

**EVALUATION OF THE SQUAD COMPANY CONCEPT FOR THE VIRGINIA BEACH  
FIRE DEPARTMENT**

EXECUTIVE ANALYSIS OF FIRE SERVICE OPERATIONS IN EMERGENCY  
MANAGEMENT

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## ABSTRACT

For the past decade the Virginia Beach Fire Department has been responding to hazardous materials and technical rescue incidents utilizing specialized engine companies. These incidents are increasing in number, while the need to provide additional disciplines such as rapid intervention teams (RIT) are becoming necessary for firefighter safety. In an effort to increase service delivery, squad companies are being utilized across the country to address these needs.

The purpose of this applied research project was to evaluate the effectiveness of a squad company concept in Virginia Beach to determine if it would meet the needs of the organization and increase service delivery. An evaluative research methodology was employed to answer the following questions:

- What is a squad company and what tasks do squad companies perform?
- How do other fire departments utilize squad companies?
- What would be the benefits of utilizing squad companies in Virginia Beach?
- What organizational theories substantiate the utilization of squad companies?

The procedures used to complete this research included a literature review, a series of semi-structured telephone surveys, a survey of all operational battalion officers within the VBFD, and a RIT training exercise.

The results showed the climate within the VBFD is conducive to the further exploration of the squad company concept in an effort to increase service delivery. The operational chief officers of the VBFD felt the concept was critical to success on the fire scene. This was substantiated by national trends and organizational theory models. The recommendations

included; utilization of current resources to place two squad companies into service, while enacting plans to upgrade personnel and apparatus to support the program in the future. The program development included; determination of response areas and duties and responsibilities, dispatch procedures and monitoring the program for effectiveness. It is critical that such a program concept be communicated to all levels of the organization to increase awareness of the benefits and impacts of the program. This program can have a positive influence on increasing the overall market share of the VBFD.

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## INTRODUCTION

The Virginia Beach Fire Department (VBFD) is composed of 376 uniformed fire fighters and 26 support personnel that protect a population of 444,688 over 310 square miles. The core purpose of the VBFD is to provide a customer service organization partnering with communities, members, citizens, and visitors to foster the feeling of safety any place, any time, through planning, mitigation, response and restoration (VBFD Quarterly Report, 2001). The department responded to 21,429 calls for service in 2000, utilizing twenty engine companies and five ladder companies (VBFD 2001-2002 Budget).

The department has been developing its specialty capabilities since the middle to late 1980's. The Hazardous Materials Team was started as a result of the Superfund Amendments and Reauthorization Act of 1986 (SARA) which established baselines for training and response to chemical emergencies (FEMA, 1992). Specialized rescue incidents took place within the city over the next several years, further defining the need for a Technical Rescue Team. In 1987 a trench collapse incident trapped and killed an underground utility worker and in 1988 a civilian employee and a Fire Captain were killed in a confined space incident at the Little Creek Naval Station, within the city limits. These circumstances prompted the department to perform a risk analysis concerning the types of specialized incidents occurring in the city and the abilities of the department personnel concerning mitigation of the incidents. As a result of this analysis, the Technical Rescue Team was formed.

For the past decade the organization has been responding to hazardous materials and technical rescue incidents utilizing specialized engine companies. Both teams are charged with

responding to traditional fire and EMS incidents, while maintaining training and capabilities to respond to specialty incidents. The administration of the organization further committed to the delivery of specialty programs in February 2000, with the formulation of the Special Operations Division within the Operations section of the department. With this re-organization, three Battalion Chiefs were charged with delivery of the specialty programs which include; hazardous materials, technical rescue and marine response. The next logical step to increase service delivery involving specialized functions is to employ utilization of squad companies in the response system of the department.

The problem is that the Virginia Beach Fire Department does not have a formal process to facilitate the deployment of squad companies in response procedures. The department has supported the growth of the specialized programs over the years, by formulation of the specialty teams. These teams are responsible for traditional fire and EMS functions, while maintaining proficiency in the disciplines of hazardous materials and technical rescue. The department has not explored the possibility to allow these programs to be delivered from a platform that will allow further specialization. Squad companies may be a solution to delivering these programs, as well as other disciplines, at an increased level of proficiency, during every response.

