders may encounter an array of emergencies that will quickly overwhelm available resources. The volume of calls for assistance will range from minor to severe; from simple medical emergencies to complex hazardous materials incidents. Responders will be forced to prioritize calls due to the limited available resources.

Compounding the problem of overwhelming requests for assistance will be the difficulty responding units will encounter as a result of the passing storm. Debris will likely be strewn about the community and telephone poles and trees uprooted and blocking roads. Trees and poles could be entangled with power lines that would present an additional hazard to responders and in some instances may be difficult to detect. Some of the debris can be easily moved while other blockades will require a more substantial effort to remove. In addition, the severity of the tornado may cause natural and man-made landmarks to be displaced. Street signs can be covered or removed by the storm along with readily identifiable landmarks for a community in a wake of a significant tornado. This will cause a delay in response for emergency units due to the inability to navigate what was once familiar territory. The problem is compounded for out of town units who generally rely on street signs and directions to respond to emergencies. In the absence of

these basic navigational amenities, responding crews will be forced to re-establish identifiable markers while proceeding to calls for assistance.

Belaboring the problem of strewn debris will be the hazard responding units will have to face with sharp objects in the roadway impeding the path of vehicles and personnel. Nails, glass, and sharp edges will cause units to become disabled and hampered in their response. Personnel will be forced to be extra vigilant to avoid puncture hazards while performing their duties. In addition, falling debris and glass from larger structures (for example, hi-rise structures) will limit responders abilities to operate in an area until the hazard is abated. This complicating factor will undoubtedly delay responders and their ability to react quickly to emergency calls.

Another problem responders could face depending on the severity of the storm is the fact that these events are largely unpredictable and could impact responders as well. Fire stations and rescue houses are not immune to the destructive winds of a significant tornado. Responders may emerge from safety to find their equipment destroyed and render them incapable of providing the necessary services in the aftermath of a tornado. Damage to structures and/or equipment could prove to be a significant blow to a community with limited resources to begin with. This will force the citizenry to rely on outside aid which could be delayed or unavailable depending on the breadth of the storm's damage.

Operational issues will certainly provide a myriad of challenges to responders in the aftermath of a tornado. Communication problems have proven to be a common theme during such emergencies. The basic premise that communications will even be available is not a given following a tornado. Cell towers, telephone poles, and other critical

communications infrastructure could have been compromised in the storm. Should they remain intact, numerous agencies will be on hand to provide assistance and each agency will likely be on a different frequency making it difficult to organize a response effort. The multitude of calls will likely overload the host agencies frequencies and render them all but useless without outside aid.

The research has shown that there are numerous challenges to be faced in the aftermath of a tornado. The complexity of the challenges will be directly related to the intensity of the storm. Larger, more damaging tornadoes will likely impact many communities making the availability of outside aid an uncertainty. Small storms can be just as problematic for communities with limited resources. The challenges responders will face will be similar though perhaps on a smaller scale.

The second question to be researched was what guidelines do other agencies in North Kansas City have to respond to a tornado disaster in the city? The research has shown that the efforts of other NKC agencies are largely directed by the Emergency Operations Plan. This document identified the Fire Department, the Police Department, the Public Works Department, and the Community Center as each having a critical role in the aftermath of a tornado. The Police Department does not have tornado specific training; however, many of the functions it performs will be similar in the aftermath of a tornado. Specifically, they are responsible for law enforcement and evacuation. While these are common roles for the NKCPD, the scope of the disaster will likely strain their resources. Numerous demands for services could easily outpace their available resources and force the need for outside aid.

The Public Works Department has a significant role in the aftermath of a tornado. Their primary function as identified in the Emergency Operations Plan is resource and supply. The Public Works Department will be tasked with providing the necessary resources identified in the immediate aftermath of a tornado. This challenge encompasses the stocking of shelters to providing heavy machinery for clearing streets and shoring buildings. In addition, Public Works has primary responsibility for providing damage assessment. This can be an enormous challenge depending on the scope of the disaster. Providing rapid damage assessment to emergency responders will aid in the deployment of resources and will be critical to providing aid to the citizenry. While this department has no specific tornado response training, they claim to be prepared to handle such a disaster.

Finally, the Community Center has defined responsibilities in the aftermath of a tornado as well. This group of employees is charged with providing shelter and care for displaced workers and residents. Indeed, the EOP reinforces this assertion and charges the Community Center with primary responsibility for reception and care. This agency has definite and practiced plans for handling such an emergency. The Community Center employees have had specific training in the areas with which they are charged and feel confident that they can deliver the services needed.

The third question the researcher sought to answer was, what guidelines have other departments who have experienced a tornado established for their personnel to follow in the immediate aftermath of a tornado? This question was answered by the distribution of a questionnaire to seventy-two career and volunteer fire departments across the United States and Canada. The questionnaire was developed to assess a

department's guidelines to a tornado disaster both prior to a disaster and after having experienced such a disaster. Sixteen departments (twenty-two percent) returned a completed questionnaire. The results of this questionnaire are summarized below (see Appendix D for more detailed results).

Of those respondents, fourteen departments indicated they had experienced a tornado in the past ten years. Only three departments indicated that they had a specific document (SOP, etc.) that specifically addressed fire department operations in the aftermath of a tornado. The "first operational period" has been described as lasting from twenty minutes to forty-eight hours. There was a wide array of challenges encountered by the respondents, many of which have been identified in the research. The measures used to combat the challenges were just as diverse and often creative. Finally, only two departments have indicated the implementation of a specific document (SOP, etc) addressing operational procedures in the aftermath of a tornado.

