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Executive Analysis of Fire Service Operations in Emergency Management

Rhode Island Urban Search and Rescue: Achieving Effective Technical Rescue Deployment Modeling for Mutual Aid Response

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Abstract

The problem was the inefficient deployment model and activation process for the Rhode Island Urban Search and Rescue (RIUSAR) team for technical rescue incidents. The purpose of the research was to identify ways to effectively incorporate RIUSAR into the mutual aid plan. Descriptive research was used determine characteristics of the current RIUSAR deployment model, other state USAR models, applicable response standards, and requirements to integrate RIUSAR into the mutual aid plan. Research was conducted through literature review and survey instruments. The results showed the need for effective deployment models and mutual aid response. Recommendations were made to adopt recognized deployment models and incorporate RIUSAR into the statewide mutual aid plan.

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Introduction

Today's fire service agencies are tasked with responding to a wide variety of non-fire related emergencies. The most challenging of these are usually related to technical rescue type incidents. In the aftermath of natural and manmade disasters there are numerous emergency situations that may require specialized responses that include water rescue, rope rescue, confined space rescue, structural collapse rescue, and trench rescue. These responses require specialized training and equipment to be performed safely and effectively. As budgetary constraints become tighter for most fire departments in Rhode Island, the ability to meet these specialized needs becomes even more difficult. In early 2003, the Rhode Island Emergency Management Agency (RIEMA) coordinated the establishment of an Urban Search and Rescue (USAR) team in the state. The main impetus for the team at the time was response to large-scale weather related disasters. The team was staffed with emergency response and civilian personnel from various agencies throughout the state. The majority of members are from fire departments throughout the state. In 2005, the team experienced its first full deployment to assist with the recovery efforts after Hurricane Katrina.

The problem is that the current deployment model for the USAR team address large-scale type incidents and require the Governor's authorization for team activation. When a local community has an incident that requires technical skills and equipment beyond the capabilities of its fire department, there is little recourse to seek assistance elsewhere. There are no recognized technical rescue teams available within the state mutual aid response plan (Rhode Island Association of Fire Chiefs Mutual Aid Response Plan [RIAFC], 2004). This presents an issue of having several million dollars of equipment and 130 trained personnel being inaccessible to local communities for non large-scale disaster responses. The purpose of this research is to identify

ways to incorporate the USAR assets into the current mutual aid plan to provide assistance to communities with technical rescue type incidents at the local level.

The descriptive research method was used to (a) determine the characteristics of the current USAR deployment model, (b) examine other state USAR team models, (c) determine appropriate levels of response as identified by applicable standards, and (d) identify requirements to integrate USAR into the mutual aid plan.

Background and Significance

The State of Rhode Island is comprised of 5 Counties, which include a total of 39 cities and towns, which encompass a land area of 1045 square miles. The Counties have no inherent governmental powers and only serve as geographical boundaries for the judicial system. The cities and towns are protected by 81 fire departments; 19 of which are fulltime, paid municipal departments. The others are comprised of 18 totally volunteer departments and 44 fire districts which are comprised of paid, on-call, and volunteer personnel (Coduri & Moss, 2007). The population base is approximately 1.1 million people with the majority (800,000) inhabiting Providence and Kent Counties. This places the densest population base along the eastern edge of the State along Narragansett Bay. Of the 39 communities in the State, 21 are classified as coastal communities (Rhode Island Emergency Management Agency [RIEMA], 2004). The western edge of the State, both north and south, are mainly rural wooded and farmland areas that are sparsely settled.

The infrastructures of the core population areas are typical of cities in the Northeast. They have a mix of older building construction dating to the Industrial Revolution when Rhode Island was known for its manufacturing and textile industries. Many of these old mill buildings are now being renovated into various mixes of residences and retail businesses. Much of the

downtown areas are the typical office high-rises of steel and re-enforced concrete construction. The major threats to these areas are from natural disasters such as Tropical Cyclones (Hurricanes), Nor'easters, and severe winter storms. There were numerous events in the State's history that accounted for severe damage and civilian deaths. The Great New England Hurricane of 1938 was one of the most powerful and devastating storms in New England history. It accounted for 262 deaths, $306 million in property damages, and flood tides of more than 12 feet above normal high tides. Hurricane Carol in 1954 caused $461 million in damage and nineteen deaths. Other major storms included Hurricane Diane in 1955, Hurricane Donna in 1960, Hurricane Gloria in 1985, and Hurricane Bob in 1991. Winter Nor'easters have caused significant loss of life and property damage. These storms can occur every few years and have caused over 400 deaths in a single event. Total losses reached $6 billion dollars for a storm in 1993 with 270 associated deaths. A storm in 1996 killed 187 people and incurred $3 billion dollars in damage (Warwick Emergency Management Agency [WEMA], 2005).

On the smaller scale, there are the incidents that individual communities will face that will be beyond their capabilities to adequately and safely mitigate. These are the technical rescue type scenarios often associated with urban search and rescue operations at the large-scale disasters. There have been numerous attempts by fire departments in Rhode Island to acquire the equipment and training necessary to perform these specialized operations. In every case the primary reasons for not implementing the programs have been time and money. Under the statewide mutual aid plan there are no fire departments capable of providing a certified technical rescue response (DelVecchio, 2006).

One available resource that is comprised mainly of firefighters from the various fire departments in Rhode Island is the state USAR team. Through the State Homeland Security

Program (SHSP), Rhode Island has been able to fund approximately $2.7 million dollars for the purchase of specialized equipment, vehicles, and training for 130 members of the USAR team. The original mission of the team was to respond to statewide disasters under the orders of the Governor. This does not allow for utilization of the team for local incidents. Here again a major concern is money. Upon activation, the State reimburses the cost for personnel from the local agencies that provide team members for a response. Under the mutual aid plan, communities share the cost of response to other communities within established parameters. If the USAR team were able to be deployed under the mutual aid system it would provide a readably available resource of highly trained personnel with the proper equipment to safely accomplish various rescue scenarios. This would alleviate the monetary issues for local communities in trying to provide this service and enhance the safety of rescuers and victims. The incorporation of the USAR team into the mutual aid system should provide essential resources and trained personnel to efficiently respond to local communities' needs for various technical rescue assistance.

