HURRICANE IMPACT ON FIRE DEPARTMENT OPERATIONS

EXECUTIVE ANALYSIS OF FIRE SERVICE OPERATIONS
IN EMERGENCY MANAGEMENT

BY: RICHARD J. HUGHES
PROVIDENCE FIRE DEPARTMENT
PROVIDENCE, RHODE ISLAND

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

October, 1998

ABSTRACT

The City of Providence, R.I., and the Providence Fire Department has previously been seriously impacted by hurricanes that occurred in 1938 and 1954, in which the downtown business district had been left under many feet of water. In 1966, the city received the completed Fox Point Hurricane Barrier, from the United States Army Corp of Engineers, which was designed to protect the area behind it from a storm tidal surge.

The problem that prompted this research is the country's leading forecaster has predicted and increase of hurricanes in 1998 and the years to come. Also compounding the problem is the Providence Fire Department has no written procedure for hurricanes and storms that it's members can follow.

The purpose of this research was to evaluate the current status of the Providence Fire Department as it stands today, and what impact a hurricane would cause. Both the historical and evaluative methods were utilized. Of which the following research questions were posed:

1. How has the Providence Fire Department been impacted by hurricanes or other significant weather related events?
2. Are there any nationally recognized standard or recommendations for fire departments to follow in preparing for hurricanes?
3. Does the Providence Fire Department comply with these nationally recognized standards or recommendations?
4. What have fire departments in the greater Providence area done to be prepared for a hurricane?

To complete this research a literature review, personal interviews, a survey of area fire departments, and queries of the computer database were conducted. Thunderstorms were utilized because there was no previous computer records in the City of Providence that dealt with the impact of a hurricane on the Providence Fire Department.

Results were found that there is a general increase in responses during thunderstorms in the Providence area. The results also showed that there are recommendations for fire departments to follow in which written procedure for storms or hurricanes. Also, area fire departments are generally decimated during thunderstorms and most likely would be unable to provide mutual aid to the city should it need assistance.

Recommendations are made that the Providence Fire Department draft written procedure for storms and hurricanes. That the city should also set guidelines for the dispatch center to curtail responses when the wind speeds reach a certain sustained speed. Further, the city should consider entering into a long range mutual aid agreement with communities far removed from Providence, so that personnel and equipment could be provided on a relatively quick notice, after a major storm impact.

Additional research is recommended to verify the results of this study, and to investigate a need for additional standard operating procedures for other types of storms that impact the fire department.

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INTRODUCTION

"For residents of the East Coast and Gulf states, hurricanes are a way of life. You board up the windows, gather a supply of food and candles, and wait until the storm passes (Nordberg, M., 1993, p.25)."

> There is nothing like it in the atmosphere. Even seen by sensors on satellites thousands of miles above the earth, the uniqueness of these powerful, tightly coiled storms is clear. They are not the largest storm systems in our atmosphere, or the most violent; but they combine those qualities as no other phenomenon does—as if they were designed to be engines of death and destruction (National Oceanic and Atmospheric Administration, 1993, p. 2).

A hurricane is a revolving storm that produces winds over 74 miles per hour, and drops great amounts of rain (Federal Emergency Management Agency, 1987, p. 3). These types of storms form over water within a tropical depression, that given the right atmospheric conditions, allows the strength of the storm to grow (NOAA, 1982, p. 2). These storms are rated by a scale called the Saffir-Simpson scale of strength which categorizes hurricanes from one through five, depending on the storms wind speed, with a Category five being the worst (Vallee, D., & Dion, M., 1997, p. 131).

The Metro-Dade Fire–Rescue Department, located in southeastern Florida, has had impacts from numerous hurricanes and has consistently "…tried to keep up with the latest information from others who have been hit by hurricanes (Paulison, R., 1993, p. 34)." Metro-Dade experienced the full fury of Hurricane Andrew on August 24, 1992

and had an internal procedure that terminated all fire department responses when wind speeds approached fifty miles per hour (Paulison, R., Montes, M., Castillo, C., and Brown, J., 1993, p. 66). The Coral Gables Fire Department, located in southeast Florida, shut down their operations at approximately the same time, because "… high winds and debris in the air made it too hazardous to respond (Teems, D., 1993, p. 84)." Also, the City of Miami Fire Department, located in Dade County, shut down their operations at approximately the same time as the other departments because of the wind being too hazardous to respond (Fisher, J., 1993, p. 59).