### Limitations

The intention of the questionnaire was to gather data from numerous departments who had experience tornadoes. It was expected that the data would produce an understanding of the procedures departments had established to follow in the immediate aftermath of a tornado. Unfortunately, the relatively low response rate yielded only limited information on the subject matter. The action research was designed to produce the components of a tornado response plan with information gathered primarily from the questionnaires. With only limited information obtained from the questionnaires, specific direction for the proposed response plan will have to rely more heavily on the research gathered from literature.

The final question the researcher sought to answer was, what are the necessary components for a tornado response plan for the NKCFD? The research does not support the development of a tornado response plan for the NKCFD. Instead, a job aid and training program, which are summarized here and presented in full in Appendix E, appears to be more appropriate. The city has an Emergency Operations Plan that is an all-hazards response document. There is no need to re-develop a document of that magnitude specifically addressing tornado response. In fact, current emergency planning is geared towards an all hazards approach. Notwithstanding this, the researcher finds a need for a document addressing the specific complexities presented in the immediate aftermath of a tornado.

The proposed job aid and training program should focus on three key points: responder safety, operational considerations, and command considerations. In the area of responder safety, the document should address some of the hazards commonly encountered in the aftermath of a tornado. Issues directly impacting responders in the first operational period should be the focus of this area. In the area of operational considerations, the common complexities presented in the first operational period after a tornado touchdown should be presented for consideration. Front line personnel operating in the field should have an understanding of what they might expect. The experiences they encounter will likely not be unique and the lessons learned from other departments can aid in the response effort. Finally, the area of command considerations should focus on issues that will be of concern to the Incident Commander. Experiences gleaned and lessons learned from previous tornado disasters will allow Incident Commanders an opportunity to address potential issues before they negatively impact an operation.

## Discussion/Implications

Based on information gathered in conducting this research, the researcher has developed the following conclusions. First, there are many complicating factors firefighters must consider in the first operational period following a tornado. Many of the complications discovered in the literature were echoed in the findings of the questionnaire. For example, in significant storms, “the usual landmarks we use to orient ourselves were simply gone” (Paules, p.50). Strong tornadoes can make the simple act of navigating once familiar streets a real challenge. This sentiment was echoed in the research questionnaire distributed by the researcher. One respondent indicated that one of the major challenges encountered by suppression and rescue forces during the first operational period was the “lack of landmarks, addresses, etc.” This complication was a “huge factor” in the response operation.

There were several other similarities noted among the respondents of the questionnaire and within the literature review. For example, ruptured gas mains were a common problem encountered by firefighters (Eichelberger, p.29). These delayed responders from accessing areas damaged by the storm and diverted resources to manage these problems. Additionally, responders were forced to deal with seemingly nuisance type things like flat tires (Garlock, p.60). This problem was echoed by respondents of the questionnaire as well. In addition, communication problems and issues regarding the large number of casualties were also complicating factors in the response effort of

firefighters (Garlock, p.116). Again, questionnaire respondents also cited these problems as challenges in their first operational period after a tornado.

The researcher believes that it is evident that regardless of where the event occurs, tornadoes will produce the same challenges for the fire service. The research does not indicate any difference in response efforts based on the size of the department or whether the department is career or volunteer or where in the country the event occurs. The research indicates that the same problems affect departments' response abilities regardless of these factors. The researcher further believes that the problems encountered by responders in the literature review will be similar in nature to those that can be expected in the North Kansas City community. The city of North Kansas City shares the same potential hazards as any other city with respect to complicating factors in the aftermath of a tornado.

Secondly, all agencies within the city of North Kansas City are guided by the Emergency Operations Plan (EOP) in their response protocols to a tornado. The Police Department, the Public Works Department, and the Community Center each receive their direction from the EOP as does the Fire Department. Responsibilities of the Police Department include providing for protection of the public from unsafe scenes, coordinating the re-unification of separated families, checking the welfare of citizens, and assisting in the notification of threats from severe weather (NKC, 2006). In an interview with a police official, the researcher determined that there is no tornado specific training done by this department (J. McClendon, personal communication, January 16, 2008).

By comparison, the Public Works Department also receives its direction for tornado response from the Emergency Operations Plan (EOP). Their primary

responsibility is in the area of resource and supply which includes maintaining a resource list of supplies and personnel that may be utilized in a disaster. In an interview with the Director, the researcher learned very little planning has been done with respect to tornado response (B. Kislter, personal communication, February 13, 2008). The only tornado specific training was limited to a tabletop exercise also attended by members of the Police Department and the Community Center.

The Community Center is another city agency with responsibilities in the aftermath of a tornado. Their tasks include providing shelter for displaced workers and residents (NKC, 2006). While they have no specific tornado response training, they feel they are capable of handling their responsibilities. In an interview with the Director of the Community Center, the researcher learned that Community Center personnel were trained and equipped to respond to emergencies regardless of the nature (G. Hansen, personal communication, February 23, 2008).

### Interpretation

The researcher has drawn the following conclusions based on the research and the derived results. The researcher believes that the development of a tornado specific response plan would be counter productive for the NKCFD. Throughout the literature review, there was no indication that any department had a tornado response plan either before or after the tornado they experienced. Furthermore, only two organizations that responded to the questionnaire indicated the existence of a tornado response plan in their department. Most organizations that referenced any type of plan indicated an all-hazards plan. The tendency for organizations to develop response plans based on an all hazards approach is indicative of the stance presented in the National Response Framework. The

Framework establishes a comprehensive, national, all-hazards approach to domestic incident response (FEMA, 2008). As this is the standard for the fire service, the researcher does not believe it would be advisable to establish a formal response program based on the single threat of a tornado disaster. Pre-existing plans address the same challenges irrespective of the type of disaster that has occurred.