Several of the principles of the National Fire Academy's Executive Analysis of Fire Service Operations in Emergency Management (NFA, 2006) have a direct bearing on this research. The first is the community risk/capability assessment of incidents in Rhode Island. Given the history of severe and damaging natural disasters, the risk is apparent in the fact that incidents have happened and are predicted to happen again (RIEMA, 2004). It has also been determined that no community has the capabilities to meet the challenges presented by an event that results in any one of the various types of technical rescue (DelVecchio, 2006). The other principle is related to developing resources. There are several different agreement models identified in the text. The currently established mutual aid plan appears to be the logical option to tie the USAR response to, although other models will be examined as well. The primary

operational objective of the USFA that this research meets is the promotion within communities of a comprehensive, multi-hazard risk-reduction plan led by the fire service. This will also address the issues of reducing civilian and firefighter loss of life.

Literature Review

The literature review began with looking at the history of the USAR system as it relates to response to disasters of various magnitudes. As the fire service responded to more and more search and rescue type missions in their jurisdictions, they realized the need for changes in their operational capabilities and training. Most of these responses were predicated on natural occurrences, such as earthquakes, in densely populated urban areas. The mid to late 1970's saw some of the first changes following major earthquakes in the California area with the development of state-wide heavy rescue teams. A formalized training program was developed in 1981 for California which was eventually used as the basis for a technical rescue program developed by the NFA (Naum, 1994).

The USAR issues of responding to large scale disasters were apparent after years of experience with natural disasters. The realizations of the issues were recognized by the emergency management community in the early 1980's after earthquakes in Northern California, Mexico, and Armenia. The rescue of victims from large scale building collapse became a critical element for emergency managers during disaster response (Krimgold, 1989).

The early stages of the development of USAR assets were fragmented throughout the nation. Areas that were prone to large scale disasters were ahead of the curve in their preparation. The Congressional Fire Services Institute (CFSI, 1992) identified certain counties in California, Florida, Maryland, New York City, and Virginia as areas that had made progress on USAR issues. Other issues centered on the lack of coordination of the resources being

assembled in different jurisdictions. McCoy (1991) refers to this situation as, “boxcars in search of a train.” This references the fact that these boxcars of technical expertise were loaded and ready to go, but there was no train to deliver them where and when they were needed. This thinking added to the notion of a national response plan for USAR. One of the key factors noted by McCoy (1991) was that the jurisdictions have limited resources, limited understanding of USAR, and limited ability for management of search, rescue, and recovery of victims. This sentiment was further conveyed by the CFSI (1992) when they identify the inability of local and state governments to handle even a single collapse emergency without going outside their normal mutual aid systems.

The original focus of USAR was response to collapse of reinforced concrete type structures from earthquake related events. This has broadened considerably since the original inception of the Federal USAR teams in 1991. USAR teams are now responding to many different events arising from various causes. These have included the collapse of two suspended walkways, an elevated highway, a building under construction, and numerous post hurricane search and rescue missions (Naum, 1994). Of recent note was the World Trade Center response, the hurricane response to Florida in 2004, and Hurricane Katrina in 2005. Even in CFSI (1992), they identified the emphasis of the report as “primarily on earthquake-caused destruction. However, the collapse of structures and the need for an urban search and rescue capability will also result from floods, hurricanes, tornadoes, flaws in construction, aging infrastructure and acts of terrorism.” (p. 2)

The concept of USAR operations has often been downplayed on the East Coast, specifically the Northeast. The Southeast has had years of experience dealing with hurricanes, flooding, and tornadoes. Krimgold (1989) identified areas of the country other than California or

Alaska that are susceptible to massive earthquake events. New England is one of these areas. Extensive damage would occur due to the geological conditions of the area, resulting in an affected area ten times greater than a western earthquake. Earthquake resistant building codes were not adopted in the East until recently. "The threat to the East Coast of the United States is relatively unstudied and little understood. That area of the country is virtually unprepared." (CFSI, 1992, p. 3) Little preparation has been done since these observations were made. The threat from earthquake events is underscored based on their frequency of occurrence. The last reported seismic event in Rhode Island was in 1951 in Kingstown that measured a 4.6 magnitude (WEMA, 2005).

A key component in much of the literature references timely responses to these emergencies. In the field of emergency medicine it is well known that there is a "golden hour" for increased survivability. In the areas of collapse rescue the hour becomes the "golden 24 hour" window (Naum, 1994). According to Moede (1989), the survival rate after one day is approximately 81% and by the end of the second day it drops to 33.7%. There is a direct link between the onset of medical treatment/rescue and increased survivability rates. Depending on conditions the time frame can be drastically reduced. It was noted during the rescue efforts in Armenia following a devastating earthquake in 1988 that the golden time period is often limited to only a few hours (Reeder, 1989). This precipitates a rapid notification and response for involved agencies. As Borden (1993) points out, "the fire service must assume the leadership role in order to meet the challenge of urban search and rescue in an environment where time is critical to the lives of those who are trapped in a structural collapse" (p. 5). Eisner (1995) and Naum (1994) explore the need for rapid notification for such incidents. For a USAR team to respond it often takes several hours. This includes time for notification, assembly, and response.

Actions taken by first responders are critical to the effectiveness of rescue prior to the arrival of any USAR assets. In a medium level collapse situation, Borden (1995) has identified that approximately 15% of the victims will be found and could take up to four hours to remove each victim. In a heavy collapse, there may be 5% of the victims and it might take 8-12 hours for each victim's extrication. A similar finding by Cowan (1989) involves "light search and rescue" which typically begins with volunteers and emergency personnel immediately following the event. It reaches its peak within hours and usually accounts for the rescue of the greatest amount of victims.