The City of Providence, Rhode Island, has been severely damaged by two significant hurricanes during this century. The 1938 hurricane had a storm surge of approximately 13.7 feet (Vallee, D., & Dion, M., 1997, p. 125). It "…completely flooded Downtown and placed an enormous cleanup and bail-out burden upon the fire service (Conley, P., & Campbell, P., 1985, p.82)". The second storm was Hurricane Carol, which struck the Providence area on August 31, 1954, in which the downtown area was severely impacted with severe flooding from the storm surge of 14.4 feet (Vallee, D., & Dion, M., 1997, p. 125). Hurricane Carol placed a severe strain on the personnel and apparatus of the Providence Fire Department (Conley, P., & Campbell, P., 1985, p. 97). It took all of the departments front line apparatus, plus fifteen reserve pumpers and twenty portable pumps were employed to manage the situation (Marshall, L., 1954, p. 3).

The problem which prompted this research project was that the country's leading hurricane forecaster has predicted an increase in the number and intensity of storms in 1998, and the years to come (Lord, 1998, p. 1). History has proven that the City of

Providence and the Providence Fire Department will be severely impacted should a hurricane strike the region. Further compounding the problem is that the Providence Fire Department has no written standard operating procedure or guidelines dealing with hurricanes or storms for it's members to follow.

The purpose of this research was to evaluate the current status of the City of Providence and it's fire department to determine if the current level of service is adequate to protect its citizens should a hurricane strike. In conducting this research, both the historical and evaluative methods were utilized. The following research questions were posed:

1. How has the Providence Fire Department been impacted by hurricanes or other significant weather related events?
2. Are there any nationally recognized standards or recommendations for fire departments to follow in preparing for hurricanes?
3. Does the Providence Fire Department comply with these nationally recognized standards and recommendations?
4. What have fire departments in the greater Providence area done to be prepared for a hurricane?

BACKGROUND AND SIGNIFICANCE

The City of Providence, is located at the northernmost point of Narragansett Bay, and is the capitol of the State of Rhode Island. The city has a resident population of 160,728 people (Costa, D., personal communication, Sept. 22, 1998). During weekday

business hours, the daytime population is approximately 320,000 people (Palmieri, J., personal communication, Sept. 18, 1998).

The Fox Point Hurricane Barrier, located in the City of Providence, was designed and completed in 1966 by the Corp of Engineers, at a cost of sixteen million dollars (Morris, J., personal communication, Sept. 18, 1998). "The very existence of the barrier is a statement about just how vulnerable Providence is to a serious hurricane (Varone, J. C., personal communication, Sept. 21, 1998)." This barrier was designed to afford complete protection from the flooding presented by a hurricane's tidal surge (U.S. Army Corp of Engineers, 1995, p .2-21). The barrier itself is 25 feet above sea level, has three gates that can be closed electrically or manually, which would then block the Providence River. The barrier contains five 600,000 gallon per minute pumps that combine for a total of 3,000,000 gallons per minute, in which the upper portion of the Providence River, the Moshassuck River, and the Woonasquatucket River are drained into the bay (Morris, J., personal communication, Sept. 18, 1998).

The Providence Fire Department is responsible for the protection of life and property within the City of Providence (Providence Fire Department, 1996, p. 2). Currently, the Providence Fire Department has 477 members with testing procedures being evaluated for training new candidates to bring the strength of the department back to 539 career members (Thomas, J., personal communication, Sept. 18, 1998).

On each of the Providence Fire Department's four shifts, there is a minimum of 98 career members working (Battista, J., personal communication, Sept. 23, 1998). These personnel operate fourteen engine companies, eight ladder companies, a special

hazards unit, five mobile intensive care rescues, two battalion chiefs and one deputy assistant chief (Turchetti, R., personal communication, Sept. 18, 1998). The department has an unmanned reserve fleet of four engines, two ladders, two rescues and one special hazards truck (Day, S., personal communication, Sept. 3, 1998). Also within the department are the Fire Prevention Bureau, Repair Division, Division of Training, and the Bureau of Operational Control [BOC] (Turchetti, R., personal communication, Sept. 18, 1998).

The BOC which is located within the Providence Communications Department, is the Providence Fire Department's communications hub, through which all radio and telephone messages pass (Varone, J. C., personal communication, Sept. 21, 1998). The BOC processed approximately 200,000 telephone calls (Reposa, R., personal communication, Sept. 18, 1998). In the same year, the BOC dispatched approximately 36,000 incidents for the Providence Fire Department (Varone, J., personal communication, Sept. 21, 1998). The BOC also logs activities of the Communications Department personnel while they perform their duties of inspections, and maintenance of the cable plant (Reposa, R., personal communication, Sept. 18, 1998).