Nonetheless, the data gathered indicates some valuable lessons learned from other agencies that would be beneficial to the North Kansas City Fire Department. Information that would be valuable to firefighters includes the operational challenges faced by response agencies as well as lessons learned. It is likely that members of the NKCFD would face similar challenges during the first operational period following a tornado touchdown. By providing a format to present this information to members of the NKCFD, firefighters will benefit from the lessons learned by other departments. This will help firefighters prepare for potential eventualities associated with tornado response and thus better enable them to manage the response effort.

### Implications

The results of this research indicate a need to provide the NKCFD with some direction on how to respond to a tornado disaster in the city. The results indicate that there is little education or training on this topic for any agency in the city. The only tornado specific training was a tabletop exercise which was well attended but received little follow up. For the NKCFD, the results indicate a need to develop a format for providing information to the membership. Moreover, this information would also be valuable to other city agencies, not just the fire department. While there is not a need for a tornado specific plan, a delivery medium for information should be considered so that

the lessons learned from other agencies that have experienced tornadoes can be identified and some forethought given to overcoming the potential challenges. Every tornado event is unique in many ways but produces similar challenges for the fire service. Undoubtedly, a tornado that strikes the city of North Kansas City will yield some special challenges. Nevertheless, the commonality of circumstances discovered in the research is likely to be repeated in some measure in North Kansas City should a tornado event occur.

The North Kansas City Fire Department has a mission to protect the lives and citizens of the community. It would be prudent for the NKCFD to consider the potential consequences of a tornado touchdown in the city. By identifying circumstances common to other departments and examining the operational challenges faced, the NKCFD can better prepare itself and its members to respond to a tornado emergency. While not every eventuality can be prepared for, common operational considerations should be reviewed and discussed at all levels of the organization. The first operational period following a tornado will likely be overwrought with challenges. Any opportunity to better prepare for those circumstances will only benefit the citizenry as a whole by better preparing its firefighters.

## Recommendations

Based on the findings and information compiled during this study, the researcher recommends the North Kansas City Fire Department train using a job aid on tornado response in the first operational period. There is sufficient information and knowledge that has been gleaned from previous tornado disasters to warrant a training session for members of the NKCFD. This information has yielded many lessons learned that can be

valuable for any fire department. The North Kansas City Fire Department has potential to experience a tornado in its community and could use the information gathered in such a response.

The researcher had originally anticipated the research would support the development of a tornado response plan for the NKCFD. A specific policy addressing tornado response procedures would provide NKC responders with specific direction in the event of a tornado disaster striking the community. However, the research indicates that incident specific protocols are not advisable. Data indicates that emergency response procedures should be adaptable to any type of incident response. Having a standard operating procedure for tornado response would be contrary to having an all-hazards approach to incident response. All hazards response procedures allow agencies to eliminate the need for multiple response protocols for different types of emergencies. The all hazards response should be flexible enough for fire personnel to respond effectively to any disaster (including tornadoes).

The researcher recommends that the job aid created be presented to all fire personnel in a training format that offers all members an opportunity to gain an understanding of the lessons learned from other agencies. The lessons learned will allow the NKC firefighters the ability to see how other agencies were able to respond to tornado disasters in their community so that they can apply the lessons learned to the NKC community in the event of a disaster. The job aid (see Appendix E) should be presented in a training session to all members of the fire department on an annual basis prior to the start of tornado season. While the researcher would certainly be able to present the job

aid to the membership of the department initially, in subsequent years, the information can certainly be reviewed on each shift by any instructor with knowledge of the subject.

The researcher had anticipated developing the components of tornado response plan for the North Kansas City Fire Department. A tornado response plan is a very specific emergency response program. The plan would be relevant only to tornado response and would not be a multi hazard plan as has become standard in the fire service. As such, the answer to the fourth question this research was designed to answer – what are the components of a tornado response plan for the NKCFD - is not presented herein. Instead, a recommendation by the researcher to utilize a job aid in conjunction with a training program on tornado response is offered. This training program and associated job aid will certainly benefit the members of the NKCFD who have not received any tornado specific training. Members will learn what challenges other agencies across the country have faced in responding to tornado disasters. They will gain an appreciation for the scope and magnitude of damage that is possible from tornados. They will learn the common hazards that are presented to responders in the first operational period following a tornado touchdown. Armed with this knowledge and the ever present threat of a tornado impacting the city, members of the NKCFD will be in a better position to respond more effectively in a tornado's aftermath. The researcher hopes the lessons learned will allow the members to more readily overcome the challenges they will surely face. By being better prepared, members will hopefully be in a better position to assist citizens in need and respond more quickly and effectively to emergency calls.

Future researchers who desire to establish a tornado response plan in their department should be open to input from a variety of sources. While there is much to be

learned from other communities who have experienced tornado disasters, no two incidents will be exactly alike. Researchers should expect however to find common themes across the states and similar obstacles to be faced by the fire service. Yet the desire to develop a specific response protocol for this type of event should be balanced with the need to be flexible and adopt an all hazards emergency response plan.

Developing plans specific to events will have the propensity to yield a great many plans that firefighters will have to learn. While there are certainly differences in each type of emergency firefighters can be faced with, the researcher should favor a more generic response plan which can be enhanced with incident specific training. The result should provide future readers with the tools they require to enhance their skills to respond to the devastating aftermath of a tornado.

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## Appendix A

(FEMA, 2004)

### Fujita Tornado Measurement Scale

**Category F0** Gale tornado (40-72 mph)  
Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to signboards.

**Category F1** Moderate tornado (73-112 mph)  
Moderate damage. The lower limit is the beginning of hurricane wind speed; peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.

**Category F2** Significant tornado (113-157 mph)  
Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.

**Category F3** Severe tornado (158-206 mph)  
Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.

**Category F4** Devastating tornado (207-260 mph)  
Devastating damage. Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.