The Federal USAR program began in 1991 with the formation of 25 FEMA USAR Task Force Teams located throughout the country. Many of these teams were born out of existing state teams. California had eight of these teams within their jurisdiction. Following the terrorist attacks in 2001, many states began developing their own resources for USAR operations. Many were born out of existing technical rescue type teams formed on the local or county level. Attention was being focused on preparedness, training and increasing capabilities for response to disasters. Many shortfalls were attributed to the delivery systems in place at the time (Naum, 1994). Some of these same concerns were evident during the Hurricane Katrina response in 2005. One of the key issues was flood-rescue response during Katrina. Rigg (2007) stated, "Flooding remains the leading cause of weather-related death nationwide (p. 70) and the federal government still views this as a local problem even after numerous hurricane events. Although federal USAR teams were deployed to Katrina and assisted in the rescue of 6,582 victims, flood-rescue is not a requirement in the federal USAR system. Team members are provided with awareness training and basic defensive type water rescue equipment. Federal USAR teams will not be deployed as water-rescue assets even though the only lives saved by these teams have

been in floodwaters, not in collapsed structures (Rigg, 2007). Following this event, the State Urban Search and Rescue Alliance (SUSAR) was formally created in 2006. One of the key purposes of the organization is "to develop, adopt, and utilize standards for participants and teams engaged in US&R" (SUSAR, 2006, para. 7). This philosophy allows the teams to stay current with issues that may affect their response and operations. This will have a direct bearing on the team's overall effectiveness and efficiency. Williams (2001) proposes following a new philosophy known as Critical Organization Re-Engineering – CORE. This philosophy requires the "fundamental rethinking and radical design of Urban Search and Rescue processes to achieve dramatic improvements in critical processes of performance, such as, speed, quality of service and cost" (p. 24). This thinking will allow state USAR teams to be proactive and adaptive to changes in their jurisdictions in a timelier manner.

Many of the procedures and standards related to USAR have been developed based upon past experiences with various disaster responses. Much of the basis for these standards began on the West Cost, as examined by Naum (1994), and progressed at that time to the development of an industry wide standard completed by the National Fire Protection Agency (NFPA). The original standard was NFPA 1470, *Standard on Search and Rescue Training for Structural Collapse Incidents* (NFPA 1470, 1994). This standard has evolved into two current standards that reflect operations and training in NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents* (NFPA 1670, 2004) and professional qualifications in NFPA 1006, *Standard for Rescue Technician Professional Qualifications* (NFPA 1006, 2008). These standards now address the broad spectrum of technical rescue type incidents versus the narrow focus of purely structural collapse events. Many of the NFPA standards reference other standards as part of their compliance and implementation. In NFPA 1670 (2004) and NFPA

1006 (2008), references to additional standards that must be met for compliance are identified. They include NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program* (NFPA 1500, 2007) which was also adopted into law by the Rhode Island General Assembly as Rhode Island General Laws Title 23 (RIGL 23, 1990), Chapter 28.4. This law had enacted the NFPA 1500 edition from 1987 and included language to automatically incorporate any future editions. Other relevant standards include NFPA 1521, *Standard for Fire Department Safety Officer* (NFPA 1521, 2008) and NFPA 1561, *Standard on Emergency Services Incident Management System* (NFPA 1561, 2008). While these standards are looked upon as voluntary or consensus standards in the industry, they can become the legally enforceable standard of care for technical rescue and USAR teams (United States Fire Administration [USFA], 1996).

There are also federal regulations that are correlated with USAR operations. The Occupational Safety & Health Administration (OSHA) regulates standards that are found in the Code of Federal Regulations (CFR). Specifically, Title 29 contains requirements for hazardous materials certifications in OSHA 29 CFR 1910.120 (OSHA, 1989), confined space rescue in OSHA 29 CFR 1910.146 (OSHA, 1993), and respiratory protection is addressed in OSHA CFR 29 1910.134 (f) and (k) (OSHA, 1998). These laws along with the previously identified NFPA standards are identified as part of the FEMA National Incident Management System (NIMS) typing and credentialing requirements for many of the minimum specifications that have been expanded in the USAR and technical rescue response areas. These USAR and technical rescue assets have been broken down into four various levels of response depending upon the primary mission. Under these guidelines you can deploy a Type IV Collapse team with a total of six personnel versus a full USAR team established as a Type I with 70 people (National Incident Management System [NIMS], 2007a). The credentialing for individual members under NIMS

can be found in *Designing a National Emergency Responder Credentialing System* (NIMS, 2007b).

The RIUSAR team was formulated under the auspices of Rhode Island General Laws Title 30 (RIGL 30, 1973), Chapter 30.15. This chapter references Emergency Management in the state. The USAR assets are classified as mobile support units and may be activated upon the orders of the governor.

Procedures

The initial research began while in attendance at the National Fire Academy's *Executive Analysis of Fire Service Operations in Emergency Management* (NFA, 2006) course during the month of February, 2007. The Learning Resource Center's Online Card Catalog (LRC) was used to perform searches within various parameters. The original research focused on information regarding the different deployment models used for USAR teams. As most of the results were directly related to the federal USAR system, the search topic produced a very narrow group of results. Additional queries were performed using various keywords (technical rescue, dispatch models, deployment models, mutual aid, collapse rescue, search, search and rescue, rescue teams, and heavy rescue) which were then reviewed to determine what items had relevance to the topic. The results included periodicals, books, journals, applied research products, and web based items. A second search was initiated at the LRC during the same period to identify applicable regulations and standards related to deployment models for technical rescue responses. The results were reviewed once the author returned home and selected items were requested through the inter-library loan program.

Numerous *Google* searches were conducted between March and December 2007 that used the same keywords as previously used at the LRC. This resulted in information from

several organizations in the search and rescue field, as well as numerous literature pieces on the topic. Some of the key information was found through the FEMA website. Another online source was the *Yahoo* website, were the author is a member of the State Urban Search and Rescue Alliance (SUSAR) group. Information in the files section of the group was examined for any relevant information. A further internet search was conducted of the laws of the State of Rhode Island to determine all applicable statutes to the USAR team and mutual aid.