Historical Perspective

Since 1900, southern New England, has experienced the effects of seven hurricanes which have made landfall, of which three were of Category 3 intensity (Vallee, D., & Dion, M., 1997, p. 122). On September 21, 1938, one of these storms, known as the Great New England Hurricane of 1938, decimated the City of Providence (Providence Journal Co., 1938, p. 1). The storm, which rated as a Category 3, caused

severe wind damage and significant flood damage to the downtown areas, which are at a few feet above sea level (Vallee, D., & Dion, M., 1997, p. 23). The Providence Fire Department was severely impacted at the time (Conley, P., & Campbell, P., 1985, p. 82).

On August 31, 1954, Hurricane Carol, which was also a Category 3 hurricane, affected the City of Providence with widespread damage (Vallee, D., & Dion, M., 1997, p. 51). This storm left the downtown areas of the City of Providence under water again (Providence Journal Co., 1954, p. 1). The Providence Fire Department was severely impacted (Conley, P., & Campbell, P., 1985, p. 97).

This research presents a capability assessment of the organization as discussed in the Executive Analysis of Fire Service Operations in Emergency Management course by utilizing necessary steps to ensure success. The course assists the executive fire officer in preparing for the worst type of situations, prioritizing, disseminating, with results that should improve conditions in the traditional organization.

LITERATURE REVIEW

A review of literature relating to hurricanes was first conducted at the Learning Resource Center of the National Fire Academy, in Emmitsburg, Maryland between April 24, 1998 and April 29, 1998. Additional materials were obtained from the Rhode Island Emergency Management Agency, the United States Army Corp of Engineers, the National Weather Service, and from various personal interviews during September of 1998.

The June 6, 1998 Providence Journal article "Busy Hurricane Season Expected", written by Peter B. Lord made reference to the fact that the "…country's leading hurricane forecaster [William Gray] is predicting a return to normal, which means the probability of hurricanes is far greater than it was last year (p.1)."

Gray, who is a professor at Colorado State University, predicted that between 9 to 10 tropical storms would develop during the 1998 hurricane season, with 6 becoming hurricanes. Of the six hurricanes, his prediction was that two would become major hurricanes. Merrill (1998), similarly recognized Gray's expertise, and cited his prediction for 1998 (p. 14A). Lord and Merrill influenced this research by documenting the prediction of William Gray that the number of hurricanes will increase in 1998.

The thesis "Southern New England Tropical Storms and Hurricanes" written by David R. Vallee and Michael R. Dion (1997), reported that since 1900, the southern New England coast had been impacted by seven hurricanes that made direct landfall (p. 122). Their research stated that the Great New England Hurricane of 1938 caused 564 deaths and approximately 1700 injuries in southern New England (p. 23). Their work also stated that Hurricane Carol, in 1954 was responsible for 65 people dead in southern New England (p. 51).

Both Vallee and Dion have provided in their research as complete a breakdown as possible on all pertinent data that was available from each of these hurricanes or tropical storms. These men are quite knowledgeable on the subject because they are meteorologists, employed with the National Weather Service Forecast Office, Taunton,

Massachusetts. Their work provided an opportunity to explore individual storms in depth, with a complete set of statistical data for all storms.

The U.S. Army Corp of Engineer's Rhode Island Hurricane Evacuation Study Technical Data Report (May, 1995), utilized the National Hurricane Center's Sea, Lake, and Overland Surges from Hurricane (SLOSH) computer model. The SLOSH model used many simulated hurricanes, which affected the southern New England and Rhode Island areas. Though areas of Rhode Island have evacuation concerns, the City of Providence may be impacted slightly, provided the barrier remains intact as it was intended (U.S. Army Corp of Engineers, 1995, p. 2-21).

The U.S. Army Corp study lent a great impact to this research project, due to an agency funded by the government stating that the downtown areas of Providence are protected by this barrier that was built over 30 years ago. The SLOSH model tests were conducted for this report in more recent times due to this report being finalized in May of 1995. However, it is important to note, that this report mentions favorable results provided there is no failure of the gates to this barrier (U.S. Army Corp of Engineers, 1995, p. 9-5).