The purpose of this applied research project is to evaluate the effectiveness of a squad company concept in Virginia Beach to determine if it will meet the needs of the organization and increase service delivery. An evaluative research methodology was employed to answer the following questions:

- What is a squad company and what tasks do squad companies perform?
- How do other fire departments utilize squad companies?

- What would be the benefits of utilizing squad companies in Virginia Beach?
- What organizational theories substantiate the utilization of squad companies?

### **BACKGROUND AND SIGNIFICANCE**

The VBFD is constantly exploring ways to increase service delivery to the citizens of the city. Several programs aimed at increasing the department's ability to mitigate situations involving technical rescue and hazardous materials response have been implemented over the past two decades. The trends within the organization suggest that calls involving these types of disciplines are increasing. According to the VBFD Operating Budget Recommendation for fiscal year 2001-2002, hazardous materials responses have increased 300 percent over the past six years. The number of calls involving the technical rescue team have doubled during this same time period (VBFD Budget, 2001).

Support for the specialty programs within the VBFD has been a key factor in growth support. The executive levels of the department have promoted the expansion of these programs since the inception of the Hazardous Materials team in the mid 1980's and the Technical Rescue Team in the late 1980's. The incremental growth has seen the establishment of a Special Operations Division within the Operations section of the department. In March of 2000 the department reorganized and placed all of the specialty companies under the command of a single battalion officer on each of the three shifts. Each of these battalion chiefs has the responsibility of program management for each of the three specialty areas; hazmat, technical rescue and the marine response program. This progression has shown that the upper management of the organization sees the necessity of providing these services.

The increase in responses to specialized incidents, along with mandates dictating how

agencies handle such incidents, have pointed out the need to re-examine how these services are delivered. The provision for technical rescue services has become more common and departments are exploring ways to deliver these services (Sargent, 1999). The need for specialized hazardous materials response and mitigation services became more apparent as the volumes of hazardous materials being transported, used and manufactured has escalated (Fanning, 1999).

In Virginia Beach, the specialty functions are delivered by engine companies that are dual role; meaning they carry out traditional roles of service delivery, while maintaining and delivering the specialty roles. This highlights the significance of this research effort; the organization may be asking too much of these individuals. Personnel in the specialty companies are responsible for delivery of both types of services. Additionally, not only are traditional call volumes on the rise, the calls for hazardous materials and technical rescue incidents are increasing as well.

This project is significant to the VBFD for reasons ranging from more effective use of resources to coming more aligned with NFPA standards and better customer service delivery. As reported in a VBFD staffing and deployment study (VBFD, 2000), there is a correlation between response times and adequate staffing in relation to community risk and fireground success. Current reality within the organization places approximately thirteen fire personnel on the scene of fire incidents within the city. The standard response to residential structure fires include three engine companies, one ladder company and one battalion chief. With minimum staffing of 3 personnel on each company, this places 13 people on the initial scene. It has become common practice to call for an additional engine or ladder company upon notification of



a working incident in order to increase these numbers of personnel. This report will examine the feasibility of addressing staffing issues through the utilization of squad companies.

Fire service organizations are continually searching for ways to better serve the internal and external members of their organizations. Squad companies could impact this service delivery now and well into the future, as a means of increasing service delivery and improving member attitudes. There are levels of frustration present within the specialty companies, as they seek to drive the programs from the bottom up. The personnel associated with these venues are typically very motivated people. They visualize how they feel the programs should be implemented and sustained and when these expectations are not met, frustration occurs. Squad companies may prove to be a beneficial recruitment tool for the specialty programs. If personnel in other areas of the organization see the utilization of these units, they may be more inclined to participate.