A literature search was also conducted at the Warwick Public Library in Warwick, Rhode Island in May and June 2007. This included the reviewing of books, reports, journals, and periodicals related to the topic. All sources found that were relevant were then obtained through the inter-library loan program. This search focused on the same keywords as previously used with the addition of several others related to response modeling, response efficiency, rescuer fatalities, and worker fatalities. All NFPA documents were obtained from the Warwick Fire Department Fire Prevention Division and the author's personal library.

After reviewing the available literature pertaining to the topic, two surveys were formulated. The survey website, *Surveymonkey.com*, was used to formulate, distribute and compile results of the surveys. The sample groups were selected based upon USAR response at the state or local level. The federal teams were not considered due to their more stringent response modeling and activation parameters. The first survey was sent to the members of the SUSAR group by being posted on the *Yahoo* group's site. This group was chosen because of their expertise in state run USAR operations. Although the membership of the group only involved approximately 18 teams at the time, they were well versed in USAR operations and response. Most of the respondents were in management positions on their team and had years of federal USAR experience as well. The survey was created under a basic account format on the

website. This allowed a maximum of 10 questions of various available formats. There was a mix of open-ended and close-ended questions used. The open-ended required a written response to the particular question. The close-ended questions required an explanation for all "yes" answers. There were also two multiple choice questions were only one answer was able to be selected. One of the options was to select "other" as a choice. Due to the limitations of the site there was no option for explanation in this type of question format. Contact information was requested of the individual so additional information could be gathered for certain responses. The focus of the survey hit several points. The first being how their team was activated and for what types of incidents. The next area was involvement in some type of mutual aid system and at what level. Lastly, the author looked at any response models created for incidents outside the norm for a USAR team deployment.

The second survey was sent to the command level managers and officers on the Rhode Island USAR team (RIUSAR) and select individuals from RIEMA who had direct involvement with USAR operations. This group was again chosen for their level of expertise and experience in the USAR environment. Most of the individuals also have years of experience at the federal level on the Beverly, Massachusetts team. All the command staff personnel are also firefighters and officers on different fire departments in Rhode Island. This survey followed the same format as the SUSAR survey except it only consisted of eight questions. The question types were the same as the SUSAR survey with the exception of no multiple choice questions. The focuses of these questions were related to the current deployment model for the RIUSAR team and its effectiveness. They also addressed the perception of a need for technical rescue response capabilities and the concept of RIUSAR being able to respond to these incidents. The final focus was on the feasibility of RIUSAR being able to be added to the statewide mutual aid system.

Several conversations were held with Mr. Robert Warren, Director of RIEMA during June through September, 2007. Mr. Warren was previously the Chief of the Cranston Fire Department before his appointment to the RIEMA Director position. He also was the EMA Director for the City of Cranston during his tenure as Fire Chief. During the initial conversation the main topic of this research was discussed as it related to the mission of the USAR team. Ensuing conversations were directed at different aspects of research findings and how they related to the current USAR situation. Pertinent information as to the original intent of the USAR team was discovered and how that role should change was discussed. These conversations were not formalized with written questions. Mr. Warren was also a participant in the RIUSAR survey and his additional comments are expressed in the survey results.

Limitations

One of the limitations was the type of survey used. There were several options as to the type and complexity of the survey formats. The survey chosen was the basic version which limited the number and type of questions. For a fee there were other levels of survey available that offered additional features to develop a more comprehensive survey format. Another was that the question format sometimes chosen allowed comments that were not relevant to the question being asked. This sometimes happened with questions that contained a "comments box" to expand upon the respondents answer selection.

Results

Using descriptive research, the author was able to identify characteristics of recognized deployment models. Through the use of surveys, personal conversations, and the review of a substantial amount of written documents, the author was able to locate pertinent information to answer the four research questions. The federal USAR teams are governed by the standards set

forth by FEMA as they relate to requirements of the teams regarding their minimum equipment and training, reporting and documentation, and activation for deployment. The original program development for the RIUSAR team was designed to align with these federal requirements as closely as possible given the constraints of being a state team with limited resources. The goal was to be comparable to a Type I federal USAR team in both personnel and equipment capabilities. The philosophy was, and continues to be, that the RIUSAR team was to be as interoperable as possible with the federal teams in the event that RIUSAR could be working with a federal team at a future disaster response. Since the inception of RIUSAR in 2002 the ideology of USAR response as a whole has changed just as the missions have also changed. The dynamics for team deployment are under constant review as identified by Naum (1994), Rigg (2007) and Williams (2001). Even as the research was being performed there were changes being implemented to deployment models nationwide (NIMS, 2007a). A comparison of some of the changes can be seen in the USAR Task Force requirements from November 2005 (Appendix A) and August 2007 (Appendix B).

As a state team, RIUSAR has the ability to determine its deployment models based on their own requirements under the auspices of the RIEMA. The team is not required under federal guidelines to meet the federal USAR mandates. It is a voluntary choice that would depend upon the ultimate mission goals of the team. As a state asset, the team would be eligible for deployment under the Emergency Management Assistance Compact (EMAC) which is an interstate mutual aid type system. The EMAC system is adopting the NIMS typing and credentialing models for interstate mutual aid response in order to allow for uniformity of resources. As part of the current RIUSAR mission the team has identified these same NIMS requirements as the benchmark goals for team deployment capabilities. Under the current

deployment model, any activation must come from the governor for both intrastate and interstate deployments (RIGL 30, 1973).

As the development of state USAR teams has increased and the SUSAR organization was formed, the paradigm shifted from the national disaster response to the more localized response. The survey instrument provided information regarding the deployment models used by other state teams. The first question identified who had the authority to activate the team for an in-state response. Of the 11 teams that responded, only one required activation through the Governor's office. Six of the teams had an EMA person or other coordinator that had the authority to deploy the team. Activation for three of the teams was through any local request such as the Incident Commander or local authority. Only one of the teams required requests to be placed through their State Police agency.