**Category F5** Incredible tornado (261-318 mph)  
Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur.

## Appendix B

The following list represents fire departments across the United States and Canada who had tornadoes touch down relatively close to their communities within the past ten years.

Each department was mailed the questionnaire listed in Appendix B along with a self addressed stamped envelope.

Oklahoma City FD	820 NW 5 <sup>th</sup>	Oklahoma City	OK	73106 73160
Moore Fire Department	301 N. Broadway	Moore	OK	-5130
Wichita Fire Department	455 N. Main St. 635 Woodland Ave., Ste. #2100	Wichita	KS	67202
Kansas City Fire Dept. Gladstone Fire Department	7010 N. Holmes St	Kansas City	MO	64106
Spencer Fire Dept.	315 E. 3rd Street	Gladstone	MO	64118
Petersburg Fire Dept.	125 N. Union Street	Spencer	SD	57374
Kansas City Fire Dept.	701 N. 7th Street	Petersburg	VA	23803
Liberty Fire Department	200 W. Mississippi	Kansas City	KS	66101
Greensburg Fire Dept.	421 N. Grove St.	Liberty	MO	64068
Manhattan Fire Dept.	2000 Denison Ave	Greensburg	KS	67054
Lawrence Fire Dept.	746 Kentucky Street 15 NW Martin Luther King Blvd	Manhattan	KS	66502
Evansville Fire Dept.	2201 University Blvd	Lawrence	KS	66044
Tuscaloosa Fire Dept.	315 E. 200 South	Evansville	IN	47708
Salt Lake City Fire Dept.	46 Talbot Street West	Tuscaloosa	AL	35401
Aylmer Fire Dept.	703 N. Desplaines St	Salt Lake City	UT	84111 N5H 1J7
Plainfield Fire Dept.	40 N. Center, Ste 115	Aylmer	Ontario	
Mesa Fire Department	P.O. Box 38	Plainfield	IL	60544
Bonner Springs Fire Dept. Sedgwick County Fire Dept.	120 E. 13 <sup>th</sup>	Mesa	AZ	85201
Columbia Fire Dept.	200 Orr Street	Bonner Springs	KS	66012
Pierce City Fire Dept.	307 E. Main Street	Harper	KS	67058
Battlefield Fire Dept.	4117 W. Second St	Columbia	MO	65201
Caruthersville Fire Dept.	104 E. 7th Street	Pierce City	MO	65723
Hallam Fire Department	100 N. Sherman Ave.	Battlefield	MO	65619 63830
Washington Fire Dept.	215 E. Washington St	Caruthersville	MO	-1616
		Hallam	NE	68331
		Washington	IA	52353

Woodward Fire Dept.	301 S. Main Street	Woodward	IA	50156
Dunkerton Fire Dept.	991 Jon Street	Dunkerton	IA	50626
Bridge Creek Fire Dept.	2297 C.R. 1222	Blanchard	OK	73010
Del City Fire Dept.	4501 Southeast 15 St	Del City	OK	73115
Midwest City Fire Dept.	8201 West Reno	Midwest City	OK	73160 73632
Cordell Fire Department	117 East Clay Street	Cordell	OK	-5205
Amber Fire Department	212 E. Main Street	Amber	OK	73004
Broken Arrow Fire Dept.	P.O. Box 610	Broken Arrow	OK	74013
Clinton Fire Department	523 Gary Blvd.	Clinton	OK	73601
Edmond Fire Department	10 S. Littler Ave.	Edmond	OK	73160
Duncan Fire Department	720 W. Willow	Duncan	OK	73533
Stillwater Fire Department	1510 S. Main	Stillwater	OK	74074
Tulsa Fire Department	1760 Newblock Pk Dr.	Tulsa	OK	74127
Topeka Fire Dept.	719 SW Van Buren St	Topeka	KS	66603 67905
Liberal Fire Dept.	PO Box 2199	Liberal	KS	-2199
Osage Cty Fire District #2	911 Laing Street	Osage City	KS	66523
Sumner County Fire Dept.	110 N. Osborn	Mayfield	KS	67103
Mulvane Fire Dept.	910 E. Main St.	Mulvane	KS	67110
Hiawatha Fire Dept.	4th & Oregon	Hiawatha	KS	66434
Brady Fire Department	207 E. Commercial	Brady	NE	69123
Goodland Fire Dept.	1010 Center Street	Goodland	KS	67735
Wellington Fire Dept.	200 N. C St., Ste. 200	Wellington	KS	67152
Conway Springs Fire Dept.	208 W. Spring Ave.	Conway Springs	KS	67031
St. James Fire Protection District	300 W. Eldon Street	St. James	MO	65559
Van Buren Fire Dept.	1301 Business Hwy 60	Van Buren	MO	63965
Marble Hill Fire Dept.	P.O. Box 175	Marble Hill	MO	63764
Mt. Vernon Fire Department	711 Breckenridge Rd	Mt. Vernon	MO	65712
Columbus Fire Dept.	1459 26th Ave.	Columbus	NE	68601
Loomis Fire Department	314 Commercial St.	Loomis	NE	68958
Ord Fire Department	240 South 16th Street	Ord	NE	68862
Oconto Fire Dept.	P.O. Box 156	Oconto	NE	68860
Omaha Fire & Rescue	1516 Jackson St.	Omaha	NE	68102
Dakota City Fire Department	1516 Myrtle Street	Dakota City	NE	68731
Wymore Fire Department	110 West 'H' Street	Wymore	NE	68466
Grant Volunteer Fire Dept.	342 Central Avenue	Grant	NE	69140
Hills Fire Dept.	90 N 1st Street	Hills	IA	52235
Jesup Volunteer Fire Dept.	P.O. Box 592	Jesup	IA	50648
Granger Fire Dept.	1906 Main St.	Granger	IA	50109

Grimes Fire Department	101 N. Harvey Street	Grimes	IA	50111
Bridgewater Fire Dept.	109 N. Main St.	Bridgewater	IA	50837
Lucas Fire Dept.	101 Front Street	Lucas	IA	50151
Missouri Valley Fire Dept.	223 E. Erie Street	Missouri Valley	IA	51555
Cedar Falls Fire Department	1718 Main Street	Cedar Falls	IA	50613
Agency Fire Department	103 E. Main Street	Agency	IA	52530
Bradgate Volunteer Fire Dept.	204 S. Garfield Street	Bradgate	IA	50520
Stratford Fire Department	805 Shakespeare Rd	Stratford	IA	50249







## Appendix D

The following represents the responses generated for each question in the questionnaire. While twenty-two questionnaires were returned, some respondents did not reply to all questions.