The squad concept may be a platform to deliver many different fireground tasks in an effective manner. Currently, the specialty companies are special called to deliver their specific function, and other traditional fireground tasks such as rapid intervention teams, air replenishment, thermal imaging, atmospheric monitoring in order to evaluate the need for breathing apparatus, lighting needs, and salvage and overhaul are provided by several different types of companies. Engine, ladder or salvage companies may be called to support the incident commander in delivery of these more traditional functions. It may be more effective to have these necessary resources already on the scene, prepared for delivery by a trained squad company.

This applied research project was completed to satisfy the stipulations of the *Executive*

*Analysis of Fire Service Operations in Emergency Management* course, which is a requirement of the National Fire Academy's Executive Fire Officer Program. The problem addressed by this project directly relates to module six of the course dealing with capability assessment. This module of instruction discusses the importance of evaluating current capabilities to meet critical identified risks in order to be better prepared to deliver trained and equipped resources. These issues, coupled with strategic direction and communication can lead to implementation of a formalized squad concept that can prove to be beneficial for the VBFD and other municipal fire departments.

## **LITERATURE REVIEW**

A literature review was conducted to analyze current documentation relevant to squad company job tasks and response concepts. In addition, academic organizational theories were examined to determine their relevance to the fire department squad company concept. The literature review involved a search of magazines, trade journals and textbooks related to the subject of specialty companies and specialization.

### **The Squad Company Concept**

According to The National Fire Protection Association (NFPA) Standard 1201, *Developing Fire Protection Services for the Public* (1994), the purpose of a fire department is to prevent the outbreak and respond to incidents and mitigate damage to persons and property caused by fire. Additionally, the fire department shall carry out other compatible emergency services as mandated. The standard goes on to indicate that preservation of human life shall be the primary responsibility of the fire department during fires and other emergencies. Chapter 5 of NFPA 1201 discusses the organizational structure of fire departments. Squad companies fit

into the standard as operating units or companies equipped with specialized apparatus and equipment to assist pumper and ladder companies as deemed necessary.

A squad company may be designated a rescue company, a heavy rescue or rescue squad, depending on location in the United States (Downey, 1992). Typically these companies combine firefighting with operations that involve extrication, search and rescue, hazardous materials response, scuba diving, and other specialized activities (Downey, 1992, p. 3). In the middle 1990's the St. Louis Missouri Fire Department implemented two squad companies to augment fire services. Squad 1 is utilized for technical rescue activities and Squad 2 handles the hazardous materials responses for the department (Svetanics, 1998). Some of the first squad companies in the United States were established in Chicago, Boston and New York City between 1913 and 1917 (Downey, 1992). These companies were organized to perform specialized duties, such as responding to accidents, performing rescue work and fighting fires in inaccessible places with specialized equipment. New York City decided to place a heavy duty rescue company into service as a result of increased numbers of fires in commercial buildings, piers, ships and the underground subway system (Downey, 1992, p. 9).

The International Fire Service Training Association (IFSTA) makes reference to squad type apparatus in its Fire Apparatus Practices publication (IFSTA 106, 1984). The name was derived from its original function, which was to bring additional firefighters to an emergency. Again, the terminology is different based on location, but squads are usually designed to achieve specific objectives for a department, supplementing personnel and equipment carried on other apparatus. In the Principles of Vehicle Extrication manual (IFSTA, 2000), heavy rescue units are discussed as being able to provide the support necessary to extricate victims from almost any

entrapment (p.26).

A squad company is usually made up of several members or rescue technicians, that operate together as a team in performing their duties. The National Fire Protection Association Standard 1006, entitled *Standard for Rescue Technician Professional Qualifications* (2000), defines a rescue team as a combination of rescue-trained individuals who are equipped and available to respond to and perform technical rescues. This standard defines a rescue technician as a person who is trained to perform or direct the technical rescue. Specialized teams are defined in the standard as emergency response teams with specific skills and equipment that can be needed on the scene.