The second question referenced the teams' identification in a state/county mutual aid system. Nine of the teams are part of their statewide mutual aid plan with two of these also included in a county plan. One team is not part of any mutual aid plan at this time and another team is currently working on inclusion in the statewide plan.

The third question asked if the teams utilized deployment models specific to their area other than the standard FEMA USAR Task Force typing. There are five teams that have no other types of deployment models other than the FEMA Type I team. Two of the states have regional teams that deploy as Type III – IV collapse rescue teams. Two additional teams have water rescue response models with one of these teams also having technical rescue team models. One team is currently working on meeting the additional NIMS USAR models but has not yet implemented them. The last team has based their deployment models on the State of Florida's model for USAR and technical rescue responses.

The fourth question asked how technical rescue incidents are handled in their state. There were four choices and respondents could select all that applied. Ten of the teams, 90.9 percent, identified “local departments with specially trained personnel” as on of their options. Other answers were “specialized teams that were not part of USAR” and “specialized teams that were part of USAR”. Each of these choices was selected by four teams. Three additional teams selected “other” as their choice but did not elaborate as to the specifics of their selection. Most USAR teams were born out of the upward development of local and regional technical rescue teams. As the needs increased in a particular area these teams became the foundation for larger teams such as the federal USAR and state USAR teams. There were never any technical rescue teams in Rhode Island. Given the small size of the state and concentrated population base most incidents were handled by local fire departments. The histories of politics and territory have precluded any county or regional type teams within the state. Rhode Island developed its USAR capabilities from the ground up. There was no expansion or combination of existing teams because there were none.

The fifth question asked if the team’s state or county had a mutual aid system. Nine of the teams, or 81.8 percent, have a statewide mutual aid system. Only two of the respondents have a countywide mutual aid system but not a statewide system. Two of the respondents that have statewide systems also have countywide systems in place.

The sixth question dealt with the way USAR equipment resources are deployed such as a central cache location or with local fire agencies. Five of the teams identified local fire agencies as the resource deployment organization. A central cache facility was used by five other teams while one team used both local and regional caches.

Question seven explored the ability of the teams to provide personnel for technical assistance to local authorities for technical rescue type incidents. Nine of the respondents are currently providing this resource as either operational personnel or incident management personnel. Only two of the teams do not have the ability to supply resources for this type of request.

Question eight examined if specialized pieces of equipment, such as a Stanley tool, were able to be deployed to assist at local incident scene operations. Of the respondents, five are able to assist with specialized equipment while the other six either are unable to, or can only deploy equipment with personnel for a team activation.

Question nine attempted to solicit information regarding any programs or procedures that the teams had instituted to respond to incidents that did not require a full Type I response. Seven of the respondents answered "no" to this question and provided no further explanation. Three of the teams answered "yes" and provided additional information and/or contact information to get further clarification. One team adopted the Florida Type II collapse response program.

Some of the key information gathered through this survey instrument is the fact that most state USAR teams are part of their respective mutual aid plans and available for response within the system. All teams reported having a mutual aid system in their jurisdiction. There is also only one other state which requires the Governor's authorization to activate the team. The majority of the teams are able to be activated more efficiently through their local or regional agency. Being able to provide specialized resources and personnel as part of a technical assistance response to local authorities is also a common practice with 9 out of the 11 teams. The survey instrument and results are found in Appendix C.

After extensive review of standards pertaining to USAR and the associated components of it, the author has found that the most prevalent documentation has been provided by NFPA, FEMA, and NIMS. These agencies have taken the experts in the search and rescue field and put them together in a working group to develop a comprehensive set of documents covering resource typing and credentialing. Within these documents they have identified several levels of deployment modeling from basic six person light collapse rescue teams to full Type I USAR teams. The requisite and recommended minimum requirements in the areas of training, education, experience, certification, physical/medical fitness, and licensing are identified (NIMS, 2007). Within these documents are references to related regulations from other agencies such as OSHA that address health and safety concerns for responders within the scope of USAR and technical rescue operations. A listing of OSHA regulations that can be found in USAR and technical rescue standards is identified in USFA (1996) 1. These requirements are intended to provide the minimums necessary for and individual or agency to be recognized to participate in the national credentialing system. If an agency chooses not to meet these guidelines they would not be deployable within the national system.

At the local level for responses within an agencies jurisdiction there are still applicable laws and standards that apply. If a state team chose only to respond instate they would not be required to meet the typing and credentialing requirements. They would be required to meet all applicable OSHA regulations and be held accountable to NFPA standards. Under the NFPA standards agencies are given procedures that are directly relevant to their actions regarding the particular standard. While these standards are looked upon as voluntary standards for the industry, they can become the legally enforceable standard of care for technical rescue teams

(USFA, 1996). The relevant NFPA standards that are associated with USAR and technical rescue operations can be found in USFA (1996).

A second survey instrument was used to examine the concept of incorporating the RIUSAR team into the statewide mutual aid plan and to what types of incidents would the most benefit be provided. The first question focused on the recognition of the need for specially trained and equipped personnel for technical rescue type responses. All seventeen respondents answered "yes" to this question. As a follow-up, question two asked for recommendations to meet this need if they answered "yes" to question one. Of the seventeen responses, eleven stated that the current USAR assets were best able to meet this need given the state of most local fire departments. Two respondents identified specialty teams as the recommended response to these incidents. Making training available statewide to firefighters was identified by four respondents.

Question three asked if the respondents saw the USAR team, or components of it, as being able to respond to these types of technical rescue incidents. All respondents answered yes to this question.

The fourth question asked if it would be seen as beneficial if the USAR assets were incorporated into the mutual aid plan in the state. This question also allowed for additional comments to be included with their answer. Fifteen of the respondents answered "yes" to this question and eleven included additional comments. Although the comments varied between these respondents, the main point that came out related to the benefit to local communities and fire departments faced with technical rescue incidents, especially when they had no trained personnel or appropriate equipment. The two "no" responses also contained additional comments. One of the comments referred to only large scale disaster responses as being able to benefit from the mutual aid plan and then proceeded to state that in a large scale incident there

would be problems with the mutual aid plan. The author attempted to clarify this with the respondent but received no additional response. The other set of comments offered some interesting aspects to the question. The point was raised that a state asset would be put into local jurisdiction. This raised questions as to legal liability, compensation, and dispatch priorities. These are all valid points based upon the current system that is in place.