### Question #1

- Yes – 1999
- Yes – May, 2003 Kansas City
- Yes – 3 in last ten years
- Sept. 2006, May 1999
- Yes, June 12, 2004
- No
- The last tornado with damage was 1992
- Yes – 2003/ Outside our community @ 10-20 miles
- May 3, 1999
- Yes. We have tornados in our area every year. The last major tornado (F5) resulting in 12 deaths occurred 12/16/00.
- Yes – 2003
- Yes – F-3 in 2001
- November 1998
- Yes. May 3, 1999. F5 in South OKC, Moore and Chataw, OK. Yes. May 8, 2003. F5 in South OKC & Moore (GM Plant)
- April 2, 2006 F3 tornado

### Question #2

- Our department had updated SOP's in 2004. However, I had responded to Couter, Mo Oct. 27, 2005 to a tornado that killed 3 people. The next day I began to receive information on a Storm Ready Community through the National Weather Service. We achieved our certification on June 28, 2005. I accredit this program to no one losing their life from this tornado. The same tornado that struck Caruthersville, killed 2 people in Pemiscot County, the county we are located in, then crossed the Mississippi River into Tennessee and killed 16 people in Dyer County, Tenn. And 8 people in Gibson, TN.
- Not really, no.
- No
- Actually no – other than a short notation that ICS would be used in severe weather operations – we just assumed our standard response plan would be sufficient.
- No.
- Other than operating on an Incident Management System, there were no specific guidelines for operations. I might add our department still does not have specific guidelines for tornado response. We do operate under the County's Emergency

Operations Plan which includes response (both prior and post) to severe weather. The county EOP was revised in 2004.

- We have an SOG for storm warning procedures. Other than that, we utilize the All Hazards Emergency Operations Plan.
- No. The only thing we have is mutual aid agreements w/all volunteer departments in our county.
- No, we did not and currently do not. We are in the early stages of disaster planning.
- The Hiawatha Fire Dept. has an SOP in place & on file to let local & state officials know what our responsibility is.
- No, not specifically for tornadoes. We do have a City Disaster Plan to cover any type of disaster. This plan mainly spells out lines of authority & priorities in re-establishing city services. It also spells out emergency shelters & alternate meeting places for city employees to report to.
- No. As with the fire service so many times, we had no plans in place for this. The first tornado hit May 1999 just south of town and damaged 20 homes & businesses. The second tornado hit Sept, 2006 in the north part of town damaging 150-175 homes & 30 businesses. Damage was from minor roof damage to total loss damaging 150-175 homes & 30 businesses. Damage was from minor roof damage to total loss.
- Yes. We train on what we call storm watch and any tornado would fall in that category. We do not try to suppress tornadoes, we simply wait them out then respond to the affected area and provide the necessary services requested.
- Not specific SOP re: tornado response. Overall SOP covered response protocol.
- No.

### Question 3

- 16 hours
- 14 hours (2PM to 4AM)
- We have spent from 20 minutes to 4-5 hours
- 2006: Approx. 34 hours although part of that time was scaled back from midnight to 6AM for safety reasons
- 1 hour
- N/A
- 8 – 10 hours
- 48 hours for the initial search & rescue operations
- 12:50pm – 19:00
- 8 hours
- 7 hrs – tornado hit at 5PM and we finally regrouped & issued new asks around 2AM
- The entire 24 hour shift
- Several hours (10-12 hours). Then our crews were on scene for several days.
- 12

## Question #4

- Response through the debris, natural gas main blowing, no water supply, not electricity, etc. Mutual aid was received from Region E & Region C for tankers and personnel. Search and rescue was done primarily on April 2, then secondary was completed on April 3<sup>rd</sup>.
- Accountability for all citizens and firefighting personnel; Taxed response resources; Access down streets, exact address & locations, excessive amount of debris in streets; Taxed utility company that was responding; Communications with other agencies very difficult; most injuries seemed to be transported to closest EMS facility – that facility was not a level 1 trauma center; these events covered a broad area (hard to setup 1 CP)
- Lack of effective IC structure; ineffective use of resources
- Obviously overwhelmed by scope of the incident; flooded by civilians wanting to help; flooded by mutual aid; lack of “landmarks” to aid in search; lack of enough plugging tools to deal with broken gas mains; fire department members wanting to see to personal business; other response agencies not educated in ICS; radio communication was impossible.
- Proper staging of resources; identifying area/neighborhoods in need of FD resources/services; maintaining effective ICS with a widespread geographical incident; few street signs or house numbers to work from
- Communication between agencies – this tornado covered 2 areas of the city, a 2<sup>nd</sup> city, and 3 areas in the county. Rather than working from a Unified Command, each area set up its own command structure. This caused competition for resources and because of the multi-agency, multi-jurisdictional nature, led to numerous communication issues.
- The tornado that struck our city was an F5. We had a half mile path with over three hundred homes destroyed or damaged. Downed power lines, ruptured gas meters and lack of landmarks, addresses, etc. were huge factors, as well as the number of injured people. The tornado tracked for over 100 miles and all of the resources over several counties were committed. The magnitude of the tornado was never before seen.
- Communications; command structure/due to comm. No one had setup command; secondary hazards (weather, second tornado w/in 1 mile)
- As I recall from our 1992 event as a lieutenant, communication was difficult and not having a structured call back policy in place to get more resources available.
- Roads were congested by storm spotters. Even worked on MVA w/injuries caused by one storm spotter rear ending another storm spotter. Transported on patient from this event. WE had EMS agencies self deploy when asked not to respond. Many people showing up to help or gawk and getting in the way of responders.
- 1<sup>st</sup>: Getting enough resources into the area. We had to make sure no other areas had or were going to have other storm damage in their area; 2<sup>nd</sup>: Access to effected area. It took several hours for police & fire to seal off the area from the onlookers. Once that was done it allowed quicker and safer work area for all, fire ems, utilities, streets; 3<sup>rd</sup>: We should have broken our staff up into operational periods as soon as we coming to grips with the fact this was going to be a long (days) operation. We wore out all key players in the first day which left no one as