In addition to specialized incidents, fire departments respond to many incidents that present a high risk to firefighter safety. Fire departments that comply with OSHA 29 CFR 1910.134, *Respiratory Protection Regulations*, must have a minimum of two persons on the scene, fully equipped for the purpose of rescuing firefighters operating in an area that is immediately dangerous to life or health (IDLH). In many instances, departments are utilizing their squad companies to comply with this regulation (NFPA, 2000). This is usually accomplished by redefining response plans to include the dispatch of an additional engine, rescue or truck company to respond to incidents and stand by as the rapid intervention crew or team.

### **Functions of Squads in Other Departments**

NFPA 1710, the *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2001), defines special operations as those incidents to which a fire

department responds that require specific and advanced training and specialized tools and equipment. The standard also defines specialized apparatus as those vehicles that provide support services at emergency scenes. These vehicles include rescue vehicles, hazardous materials containment vehicles, electrical power and light generating vehicles and vehicles that transport equipment and personnel. NFPA 1710 discusses special operations in chapter four, in particular, hazardous materials response capability, confined space response capability, natural disasters, terrorism and weapons of mass destruction and large scale mass casualty events. Squad companies are discussed in chapter 5 of NFPA 1710 as those companies equipped with specialized apparatus and equipment in order to assist engine and ladder companies as part of established practice. These companies shall be staffed with a minimum number of on-duty personnel as required to perform the duties associated with the tactical hazards found in the jurisdiction (NFPA, 2001).

The city of Philadelphia, Pennsylvania utilizes two squad companies within the city. One squad company is tasked with hazardous materials mitigation and the other squad performs technical rescue response. With a heavy chemical presence, Philadelphia has taken a proactive approach to hazardous materials response by purchasing a new heavy squad type apparatus to utilize as a platform to deliver service to an area on the south and east sides of the city, saturated in the chemical industry (Burke, 1999). Philadelphia also utilizes a squad company to assist with technical rescue operations and to provide additional personnel on the scenes of working incidents. This squad company is primarily designed to provide additional protection to the firefighters operating on the scene. Endrikat (2001) believes this source of specially trained individuals with specialized equipment gives added protection to personnel operating in

hazardous environments. In his own words during an interview, Captain Endrikat explained, “Who would you want to engage when a firefighter is trapped, other than a team trained in structural collapse with the necessary gear and knowledge, skills and abilities needed to go in and get one of our own?”

The New York City Fire Department utilizes several squads within the city to handle specialty functions. Downey (2000) and Fanning (1999) highlight the structural collapse and hazardous materials capabilities of the department. Even though New York City is a large department, capable of delivering several companies of specially trained personnel to incident scenes, the theory is the same as smaller departments. The ability to bring additional help with necessary resources to the incident scene.

The Minnetonka, Minnesota Fire Department conducted a risk assessment in 1995 and noted a one-third increase in non-medical emergency rescue situations. This realization led to the development of specialized training in technical rescue (Flanders, 2000). The department undertook a five year training plan to become more proficient in the technical rescue disciplines and placed into service a heavy rescue apparatus. The same sort of risk assessment was performed in Southampton, Pennsylvania in 1995 (Jakubowski, 2000). This volunteer fire company had many individuals trained in different disciplines, but they did not functionally train together or have a specialty apparatus to carry equipment to emergency scenes. Now the company has a team of over 25 individuals trained and a rescue truck equipped with technical equipment to operate at technical rescue incidents.

Several authors (Shank, 1990; Grantham, 1994; Fournier, 1998) indicate the need to factor in the demands of the community when providing specialized response capabilities.

Trends and risk assessments are tools to be utilized in deciding which programs are needed within a particular community. Fournier (1998) also indicates to make the most of what you have as a response agency. Many individuals within the organization will usually have specialty training in the areas highlighted by the risk assessment. These individuals can be very beneficial in developing the programs further. There are also options to consider when looking into apparatus, as explained by Cook (2001). Affordable ways to transport specialty equipment include utilization of commercial fifth wheel trailer, much like soda and beer distributors use. This is a cost effective delivery system that has been proven in the trucking industry.