Question five asked if the respondents felt that the current activation process was effective for instate team deployments. For a "no" answer, additional comments regarding any reasons why they thought the process was ineffective were requested. Of the 12 "no" responses, reasons were submitted by all respondents that included; the activation process itself as a concern (10 responses), need for an advance team (two responses), the current team call-down procedure (one response), and the current equipment cache location (one response). The point raised consistently with the activation process was the need for the Governor's authorization and the associated time frame with it causing delays in deployment.

The sixth question dealt with the feasibility of a tiered response system that included deployment of individual components up through a Type I response as being beneficial to increasing the effectiveness of USAR assets. All respondents felt that a tiered system would provide a more efficient and effective response capability. Cost effectiveness was commented on as it relates to a full team deployment versus only a small group of personnel. The increased number of possible activations was noted as a positive factor in that it would allow for more real-life experience for the team and increased exposure to communities in the state.

The final question related to any additional concerns regarding a more effective deployment model and/or utilization of USAR assets that the respondents would like to add. There were 11 responses to this question with 6 raising concerns related to issues of better

coordination between the Governor, the RIEMA, and local fire chiefs. Three responses discussed the need for an increased awareness of USAR capabilities within the state. These responses can be tied in with the first six that referred to better coordination. As the coordination between agencies is improved the awareness of capabilities should also improve. The survey instrument and results are found in Appendix D.

Based upon the current legislation governing the creation and deployment of the RIUSAR team there would need to be amendments to the General Laws pertaining to emergency management (RIGL 30, 1973). If the USAR team continues to be considered a mobile support unit within the RIEMA there would need to be additional legal considerations examined to allow the team to participate in some fashion within the statewide mutual aid plan. The enactment of Memorandums of Agreement (MOA) and Memorandums of Understanding (MOU) similar to those used by other response teams in the state would need to be examined and developed to allow for liability and compensation issues.

Discussion

The results of this research have found a very dynamic arena that USAR is involved in. Change is a fairly common occurrence largely due to the ever-changing factors associated with a field as technical as USAR. One aspect of this research focused on the current deployment models of USAR teams, specifically at the state level. This area is an ongoing issue both at the state and federal level as working groups are currently reviewing and modifying these models (Naum, 1994; NIMS, 2007a). The SUSAR organization is playing a key role in the coordination of state teams to adopt common standards for their organization that will meet the requirements of NIMS and EMAC (SUSAR, 2006). The state response models vary based upon the local political structure and geographic factors of the given region. Most of the teams follow, or are

planning to follow, the requirements set forth under NIMS. The differences occur with the methods of implementation each team undertakes given the regional factors governing their operations. The coordination of these resources is of primary concern, no matter what the method to accomplish that goal. This was reinforced by McCoy (1991) when in the early stages of the development of USAR there were resources available but the mechanism was lacking for the effective deployment of them. Even though the original deployment models were focused on earthquake type incidents it has been recognized all along that there are many other types of incidents that would require a USAR response (CFSI, 1992). In the initial development of the RIUSAR team the original intent was for hurricane type disaster response in Rhode Island. Shortly after the formation of the team, a component was sent to Florida after Hurricane Charlie in 2004 to assist with logistical and management support. This was the first incident that occurred that fell outside of the normal deployment parameters. Because it was initiated through the EMAC system the Governor authorized the deployment of six team members. The next deployment came after Hurricane Katrina hit and a full Type I team was sent to Mississippi, again through the EMAC system.

One of the findings that stood out with the survey results of other SUSAR teams was the ease of accessing the team capabilities for assistance within the state. Most teams required no more than what was needed to request mutual aid fire resources on a daily basis. This was partially accomplished with local fire departments having specially trained personnel (USAR members) on their department and possibly responding as part of the initial incident assignment. This aspect correlated with the issue of a timely response to these incidents as it relates to victim survivability. It has been well documented that there is a golden timeframe associated with USAR operations. Several findings (Borden, 1993; Moede, 1989; Naum, 1994; Reeder, 1989)

reference this timeframe and the associated factors of victim survivability. There are many variables when discussing the golden timeframe and a key aspect of it is the time involved for initial notification and response. It may take several hours for a USAR team to respond so it becomes critical that appropriate actions be taken immediately (Eisner, 1995; Naum, 1994).

There are numerous standards that have been identified in this research that need to be implemented at several levels. The USAR team needs to follow the industry accepted guidelines developed through NIMS as they relate to their jurisdictional area. Some components of the NIMS requirements are not relevant for all USAR teams because some areas, such as cave or mountain search, contained in the guidelines are not applicable. Within these NIMS documents there are also referenced standards from NFPA and OSHA which are required. The equipment and training requirements are designed to provide for the safety of rescuers and victims. At the USAR level, the determination has been made to follow the Type I team guidelines so the requirements for the lesser typing levels will also be met.

There are several issues that have been identified in order to incorporate the RIUSAR team into the mutual aid plan. The primary one is amending the current legislation to change the mechanism for team activation. Along with this would be some additional documentation related to modifications in the existing MOU and MOA agreements. The inclusion of the RIUSAR team in the mutual aid plan would be virtually automatic following the necessary legislation and document changes.