sharp for the second full day; 4<sup>th</sup>: Care for, feeding & sheltering staging all of the mutual aid companies

- We do no suppression. The rescue forces have the normal problems of downed power lines, no power, trapped victims, problems with onlookers, darkness, rain, duplicate call from cell phone on the same call and accountability of both fireman & people.
- Scope of damage; number of 911 calls; firefighters (off duty) reporting to assist; volunteer resources (Lowe's); setup of forward command post; coordination w/PD; damage to fire trucks (avoidance)
- Communications were a major problem. The radio was constant chatter. This caused a lot of duplication in the first hour. The first due station was dispatched to a house fire outside the tornado area. This was a working fire and it was dispatched as the tornado was hitting Haysville. This caused a lot of confusion.

#### Question #5

- The Division Chief in charge created a storm damage area approx. 5 mile square and moved all operations in that area to his command. Dispatch did not put out alarms to that area, but gave them to an aide at the command post. Command utilized staging from one of our stations with another Division Chief being the staging officer. This really helped in the organization of alarm response.
- Use of television (Johnny Rowland) helicopter footage; Setup command structure to handle individual challenges; assign liaison to PD and dispatch center; limit search and rescue to known injuries.
- Follow the IC plans that we practice helps a lot.
- 1<sup>st</sup>: Plenty of mutual aid. We had 23 other departments for the next three days in our town. We had other offers & had we needed it, would have called them & return the 1<sup>st</sup> batch of mutual aid; 2<sup>nd</sup>: working with law officials. Trying to get an area around here blocked off is hard with limited police; 3<sup>rd</sup>: new department policies stating that large incidents will be broke up in smaller time periods from the start. Problems with this is forcing people to leave & rest.
- Sherriff sealed off the mile lines and would not allow anyone to enter; but this was about 1 hr into the event; not enough law enforcement available at the onset of the event.
- Staged personnel at a local shopping center via the radio & TV.
- Communications had no real solution; Command – we took command and united all groups we were exposed to.
- The original track of the tornado had it striking Tinker Air Force base, one of our mutual aid resources. The tornado took a slight turn toward our city and the Air Force Base only suffered minor damages. They were utilized for manpower, equipment, light generators, rescue, command post facilities, tents – everything. Our 2 other mutual aid depts. were overwhelmed with their own situations and they were not able to assist us. All city personnel were activated – FD, PD, Pubic Works, Administration.

- Each jurisdiction handled its own area. This got the job done, with all injuries being transported within 2 hrs and the last fatality being found within 20 hrs. It however was not the most effective.
- Relocated staging area; delivered maps to the scene; established geo sectors.
- All responders – civilian or otherwise were forced to report to EOC for assignment. Some mutual aid was actually sent back or refused until they were needed. City responders were rotated home in order that they could take care of personal business. Crash course in ICS was held for heads of departments & city admin. – then we were able to transition into Unified Command.
- The incident involved no loss of life or major injuries. The damage was contained to a specific area so all resources were sent to the area. Issues listed were remedied when the incident was mitigated.
- Utilized GIS maps for locations, streets, electric, gas, etc.; Utilized Public Works to clear streets, brush pumper to access hard to get to areas; The OCFD & OKC now have 800 mhz radio system (used runners); Utilized churches nearby to operate as CP & Operations Center; Several off-duty firefighters live in this part of the city and many self responded to assist on duty crews.
- Checked on family first. I had 3 firefighter homes heavily damaged, so they were not readily available during response. Half of the members were storm spotters when the storm hit. Tree trimming companies helped to clear the streets and highways along with Public Works. These were important challenges to get into effected areas.

#### Question #6

- No changes have been made since the April 2, 2006 tornado. However, our state emergency management disaster plan has been updated to include measures faced after the tornado. Debris removal, donations management, sheltering, hazmat cleanup of discarded household chemicals, and electrical transformers were addressed. Animal sheltering was also a topic of interest. I am a member of the long term recovery team and have been involved in the restoration of the effected area of the city. Many vehicles received flat tires due to nails , screws, and sharp objects in the roadways – this was a problem also.
- We now have a city & state USAR team that can respond to any incident like this; We have not developed an SOP, but we have trained for future events as this; We do have a call back system in place for calling back firefighters if needed; We now have city wide interoperability for communications; We have trained w/other agencies – PD, Red Cross, OHP, etc. – in the event of another tornado. We have had several smaller tornado incidents since 1999 & 2003.
- No.
- Yes – our response plan now covers everything from storm spotting to GPS Ident. of storm shelters to pre-located staging areas. ICS is now taught to all city departments and dept. heads regularly participate in response exercises.
- No – we use mostly all hazard SOPs.
- No. However, several things have been done. An interoperability communications van has been purchased for our region. A regional technical rescue team has been