### **Functions of Squads in the VBFD**

There are two National Fire Protection Association standards that can serve as a benchmarking process in determining functions for potential squad companies. NFPA 471, *Recommended Practice for Responding to Hazardous Materials Incidents* (1997) outlines the responsibilities of organizations when responding to hazardous materials incidents. The standard provides benchmarks for planning, response, safety, personal protective equipment, control, decontamination and medical monitoring. The recommendations should be followed by jurisdictions and incident commanders that are managing these types of incidents. NFPA 1670, *Standard on Operations and Training for Technical Rescue Incidents* breaks down the disciplines of technical rescue into seven areas: structural collapse, rope rescue, confined space rescue, vehicle and machinery extrication, water rescue, wilderness search and rescue and trench rescue. The standard provides operational levels to which an organization may choose to perform based on the community need. Sargent (1999) notes that like any NFPA standard, 1670 is a consensus standard, which means departments have no legal requirements to adhere to the

standard. However, if legal action should occur as a result of operations, the standard would most likely come into play in a court ruling.

A comprehensive study of staffing and deployment for structural firefighting for the VBFD was conducted over a 24 month period and a report was submitted to executive staff in July of 2000. This study was performed to determine the adequacy of response to a structure fire based upon the risk associated with the particular structure (VBFD, 2000). The study highlighted the facts that a correlation exists between response times and minimum staffing as it relates to community risk and fire loss. The report determined a recommended standard of coverage for the VBFD outlining the necessary staffing to effectively extinguish a structure fire based on response time, task analysis and the risk/hazard associated with the structure. The report recommends among other initiatives, the VBFD should place three heavy rescue companies into service with a minimum of four firefighters assigned per rescue company (VBFD Staffing and Deployment Study, p.9).

Additionally, in the Spring of 2001, the VBFD had completed the requirements for the Commission on Fire Accreditation International (CFAI) to conduct an on site visit for the VBFD in order to determine if all requirements for accreditation had been met by the department. During this site visit, each program delivered by the department was scrutinized by a peer assessment group. Upon completion of their work, the site assessors compiled an exit report that was left with the executive staff of the organization. This report indicated that the technical rescue program within the VBFD was operating at the basic level and there was opportunity for improvement in this area (CFAI, 2001).

In addition to the hazardous materials and technical rescue disciplines delivered by squad



companies, several authors (Norman, 1997; Cobb, 1998; Crawford, 1999) highlight the need for rapid intervention teams to be utilized on the fireground. This team is dispatched to the incident scene and held in a reserve capacity in case the need to rescue trapped firefighters arises. The NFPA has reported that in some years 20 percent of fireground fatalities are related to firefighters becoming lost or disoriented in buildings. In several case studies, once the need to rescue the firefighters became evident, there were no resources immediately available to rescue them (Cobb, 1998). In some cases, a firefighter rescue situation may arise where tools not common to engine or truck companies may be needed. McLees (1997) suggests the utilization of a specialized rescue or collapse unit in this situation. Rapid intervention teams must be proficient in basic and advanced search techniques and have the ability to operate hydraulic rescue tools, airbags or other specialized equipment; if not a trapped firefighter could lose his or her life (Crawford, 1999).

### **Organizational Theories Supporting the Squad Concept**

According to Gordon and Milakovich (1995), organizational theory deals with the formal structure, internal workings and external environment of complex human behavior within organizations. As a field spanning several disciplines, it focuses on prescribing how work and workers ought to be organized. These authors go on to discuss the theory of scientific management that was proposed by Frederick Taylor in the early 1900's. This theory contained four underlying values: (a) maximum benefit or gain from a given investment of resources; (b) rationality in work procedures, meaning arrangement of work in the most direct relationship to the objective sought; (c) productivity, maintaining the highest production levels possible; (d) profit, which should be the ultimate objective of everyone in the organization.