Chief R. D. Paulison, of the Metro-Dade Fire-Rescue Department wrote (1993) that during Hurricane Andrew, his department has made efforts to stay current through a historical record of what happened to other fire departments that were impacted by hurricanes (p. 34). Paulison's department had established procedure, so that his personnel would be ready for the full impact of a hurricane in which they found out that

they had much more damage to the fire department than planned, and needed much more external support to achieve their mission (pp. 34-40).

The article "Metro-Dade Fire Department: A Comprehensive Look" written by R. Paulison, M. Montes, C. Castillo, and J. Brown (1993) related how the Metro-Dade Fire-Rescue Department had made preparations for the oncoming Hurricane Andrew (pp. 64-66). The article further related that the department would shut down the dispatching of apparatus when the wind speed reached fifty miles per hour (p. 66).

The article "Hurricane Andrew: A Personal Account" written by Jim Fisher (1993), stated that on-duty personnel were using written procedure for guidance in preparation for the oncoming Hurricane Andrew (p. 58). Fisher wrote that the City of Miami shut down responses for service because it was deemed too hazardous for fire and rescue personnel to respond (p. 59).

In the article "Coral Gables: Overview and Organization" written by David Teems (1993), the Coral Gables Fire Department was forced to shut down operations due to high winds and debris flying in the air, which was deemed hazardous for response (p. 84). In addition, the Coral Gable Fire Department had in place, written procedure (p. 84).

The article "Stormy Weather" written by Marie Nordberg (1993), discussed Hurricane Andrew, which was a Category 5 hurricane that slammed through southern Florida and onto Louisiana, leaving severe destruction in it's wake. Nordberg wrote that the Metro-Dade Fire-Rescue was believed to be ready but experienced an overload of calls for service, which could not be dispatched due to the fire and rescue personnel being

grounded due to high winds. This occurred when the winds were more than 150 miles per hour, in which the department was physically unable to respond for service.

The articles written by Paulison, Fisher, Teems, Nordberg, and Paulison (et al) greatly affected this research by demonstrating the impact that storms can have upon communities, even if they have taken pro-active steps toward disaster planning. Their articles also related information on internal procedure: that their respective fire departments developed policies based on real life experience to cease responses to incidents when wind speeds reach fifty miles per hour, for safety factors.

In "Firefighters and Fires in Providence, a Pictorial History of the Providence Fire Department, 1754-1984" (1985), Conley and Campbell wrote that the fire department after the 1938 hurricane struck, had an "…enormous cleanup and bail-out burden (p. 82)" placed upon itself. They also wrote that Hurricane Carol [August 31, 1954] had placed a great strain on the Providence Fire Department (p. 97).

The information contained in this historical volume is significant because it related the impact, which the Providence Fire Department felt from the 1938 and 1954 hurricanes. The volume displayed the leading role that the fire department had. Finally, it told of the great service the fire department was able to deliver in the 1954 hurricane, mainly because of the retention of a reserve apparatus fleet (p. 97).

In the Federal Emergency Management Agency's [FEMA] "Fire Department Communications Manual: A Basic Guide to System Concepts and Equipment" (1995), stated that the "…the effective functioning of fire department units and personnel for

emergency operations requires clear, decisive action. Standard Operating Procedures are uniform procedures to be employed to meet various situations (p. 4-4)."

In the National Fire Protection Association (NFPA) 1201, Standard for Developing Fire Protection Services for the Public (1994) which "… is intended for the use and guidance of those charged with providing fire protection (safety) services to protect lives, property, and the environment from the effects of fire and, in many cases, other perils (p. 5)." The standard also refers to operational guidelines and orders where the fire chief is responsible for "…issuing written administrative regulations and operating guidelines and orders (p. 11)."

The FEMA Communications Manual and NFPA 1201 influenced this research by providing a mandate that all operational procedures need to be in writing. Further, the State of Rhode Island has previously adopted NFPA 1500 into law (Rhode Island General Law, 23-28.4-1, 1998). NFPA 1500 was written for the occupational safety and health of fire service personnel, and is a referenced standard in NFPA 1201.

PROCEDURES

A literature review was first conducted within the Learning Resource Center, located in Emmitsburg, Maryland at the National Fire Academy between April 24 and April 29, 1998. Additional requests for information were requested of the National Weather Service, Taunton, Massachusetts office; the United States Army Corp of Engineers, Waltham, Massachusetts office; the Rhode Island Emergency Management Agency, Cranston, Rhode Island; the Providence Communications Department; the

Providence Emergency Management Agency; the Providence Fire Department; and the Providence Journal Company Library between June and September of 1998.