The components for the deployment of USAR assets are readily available and awaiting their final restructuring. The personnel, equipment, and vehicles are in place and proven through previous deployments. The local communities are not prepared to respond to technical rescue incidents in a safe and efficient manner due to several reasons. They do not have adequate

procedures and training for these responses, nor do they have the proper equipment (DelVecchio, 2006). An investment of federal dollars was made for the development and continued operation of the RIUSAR team to serve the state and its communities. Williams (2001) identified in his *CORE* philosophy the fact that USAR needs to rethink and redesign how they can improve their performance, quality of service and cost effectiveness. This is a key point given the fact that federal grant funding has continued to diminish over the last several years and is anticipated to continue on that course. The expansion of the USAR role in the state would allow for a maximization of invested dollars by increased service to all communities. This could also offset monies spent locally if a resource was available statewide. The effect would be similar to the formation and operation of the hazardous materials response teams created in the state.

The implications of this research as they relate to the USAR organization are that they have identified several deficiencies in the current deployment model as compared to other state teams and industry standards. The implementation of NIMS deployment models will provide for more efficient operations and a standardized response to various type incidents. The incorporation of the RIUSAR team into the statewide mutual aid plan will provide for an expanded resource base for local communities at little or no cost as long as federal grant monies are available. To implement these changes there must be a modification to the current activation process where authorization is moved from the Governor's office to a lower, more accessible level. All fire departments and other agencies who are participants in the USAR program will benefit from the training and experience their members receive. Additionally, this training and experience is provided at no cost to the department.

Recommendations

The main focus of this research was to determine an effective deployment model for an all-hazards technical rescue response. After an extensive review of the research results, it is recommended that the RIUSAR team maintain its affiliation with the SUSAR organization and meet the requirements for typing and credentialing set forth through NIMS. The particular subsets of resource typing and credentialing must be determined as to applicability for RIUSAR. This will allow for interoperability and efficiency of operations and meet federal grant requirements for NIMS compliance. As part of the EMAC system this will allow for deployment on an interstate mutual aid as well.

Due to the time factors involved with successful rescues in USAR operations it is imperative that the current activation system be modified. As was identified in the research, SUSAR teams utilized numerous methods for activation and the majority was at the local level. This provided for rapid notification and deployment of team assets. At a minimum, the authority to activate the RIUSAR for technical rescue responses within the state should be with the director of RIEMA. This would allow for a much quicker response than under the current system. Ultimately, assets should be available through the dispatch centers under the mutual aid plan for technical rescue type incidents. This will require an agreement between the Rhode Island Association of Fire Chiefs (RIAFC), RIEMA, and the Governor's office. There will also be required legislative changes to existing General Laws that pertain to EMA and USAR.

A committee shall be formed that consists of representative of the RIAFC, RIEMA, RIUSAR, and the Governor's office to perform the following:

1. Determine the parameters of deployment within the statewide mutual aid plan.
2. Determine the feasibility of the current equipment cache location as it would relate to the deployment of resources in the mutual aid plan.

3. Determine the necessary requirements to address liability issues, compensation, and any other items that might arise through the process.
4. Evaluate and reassess on an annual basis all elements of team operations and compliance to ensure all current applicable standards are being met.

To address the needs for technical rescue response within the state not covered in the NIMS requirements, additional guidelines should be developed by RIUSAR in accordance with NFPA 1670 (2004), NFPA 1006 (2008), and any accompanying regulations to allow for USAR members to respond to these incidents.

To increase the awareness of RIUSAR capabilities throughout the state a USAR Committee shall be established within the RIAFC and a representative from RIUSAR shall coordinate with the association and report at the association's monthly meeting regarding issues and events involving RIUSAR and USAR nationally.

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Appendix A

Typed Resource Definitions US&R Task Forces November 2005

FEMA

U.S. Department of Homeland Security
Federal Emergency Management Agency

RESOURCE:	US&R Task Forces						
CATEGORY:	Search & Rescue (ESF #9)			KIND:			
MINIMUM CAPABILITIES:		TYPE I	TYPE II	TYPE III	TYPE IV	OTHER
COMPONENT	METRIC					
Personnel	Number of People per Response	70-person response	28-person response			
Personnel	Training	Same as Type II	NFPA 1670 Technician Level in area of specialty Support personnel at Operations Level			
Personnel	Areas of Specialization	High angle rope rescue (including highline systems) Confined space rescue (permit required) WMD/HM operations Defensive water rescue ALS intervention Communications	Light frame construction and basic rope rescue operations HazMat conditions Trench and excavation rescue ALS intervention Communications			
Personnel	Sustained Operations	24-hour S&R operations Self-sufficient for first 72 hours	12-hour S&R operations Self-sufficient for first 72 hours			
Personnel	Organization	Same as Type II	Multidisciplinary organization of Command; Search; Rescue; Medical; HazMat; Logistics; Planning			
Equipment	Sustained Operations	Same as Type II	Potential mission duration of up to 10 days			
Equipment	Rescue Equipment	Same as Type II	Pneumatic Powered Tools Electric Powered Tools Hydraulic Powered Tools Hand Tools			

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RESOURCE:		US&R Task Forces				
CATEGORY:	Search & Rescue (ESF #9)			KIND:		
MINIMUM CAPABILITIES:		TYPE I	TYPE II	TYPE III	TYPE IV	OTHER
COMPONENT	METRIC					
			Electrical Heavy Rigging Technical Rope Safety			
Equipment	Medical Equipment	Same as Type II	Antibiotics/Antifungals; Patient Comfort Medication; Pain Medications; Sedatives/ Anesthetics/Paralytics; Steroids; IV Fluids/volume; Immunizations/Immune Globulin; Canine Treatment; Basic Airway; Intubation; Eye Care Supplies; IV Access/ Administration; Patient Assessment Care; Patient Immobilization/Extrication; Patient/ PPE; Skeletal Care; Wound Care; Patient Monitoring			
Equipment	Technical Equipment	Same as Type II	Structures Specialist Technical Information Specialist HazMat Specialist Technical Search Specialist Canine Search Specialist			
Equipment	Communications Equipment	Same as Type II	Portable Radios; Charging Units; Telecommunications; Repeaters; Accessories; Batteries; Power Sources; Small Tools; Computer			
Equipment	Logistics	Same as Type II	Water/Fluids; Food; Shelter; Sanitation; Safety;			