- developed with regular training. There have been numerous interagency, inter-jurisdictional drills this year, including a full scale drill that lasted 24 hours.
- We critiqued our response to the tornado. For the most part, our response went as well planned as it could. We identified areas that we needed to work on – like getting porta potties in the affected areas quicker. This was a rare tornado event for not only our city, but for our state. The local media was covering the storm from the outset. Even though there was loss of life, it wasn't as high as it could have been. Another lesson learned was that we developed a storm shelter registration – so that we know where to search for below ground shelters if we have people trapped in their shelter, which we did have during our tornado event. The registered shelters were plotted with GPS and an updated list is kept in all the EOP's.
  - No.
  - As stated earlier, we are working with other local agencies and our county emergency preparedness dept. to develop a disaster response plan.
  - No, fire & rescue efforts went well. SOG's would not help with the issues we had with citizens and storm chasers. SOG's would not help with other agencies self dispatching after we advise them to stage in their districts. The key to these events is a strong Incident Command from the start of the event. We had units out in the field storm spotting so our resources were immediately available. We had been monitoring activities for over one hour & a half before the tornado. All of our personnel were at the station or in the field @ the time of the event.
  - Yes. We are still drafting and revising these policies with all other local agencies so it is not in a final document. Basically states the use of unified command with assistance IC & will be broke down with mandatory relief for all involved. People not assigned for an operational period must leave the scene &/or command post. All locations for CP have generators. We have developed local forms for our use and for other city departments.
  - No.
  - No – use NIMS.
  - No – we have PIA's on the alarm and do review that from time to time.

## Appendix E

The following represents the proposed job aid for tornado response training for the North Kansas City Fire Department. This document can be presented in many formats. The researcher chose to develop a PowerPoint slide presentation (see Appendix F).

### **Tornado Response**

#### **The First Operational Period for the NKCFD**

##### **Responder Safety**

- Responders should be equipped with full turnout gear. The use of SCBA should be considered when responding to areas or structures that may pose an inhalation hazard (oxygen deficiency, toxic environments, etc).
- Firefighters should be watchful of downed power lines and treat every line as energized until proven otherwise or rendered safe by power company representatives.
- Natural gas leaks should be addressed as quickly as possible to minimize the potential for gas-fed fires.
- Operations in darkness will require the use of lighting equipment to illuminate any hidden hazards.
- Collapsed or partially collapsed structures should only be entered when the appropriate shoring is in place and there is a potential to rescue a viable trapped victim.

- Responders should not participate in operational activities beyond twelve continuous hours. Mandatory rest/rehab periods will be established by Command personnel.
- If the threat of additional storms continues, suppression forces should be withdrawn and rescue operations suspended until the threat passes.
- Responses to target hazard facilities with known quantities of hazardous materials should be engaged with trained HAZMAT personnel. Collapsed or partially collapsed structures containing large quantities of hazardous materials should be off limits to responders until the hazard has been mitigated.
- Triage will need to be done if multiple casualties are present.

### **Operational Considerations**

- Operational cycles should not exceed twelve working hours. Mandatory rest/rehab periods will be established.
- Responses to high life hazard facilities (school, hospitals, etc) should be a high priority for suppression forces.
- Firefighting in collapsed or partially collapsed structures should be limited to defensive measures (exterior master streams, exposure protection). Interior firefighting should not be attempted in these structures.
- Storm debris will make road passage challenging in some areas. All operating crews should be equipped with chain saws to help gain access to the affected areas. In addition, replacement fuel should be readily available.
- Damage to infrastructure may lead to poor water supply and no electricity. Operations in the dark should be limited in nature.

- All crews should have city maps on the apparatus to aid in navigation should street signs and landmarks be removed or unrecognizable.
- In the event access is blocked by large trees or other large objects, Public Works should be notified to clear the area using bulldozers and such.
- Radio communications should be limited. Clear and concise reports to Command should be delivered as needed.

### **Command Considerations**

- Communications will quickly be overwhelmed early in the incident. Consider alternative means of communications (cell phones, runners, etc).
- Resource needs will quickly outpace inventory. Prioritize resource allocation based on the greatest need and potential positive outcome.
- Rotate personnel out of the response operation every twelve hours (maximum). Firefighters will want to work thru to exhaustion. This will make them more vulnerable to injury and less aware of their surroundings.
- Isolate the damaged area and advise dispatch to route all calls for service in the affected area to the Command Post. This will limit radio communications and allow for proper resource allocation in the affected area.
- Establish Unified Command early so that all agencies operating in the area are making the most effective use of available resources. Establishing a strong, direct, and visible command early will allow for rapid implementation of procedures and deployment of resources.
- Anticipate spontaneous volunteers. Outside agencies and local volunteers will present themselves for service even without being called upon. Command must

designate a staging area and staging manager for these resources so they can be utilized when appropriate.

- Lack of physical landmarks will make travel in the affected area difficult for responders. Utilize available resources to erect temporary street markings in a safe manner.
- Search and rescue operations in collapsed or partially collapsed structures should be limited to day light hours unless significant lighting can be brought to the scene.
- If the threat of damaging storms continues, all non-essential operations should be suspended until the threat passes.
- Rapid damage assessment will allow for the best allocation of resources to the affected area.
- Anticipate the need for large equipment caches (shoring, saws, etc).
- Have a mobile tire repair service on hand to handle disabled apparatus.
- Know where to get and how to request heavy equipment (bulldozers, etc).
- Call for help early once the scope and magnitude of the damage has been assessed.
- Utilize local media outlets to help develop an assessment of the damage path (“eye in the sky”).
- Provide regular briefings to the media
- A scribe will be needed to maintain an account of all activities relating to the emergency for potential re-imburement.