Personal interviews were conducted with Stephen T. Day, Superintendent, Repair Division, Providence Fire Department on September 3, 1998; James T. Morris, Superintendent of the Fox Point Hurricane Barrier on September 18, 1998; Gary Mulcahy, Acting Assistant Chief of Department, Providence Fire Department on September 18, 1998; John Palmieri, Director, Planning and Development, City of Providence on September 18, 1998; Ronald Reposa, Computer Administrator, City of Providence Communications Department on September 18, 1998; John Thomas, Battalion Chief and Director of Training, Providence Fire Department on September 18, 1998; Richard Turchetti, Deputy Assistant Chief, Providence Fire Department, on September 18,1998; J. Curtis Varone, Battalion Chief, Providence Fire Department, and also a lawyer on Sept. 21, 1998; David Costa, Fire Marshall, Providence Fire Department on September 22, 1998; and Joseph Battista, Deputy Assistant Chief, Providence Fire Department on September 23, 1998.

A telephone survey was conducted for the purpose of obtaining information from the municipal fire departments located within the greater Providence area. The fire departments that were contacted are the communities that would be asked for mutual aid should the City of Providence Fire Department need additional resources. The communities that were contacted were Barrington, Bristol, Cranston, Central Falls, East Greenwich, East Providence, Johnston, Lincoln, North Kingston, North Providence, Pawtucket, Scituate, Seekonk , Smithfield, Warren, and Warwick. The survey was field

tested and questions revised prior to actually administering it to the subjected fire departments. The local fire chief of each community was called and asked to answer the survey. In three instances, a subordinate with at least the rank of Battalion Chief, was directed by the fire chief to answer the survey. The telephone survey took place between August 24, 1998 and September 3, 1998. The survey [see Appendix A] requested information as to whether or not that fire department had an established standard operating procedure [SOP] for hurricanes in place within their department. If that department did not have a SOP in place, did they follow a local emergency preparedness plan. The survey also requested information as to the status of reserve apparatus and if personnel were recalled in case of storms. Finally, the survey requested information as to the operating condition of that local fire department during severe thunderstorms that pass through their areas during the warmer months of the year. This question was asked because of the infrequent affecting of hurricanes in the New England area.

A query of the City of Providence Communications Department computer database in the BOC was utilized for the purpose of finding dispatched responses to incidents during a thunderstorm. Thunderstorms were utilized because the Providence Fire Department has no computerized data from any hurricanes. Printouts were made for the incidents transmitted during a thunderstorm. Printouts were made of all incidents that were dispatched on the date of the storm. As a means to calculate data from the storms against an everyday norm, printouts were made for three days before and three days after the storm date. The printouts were from the same time period during the date of the

storm and for the entire day. Data was tabulated and compared in which tables were created.

It is important to note that the survey would be held to a limitation by asking whether severe thunderstorms affected that local fire department's operating condition. The effects of a hurricane rarely influence the New England area, so asking that question, which would have specifically mentioned hurricane, would have been unanswerable in most cases. Another limitation would be that the survey was purposely held to a geographical area around the City of Providence, which may be considered a small survey with results that may be tainted. The reason for the small survey was that the Providence Fire Department has rarely requested apparatus from an area that is more than thirty miles from the City of Providence.

RESULTS

1. How has the Providence Fire Department been impacted by hurricanes or other significant weather related events?

In the past, the Providence Fire Department has been significantly impacted by two hurricanes. Conley and Campbell reported that the 1938 and 1954 hurricanes kept the department busy. The 1954 Providence Fire Department mentioned that the fifteen reserve engines were of considerable help in bailing out the city after Hurricane Carol flooded the downtown business district.

Through a number of queries into the database at the BOC, thunderstorms have increased requests for the fire department's assistance [see Table 1]. The four

thunderstorms selected show that an increased requests for service is between 11.6% and 28.4% [see Appendix A]. The Providence Fire Department on some occasions has been left with no engine or ladder companies in service. These storms have increased the requests for the fire department from an approximate rate of between 85 to 114 incidents per day, to a total of between 131 to 166 incidents [see Appendix A].