Appendix B

Typed Resource Definitions US&R Task Forces August 2007

FEMA

U.S. Department of Homeland Security
Federal Emergency Management Agency

RESOURCE	URBAN SEARCH AND RESCUE TASK FORCE					
CATEGORY:	Search & Rescue (ESF #9)		KIND:	Team		
MINIMUM CAPABILITIES:		TYPE I	TYPE II	TYPE III	TYPE IV	OTHER
COMPONENT	METRIC					
Personnel	Training and Certification	70 person Comply with NFPA 1006 and NFPA 472 requirements for their area of specialization or organization operations level for support personnel as outlined in NFPA 1670.	29 person Comply with NFPA 1006 and NFPA 472 requirements for their area of specialization or organization operations level for support personnel as outlined in NFPA 1670.	28 person Comply with NFPA 1006 and NFPA 472 requirements for their area of specialization or organization operations level for support personnel as outlined in NFPA 1670.		
Team	Training	Trained for Heavy Floor Construction, Pre-cast Concrete Construction, Steel Frame Construction, High Angle Rope Rescue (including highline systems), Confined Space Rescue (permit required), and Mass Transportation Rescue	Trained for Heavy Floor Construction, Pre-cast Concrete Construction, Steel Frame Construction, High Angle Rope Rescue (including highline systems), Confined Space Rescue (permit required), and Mass Transportation Rescue	Trained for Light Frame Construction		
Team	Sustained Operations	Capable of continuous 24 hour operations	Capable of heavy operations for 12 hours	Capable of light operations for 12 hours		
Team	Certifications	NIMS credentialed consistent with applicable job requirements	NIMS credentialed consistent with applicable job requirements	NIMS credentialed consistent with applicable job requirements		
Team	Equipment	Consistent with FEMA US&R Standardized Cache List for Type I Task Force	Consistent with FIRESCOPE Standardized Equipment List for Regional Task Forces	Consistent with FEMA US&R Standardized Cache List for Type III Task Force		
COMMENTS:						

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Appendix C

SUSAR Survey and Results

1. Who has the authority to activate your USAR team for in-state responses?

2. Is your USAR team identified in a state/county mutual aid type dispatch or resource identification system? If yes, please explain type of system.

3. Does your team utilize deployment models specific to your area other than those identified by FEMA typing? If yes, please explain type of deployment model.

4. How are technical rescue type incidents (confined space, trench, rope, etc.) handled in your state?

   Specialized team (not part of USAR)

   Specialized team (from USAR team assets)

   Local departments with specially trained personnel

   Other

5. Does your state/county have a mutual aid system?

   Statewide

   Countywide

   No

   Other

6. How are USAR equipment resources deployed (ex. Central cache, local fire agency, etc.)?

7. Does your USAR team have the capability to supply personnel for technical assistance to local authorities to assist with technical rescue type incidents? If yes, please explain.

8. Are specific pieces of equipment (ex. Stanley tool) available to local departments to assist at incident scene operations? If yes, please describe how a request is handled and how the equipment is deployed to the scene.

9. Are there any programs or procedures that your team has instituted to improve response to incidents that do not require a full Type I – Type II response? Please explain.

10. Please provide your contact information if willing to provide additional USAR team information if needed. Also indicate if you would like a copy of the final project report.

Survey Results

Question 1. Authority to activate.

EMA	3
Any official	3
State Coordinator	2
Fire Marshal's Office	1
Governor	1
State Police	1

Question 2. Identified in state/county mutual aid.

State	6
County and state	3
No	2*

* One state is currently working on being included in the mutual aid system.

Question 3. Area specific deployment models.

None	5
Regional collapse	2
Water, rope, trench	2
Working to meet NIMS	1
“Florida” model	1

Question 4. Handling of technical rescue incidents.

Specialized team (not USAR)	4
Specialized team (USAR)	4
Local fire department	10
Other	3

Question 5. State/county mutual aid system.

State	7
County	2

Question 6. Resource deployment

Local fire department	5
Local and regional cache	1
Central cache	5

Question 7. Personnel for technical assistance.

Yes	9
No	2

Question 8. Specific equipment availability.

Yes	5
No	6

Question 9. Additional programs or procedures initiated.

Yes	3
No	7
Florida Type II	1

Appendix D

RIUSAR Survey and Results

1. Based upon your experience and knowledge of fire department capabilities in RI, do you recognize a need for specially trained and equipped response personnel for technical rescue type incidents such as: search and rescue, building collapse, water, rope, confined space, and trench rescue?

Yes

No

2. If you answered yes to question #1, what recommendations would you make to meet these needs?

3. Do you see the USAR team, or components of it, as being capable of responding to these types of incidents?

Yes

No

4. Do you feel it would be beneficial to incorporate USAR personnel and/or equipment into the Mutual Aid Response Plan utilized in RI?

Yes

No

Additional comments

5. Do you feel that the current activation process is effective for instate deployments?

Yes

No

If no, provide reason(s).

6. Do you feel that a tiered response model system (deployment of individual components up through a full Type I deployment) would be beneficial to increase effectiveness of the state USAR assets?

Yes

No

Comments

7. Are there any additional concerns related to developing a more effective deployment model and/or utilization of USAR assets that you would like to identify?

8. Please include your name, contact information, and position associated with RI USAR TF-1.

Survey Results

Question 1. Need for technical rescue response personnel.

Yes	17
No	0

Question 2. Recommendations from question #1.

USAR assets	11
New training/facilities	4
Special teams	2

Question 3. USAR response capabilities to technical rescue incidents.

Yes	17
No	0

Question 4. Beneficial to incorporate USAR into mutual aid plan.

Yes	15
No	2

Question 5. Is current activation process effective, give reasons if no.

Yes	5
No	12

Reasons

Activation process itself	10
Advance team needed	2
Cache location	1
Team call down process	1

Question 6. Would a tiered response model be effective.

Yes	17
No	0

Question 7. Additional concerns for more effective deployment.

Liability issues	1
Coordination between Governor, EMA, and RIAFC	6
Increased awareness of USAR capabilities	3