- Be familiar with responsibilities outlined in the city's Emergency Operations Plan.
- Anticipate a transition from rescue to recovery mode once the emergency phase of the operation is over.

## Appendix F

PowerPoint presentation of Job Aid

# TORNADO RESPONSE

## **The First Operational Period**

### The Threat

- NKC lies in Tornado Alley
- This area of the country receives proportionally more tornadoes than anywhere else (except Florida)
- Tornado season runs from March – August (though they can occur anytime)

### Tornado Alley

### U.S. Tornadoes

### Tornado Response

- NKCFD SOP's dictate that in the event of a tornado warning, suppression personnel will wait out the storm in quarters
- Calls for assistance will be answered after the threat has passed

### Tornado Response

- Issues pertaining to response in a tornado's aftermath are divided in the following categories:
  - Responder Safety
  - Operational Considerations
  - Command Considerations

## Responder Safety

- Responders should be equipped with full turnout gear
  - Special consideration given to eye protection
- The use of SCBA should be considered in areas or structures where an inhalation hazard may exist
  - Toxic environments
  - Oxygen deficient environments

## Responder Safety

- Firefighters should be aware of downed power lines (these may be tangled in trees)
- Consider every line as charged until proven otherwise or rendered safe by KCP&L

## Responder Safety

- Natural gas leaks should be addressed as quickly as possible to minimize the potential for gas-fed fires
- Operations conducted in darkness will require lighting equipment to illuminate hidden hazards

## Responder Safety

- Collapsed or partially collapsed structures should only be entered when the appropriate shoring is in place and there is a potential to rescue a viable trapped victim

## Responder Safety

- Responders should not participate in operational activities beyond 12 continuous hours
- Mandatory rest/rehab periods will be established by Command

## Responder Safety

- If the threat of additional storms continues, suppression forces should be withdrawn and rescue operations suspended until the threat passes

## Responder Safety

- Responses to target hazard facilities, with known large quantities of hazardous materials should be engaged with trained HAZMAT personnel
- Collapsed or partially collapsed structures with known large quantities of hazardous materials should be off limits to responders until the hazard has been mitigated

## Responder Safety

- In the event multiple casualties present themselves, triage will need to be performed
- Re-familiarize yourself with triage equipment and protocols

## Operational Considerations

- Operational cycles should not exceed twelve working hours.
- Mandatory rest/rehab hours will be established

## Operational Considerations

- Responses to high life hazard facilities (hospital, Harrah's, Gardens, etc) should be a high priority for suppression forces

## Operational Considerations

- Firefighting in collapsed or partially collapsed structures should be limited to defensive measures (master streams, exposure protection)
- Interior firefighting should not be attempted in these structures

## Operational Considerations

- Storm debris will make road passage challenging in some areas
- All crews should be equipped with chain saws to help gain access to affected areas (include replacement fuel)

## Operational Considerations

- Damage to infrastructure may lead to poor water supply and no electricity
- Operations in the dark should be limited in nature
- All crews should have city maps to aid in navigation should street signs & landmarks be removed or unrecognizable

## Operational Considerations

- In the event access to an area is blocked by large trees or other large objects, Public Works should be notified to clear the area using heavy equipment (bulldozers, etc)
- Radio communications should be limited. Clear & concise reports to command should be delivered as needed

## Command Considerations

- Communications will quickly be overwhelmed by the scope of the incident
- Consider alternative means of communications (cell phones, runners, etc)

## Command Considerations

- Resource needs will quickly outpace inventory
- Prioritize resource allocation based on the greatest need and potential positive outcome

## Command Considerations

- Rotate personnel out of the response operation every twelve hours (maximum)
- Firefighters will want to work thru til exhaustion
- This will make them more vulnerable to injury and less aware of their surroundings

## Command Considerations

- Isolate the damaged area and advise dispatch to route all calls to the affected area to the Command Post or EOC
- This will limit radio communications and allow proper resource allocation in the affected area

## Command Considerations

- Establish Unified Command early so that all agencies operating in the affected area are making the most effective use of available resources
- Establishing a strong, direct, and visible command early will allow for rapid implementation of procedures and deployment of resources

## Command Considerations

- Anticipate spontaneous volunteers
- Outside agencies and local volunteers will present themselves for service even without being called upon
- Command must designate a staging area and staging manager for these resources so they can be utilized when appropriate

## Command Considerations

- Lack of physical landmarks will make travel in the affected area difficult for responders
- Utilize available resources to erect temporary street markings in a safe manner

## Command Considerations

- Search and rescue operations in collapsed or partially collapsed structures should be limited to daylight hours unless significant lighting can be brought to the scene
- If the threat of damaging storms continues, all non-essential operations should be suspended until the threat passes

## Command Considerations

- Rapid damage assessment will allow for the best allocation of resources to the affected area
- Did you know that the damage assessment process is assigned to Public Works?

## Command Considerations

- Anticipate the need for large equipment caches (shoring equipment, saws, etc.)
- Have a mobile tire repair service on hand to handle disabled apparatus
- Know where to get and how to request heavy equipment

## Command Considerations

- Call for help early once the scope and magnitude of the damage has been assessed
- Use local media outlets to help develop an assessment of the damage path (“eye in the sky”)

## Command Considerations

- Provide regular briefings to the media
- A scribe will be needed to maintain an account of all activities relating to the emergency for potential future reimbursement

## Command Considerations

- Be familiar with responsibilities outlined in the city's Emergency Operations Plan
- Anticipate a transition from rescue to recovery mode once the emergency phase of the operation is over

## End of Presentation

Are you prepared???

Questions???