Of the four storms selected for queries, they have released between .50 inches and 3.02 inches of rain in the city [see Appendix A]. Large amounts of rain increased the requests for water emergencies [see Table 1] in homes and business with an average from these four storms of 15 per storm (32.8% of the average responses per storm). By evaluating the data for the three days before and the three days after each of the four thunderstorms, and calculating an average of .9 water emergencies a day (.9%), with an average day having approximately 100 incidents [see Table 2]. Master Boxes that are wired into the city's cable plant accounted for 4.8 per storm (10.5%). Commercial Alarms received from Central Stations accounted for 3.3 per storm (7.2%). An incident reported over the telephone, which requires the assignment of three engines, two ladders and a chief, known as a Still Box [see Table 1] averaged 2.3 per storm (5% of the average responses per storm). Still Alarms [see Table 1], which is a telephone call for service requiring one or two pieces of apparatus for assignment accounted for 7 per storm (15.3%). The data provided [see Table 1] that requests for medical aid averaged 11.5 per storm (25.1%) and street boxes averaged, two per storm (4.4%). All categories of responses provided a higher percentage of average responses during the storm, than the

average percentage of response by category, for the entire averaged storm day [see Tables 1 & 2].

Table 1

Thunderstorms -Providence and Vicinity- 22Jun97, 9Mar98, 19Jun98, 30Jun98

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
Thunderstorm 22Jun97 1615-2035	5	10	9	7	17	9	19	76
Thunderstorm 9Mar98 1900-2100	1	2	0	2	4	12	11	32
Thunderstorm 19Jun98 1430-1600	1	4	0	3	4	8	5	25
Thunderstorm 30Jun98 1145-1400	1	3	0	1	3	31	11	50
Total	8	19	9	13	28	60	46	183
Average Of 4 Storms	2	4.8	2.3	3.3	7	15	11.5	45.8
% of Average Total storm incidents	4.4%	10.5%	5%	7.2%	15.3%	32.8%	25.1%	100%

Table 2
Average and Percentage of
Total Incidents Dispatched for 22Jun97, 9Mar98, 19Jun98, and 30Jun98

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
22Jun97	21	13	11	8	25	9	79	166
9Mar98	4	11	4	6	15	14	77	131
19Jun98	17	15	0	6	13	9	74	134
30Jun98	19	5	2	3	7	36	61	133
Total	61	44	17	23	60	68	291	564
Average Of 4 Days	15.3	11	4.3	5.8	15	17	72.8	141
Storm Day Average 24 hours	10.9%	7.8%	3%	4.1%	10.6%	12.1%	51.6%	100%

The Providence Fire Department has experienced a general increase in requests for service in most all categories of incidents, depending on the severity of the thunderstorm [see Tables 1 and 2].

The survey found that local fire departments for the most part were decimated by the impact of a thunderstorm, which would cause lightning strikes, numerous master boxes being activated, accidents and water conditions. With fire departments in the area of Providence experiencing an overload of requests for service, that department may not be able to provide or receive mutual aid apparatus if requested.

2. Are there any nationally recognized standards or recommendations for fire departments to follow in preparing for hurricanes?

The National Fire Protection Association through Standard 1201 (1994), recommended that fire personnel be given written guidelines and orders (p. 11). The Federal Emergency Management Agency's Communications Manual (1995) recommended that Standard Operating Procedures be utilized for dealing with different situations (p. 4-4).

In the state of Florida, Metro-Dade Fire-Rescue Department, Coral Gables Fire Department, and the City of Miami Fire Departments all have written procedure in which these departments operate by during incidents of hurricanes. Included in these standard operating procedures is the orders to cease operations at fifty miles per hour sustained wind speeds.

3. Does the Providence Fire Department comply with these nationally recognized standards and recommendations?

During storms and disasters, the City of Providence will utilize an Emergency Operations Plan [EOP] (Providence Emergency Management Agency, 1997). This plan is utilized for procedure during storms and disasters at a department director level, and does not break down specific duties at a fire company level (Varone, J. C., personal communication, Sept. 21, 1998).

The Providence Fire Department at present has no written standard operating procedure addressing the occurrence of storms or hurricanes for members to use for guidance (Providence Fire Department Standard Operating Procedures). The Providence Fire Department has no written policy to cease operations when there are high sustained winds. Also, there are not any pre-arranged mutual aid agreements, from communities located a long distance from the City of Providence.

4. What have fire departments in the greater Providence area done to be prepared for a hurricane?

Of the departments that were surveyed, twelve of the sixteen (75 %) already have internal procedure dealing with storms in general [see Table 3]. Five of the twelve (41.7%) have written procedure in place within the fire department. All (100%) of the communities have an emergency preparedness plan.