The formal structure of an organization has been thought to make a difference in the minds of organizational theorists (Bozeman & Straussman, 1990). These authors indicate that such theorists believed that clear lines of authority provided the best means to transform units of inputs into units of outputs in the most effective manner. The outputs being services or goods delivered to the customer. Bozeman and Straussman (1990) go on to indicate that the theory of specialization of task is a key concept in the classical organizational structure; the pyramid (p.138). The principle behind specialization is that workers will be able to maximize their efficiency by repeating and perfecting tasks. Leavitt (2000) describes the same concept as differentiation (specialization) versus integration. The trend is less specialization and more job rotation in lower skill tasks in order to allow speed and ease of coordination; while in the higher skill task areas the trend is toward specialization in order to allow the pursuit of in-depth knowledge. Specialization of high-skill workers allows talented employees to gain greater expertise in their specific areas. The more complex the field of work, the greater the pressure for specialization (Leavitt, 2000).

Famularo (1986) speaks to the thought of grouping activities as being one of the principles of organization. He indicates that functions should be assigned to organizational units on the basis of homogeneity of objective in order to achieve the most efficient and economic operation (p.2-10). Drucker (1992) indicates a shift towards more knowledge-intensive work. This increase in knowledge not only relates to the labor force but also to the processes that are applied. According to Drucker (1992), knowledge is specialized and these specialists in a particular field constantly refine their jobs or duties. The basic principle of specialization involves breaking down the work into small specialized functions (Famularo, 1986).

A traditional approach to organizational structure is the idea that there exists an ideal structure to which all organizations should conform to be maximally effective (Gortner, et. al., 1997). These authors mention specialization of function enhances the stability, consistency and efficiency of operations; specialization brings expertise. Ivancevich and Matteson (1997) indicate that the most important characteristic of a job is the degree of specialization associated with that job. These jobs can be specialized by both method and by the application of the method. The economic advantages of dividing work into specialized jobs are the principal historical reasons for the creation of organizations (Ivancevich & Matteson, 1997).

### **Literature Review Summary**

The literature review provided an opportunity to examine the history and purposes of squad companies in many different fire organizations. The review also highlighted the fact that there are many different names and functions assigned to squad companies based on the need and location of the organization. There is not one universal set of job functions that are applied to these specialty companies. A common theme is that squad companies are operating units equipped with specialized equipment and apparatus to assist engine and ladder companies during fire department operations.

Several consensus standards impacting the squad company concept were evaluated. There are several NFPA standards that address the specialty areas of hazardous materials and technical rescue. These standards are directly related to the delivery platform of these programs, as they provide benchmarks that the programs offered by an organization can be compared.

Fire departments, large and small, in cities across the United States have found creative ways to utilize squad companies in their response procedures. The theories utilized to

substantiate the need for these specialty companies can be tied to traditional organizational theory models that focus on how workers and job tasks should be organized.

## **PROCEDURES**

This research project utilized an evaluative research methodology to examine the tasks performed by squad companies, how other organizations deploy squad companies, the benefits of squad companies and how organizational theory supports the use of squad companies. The procedures used to complete this research included a literature review, a series of semi-structured telephone surveys, a survey of all operational battalion officers within the VBFD, and a RIT training exercise.

### **Literature Review**

A literature review was conducted through the Learning Resource Center at the National Fire Academy during February of 2001. Additional literature reviews were conducted from March through June, 2001 at the Virginia Beach Municipal Reference Library, the VBFD library, the Old Dominion University Library, and the Internet.

The review of materials targeted trade journals and magazines that contained articles on formulation and response of squad or specialty companies. Additionally, college textbooks that contained information relating to organizational theories substantiating specialization of tasks were reviewed. The sources applicable to the research questions and intent of this project were discussed and summarized in the literature review section of this report.

### **Surveys**

A survey was developed to evaluate the opinions of the operational chief officers within the VBFD concerning the utilization of squad companies. The battalion chief level was selected because these officers are charged with managing the response of fire department assets on a daily basis. The feelings of these mid-level managers will have a great influence on the decisions of the executive level staff concerning the implementation of such a program.