Fourteen of the sixteen (87.5%) departments surveyed stated that apparatus would have additional personnel recalled, also reserve apparatus would be staffed, should there be any available. Fourteen of sixteen (87.5%) departments stated that their departments are briefly inundated during thunderstorms, in which their entire department is deployed.

These fourteen departments related that they would most likely be unable to provide any mutual aid of fire apparatus during severe thunderstorms.

Table 3

TELEPHONE SURVEY RESULTS
16 FIRE DEPARTMENTS

	YES	NO
Department has Emergency Preparedness Plan	16	0
Department have internal procedure for storms	12	4
Department has written SOP for storms	5	11
Department recalls personnel for storms	14	2
Department inundated during storms	14	2
Department able to render mutual aid	2	14

DISCUSSION

Through research, the City of Providence has in the past, fallen victim to the both the 1938 and 1954 hurricanes. Though proactive steps have been taken, such as the creation of the Fox Point Hurricane Barrier, it is widely believed that the downtown and river basins within the city will be spared future flooding from the effects of a hurricane (Morris, J., personal communication, Sept. 18, 1998). The citizens of Providence are quite fortunate to have such a structure located in their community.

Authors cited within this research have been consistent in saying that fire departments have been severely impacted whenever a hurricane has struck. Those authors have repeatedly related that written procedure is necessary for the organization to

have clear direction on what to do when a hurricane is about to impact. Personnel must be given clear written direction, for their own safety and for the department's equipment.

NFPA, through Standard 1201 makes it quite clear that written standard operating procedures is necessary for the operations of fire departments. Also, with NFPA 1500, which was produced for the safety of fire department personnel, being law in the State of Rhode Island, written procedure for practically every aspect of the fire service is necessary. This is because NFPA 1500 is a referenced standard of NFPA 1201.

The computer data queries repeatedly show that in many categories of incidents that there is an increase of responses during thunderstorms. In only two categories was there a decrease, which were street boxes and requests for medical aid. Should a major hurricane impact Providence, requests for assistance could reach unimaginable levels, as demonstrated in Metro-Dade County, in Florida, during Hurricane Andrew in 1992 (Nordberg, M., 1993, p. 26).

The survey of other fire departments operating near the City of Providence found that those departments experience a similar type of condition that the Providence Fire Department experiences during thunderstorms. The City of Providence may find that during these types of storms, or hurricanes, that there will be no community within the region available for mutual aid. It may be entirely necessary to enter a mutual aid agreement with communities perhaps one hundred, or two hundred miles away, for assisting with the aftermath of a severe storm. This type of agreement would be beneficial to the city because the Providence Fire Department could be severely impacted

or damaged and it may be entirely necessary for another large city to assist with personnel and equipment.

The current level of service, within the City of Providence, is at an outstanding level, with the fire department consistently rising and meeting the challenge presented. The city administration has been taking proactive steps on improving the working conditions for all personnel in the fire department. However, written procedure is consistently being mentioned by the various authors, and must be produced to establish clear written direction.

Implications on the organization is quite clear that the fire department must have written procedure not only for hurricanes and storms, but for any other peril that may present itself. Granted that a standard operating procedure could cover a wide range of operations in various types of storms, and is not restricted to one type of storm.

Firefighting personnel in any community that has written procedure for specific issues would find operations running a great deal smoother than the department that is learning as they go. Drilling with written SOPs would also assist in achieving successful operations.

RECOMMENDATIONS

Storms, especially hurricanes would definitely stretch the capabilities of the Providence Fire Department. Historically, the department has always risen to the occasion and handled any predicament that has been presented, the administration should consider implementing SOP for hurricanes and storms, so that all members of the

department can become familiar with them. The potential benefit will be immediately realized with personnel being much better informed on what is expected but also that their own safety in these storms is very important.

The Providence Fire Department apparatus inventory is adequate for the completion of its mission to protect life and property. The department has an inventory of reserve apparatus that can be readily deployed with personnel being called back to duty for staffing purposes.

Another recommendation is that the administration should explore options in which other fire departments have established guidelines for dispatch centers in hurricanes. These communities would be in the regions of the country that have had recent impacts from hurricanes, of which many are curtailing their operations as sustained wind speeds are fifty miles and hour and above. This being due to debris flying through the air and the potential for the injuring of firefighting personnel and the damaging of apparatus.

The City of Providence should also explore entering into a mutual aid agreement with a similar sized community that is far removed from the region. This would be most beneficial should the city and fire department suffer the consequences of a hurricane or other storm. The City of Providence could also reciprocate should the other community suffer the catastrophic effects of a storm.

Additional research is recommended to verify the results of this study and to investigate a need for additional SOPs for other types of storms that impact the fire department.

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APPENDIX A

Table 4
Thunderstorm-Providence and Vicinity- 22JUN97 1615-2035 hours
1.26 Inches of Rain- Wind Gusts of 51 Miles per hour

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
Storm Responses	5	10	9	7	17	9	19	76
Responses 24 hrs	21	13	11	8	25	9	79	166
Storm Percentage	23.8%	76.9%	81.8%	87.5%	68%	100%	24%	45.7%

Table 5
6 Day Average Responses – Week of 22Jun97

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
6 Day Average 1615-2035 hours	4.2	1.7	.3	.2	1.7	.2	15.5	23.7
6 Day Average 24 hours	14	8.7	2.5	1.7	10	.7	64.8	102.3
6 Day Percentage	30%	19.5%	12%	11.7%	17%	28.5%	23.9%	23.1%
Increase or (Decrease) From 22Jun97	(6.2%)	57.4%	69.8%	75.8%	51%	71.5%	.1%	22.6%

Table 6
Thunderstorm-Providence and Vicinity- 9Mar98 1900-2100 hours
3.02 Inches of Rain- Wind Gusts of 45 Miles per hour

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
Storm Responses	1	2	0	2	4	12	11	32
Responses 24 hrs	4	11	4	6	15	14	77	131
Storm Percentage	25%	18.2%	0%	33.3%	26.6%	85.7%	14.2%	24.4%

Table 7
6 Day Average Responses – Week of 9Mar98

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
6 Day Average 1900-2100 hours	1.7	.2	.2	.2	.5	0	6.5	9.2
6 Day Average 24 hours	7.8	3.8	2.2	1	7.5	.7	62	85
6 Day Percentage	21.8%	5.3%	9%	20%	6.7%	0%	10.5%	10.8%
Increase or (Decrease) From 9Mar98	(6.2%)	57.4%	69.8%	75.8%	51%	71.5%	.1%	22.6%

Table 8
Thunderstorm-Providence and Vicinity-19Jun98 1430-1600 hours
.50 Inches of Rain- Wind Gusts of 13 Miles per hour

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
Storm Responses	1	4	0	3	4	8	5	25
Responses 24 hrs	17	15	0	6	13	9	74	134
Storm Percentage	5.8%	26.6%	0%	50%	30.7%	88.8%	6.7%	18.6%

Table 9
6 Day Average Responses – Week of 19Jun98

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
6 Day Average 1900-2100 hours	1.3	.7	0	.3	.5	„3	4.8	8
6 Day Average 24 hours	18.8	8	3.2	2.3	7.3	1.3	73.3	114.3
6 Day Percentage	6.9%	9.8%	0%	13%	6.8%	23.1%	6.5%	7%
Increase or (Decrease) From 19Jun98	(1.1%)	16.8%	0%	37%	23.9%	65.7%	.2%	11.6%

Table 10
Thunderstorm-Providence and Vicinity- 30Jun98 1145-1400 hours
1.47 Inches of Rain- Wind Gusts of 22 Miles per hour

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
Storm Responses	1	3	0	1	3	31	11	50
Responses 24 hrs	19	5	2	3	7	36	61	133
Storm Percentage	5.2%	60%	0%	33.3%	42.8%	86.1%	18%	37.5%

Table 11
6 Day Average Responses – Week of 30Jun98

	Street Box	Master Box	Still Box	Commercial	Stills	Water	Medical Aid	Total
6 Day Average 1900-2100 hours	1.2	.2	.2	.2	.5	0	6.8	9
6 Day Average 24 hours	15	3.2	1.5	1.8	7.8	.7	68.5	98.5
6 Day Percentage	8%	6.3%	13.3%	11.1 %	6.4%	0%	10%	9.1%
Increase or (Decrease) From 30Jun98	(2.8%)	53.7%	(13.3%)	22.2%	36.4%	86.1%	8%	28.4%

APPENDIX B

TELEPHONE SURVEY

Does your fire department have written standard operating procedure for hurricanes or other storms that impact your fire department?

Does your community have an Emergency Operations Plan (EOP) in place?

Do you staff additional equipment and raise staffing on existing in service equipment for an anticipated storm, etc.?

During severe thunderstorms, how has your department been impacted?