The battalion officer survey was sent to two senior captains within the organization in a draft format. The confusing, ambiguous and redundant items were adjusted and the final draft of the survey was completed. The author is one of 12 operational battalion chiefs, so surveys were distributed to the remaining 11 operational battalion chiefs within the department. Nine of the eleven surveys were completed for a return rate of 81.8 percent. The survey was structured to extract the opinions of the officers concerning: (a) utilization of squad companies in the VBFD; (b) criticality of squads to fire ground operations; (c) functions of squad companies; (d) dispatch of squad companies; (e) implementation priority of such a program; and (f) backfilling of stations during working incidents. A copy of the survey can be found in Appendix A and a summarization of the surveys can be found in the results section of this project.

An external telephone survey was also developed and delivered to individuals from ten metropolitan sized fire departments within the United States that were similar demographically to the VBFD in terms of population and number of employees. The experience of the author and utilization of the National Directory of Fire Chiefs and EMS Administrators, 2001 edition were the factors considered in obtaining the convenience sample. A telephone survey was chosen in order to provide additional information to the respondents during the interview process and to maintain more control over the survey procedure. The intent of the external survey was to

compare the responses of the VBFD chief officers to those of personnel of similar rank in other departments. A copy of the survey can be found in Appendix B and the summarization of the respondents answers can be found in the results section of this report and in Appendix C.

### **Rapid Intervention Team Exercise**

As part of the quarterly proficiency exercises conducted by the VBFD, the author conducted a simulated firefighter down scenario in an abandoned single-family dwelling that was being torn down in the battalion. Four different engine companies were evaluated as they conducted RIT operations that involved them entering the structure with covered masks. While searching the structure, after being told the last known approximate location of the downed firefighter; the companies were told they had to breach the interior wall to reach the victim. Time started upon the companies being told the RIT was being activated and time ended upon contact with the simulated down firefighter. A summary of the exercise results can be found in Appendix D.

### **Assumptions and Limitations**

There were several assumptions made concerning the procedures utilized for this applied research project. First, it was assumed that the authors of the materials reviewed performed accurate initial research. Next, it was concluded that the respondents answered the research surveys objectively. Third, it was assumed that the representatives of the external fire departments surveyed were qualified to answer the questions and they did so completely to the best of their knowledge. Finally, it was assumed that the respondents did not discuss the survey process prior to providing their information to the author. Concerning the RIT exercise, it was

assumed that each engine company performed to the best of their abilities and to their highest levels of training.

There were also several areas limiting the research. First, there is no formal definition of squad companies that is utilized throughout the fire service. There are many similar terms utilized throughout the country, depending on location and duties provided that are deemed necessary by the organization. The literature review contained information that was directly related to the squad company concept in some cases and specialty functions in general in other instances. Third, was designing a telephone survey that could extract the needed information from the respondents in a short time frame; as the officers called were very busy. Fourth, is the time factor imposed by the Executive Fire Officer Program for completion. This factor did not allow for a more thorough review of the available literature on the subject; nor did it allow enough time to implement and evaluate a squad company concept over a period of time.

## **RESULTS**

### **1. What is a squad company and what tasks do squad companies perform?**

The term squad company has different meanings depending upon location within the United States and the duties assigned to such units. NFPA 1201 (1994) suggests squad companies fit into the specialty category as companies equipped with specialized equipment and apparatus in order to assist engine and ladder companies as deemed necessary. NFPA 1006 (2000) defines such companies as specialized emergency response teams with specific skills and equipment needed on the incident scene.

The fire service professionals that participated in the semi-structured telephone interviews indicated the duties performed in their organizations were based on the needs of the

jurisdictions they serve. All of the respondents (100 percent) indicated their squad companies performed job tasks associated with the technical rescue disciplines. These include: Structural collapse, rope rescue, confined space rescue, vehicle and machinery extrication, water rescue, search and rescue and trench rescue. The external respondents indicated hazardous materials response and operations was a set of tasks assigned to the squad companies in 80 percent of the interviews. The respondents from within the VBFD felt the priority of the squad companies should be rapid intervention team (RIT) tasks. Ninety percent of the surveys indicated RIT should be the priority function of squad companies. In a personal interview, Captain Endrikat (2001), from Philadelphia placed high importance on the abilities of the squad companies to rescue trapped firefighters.

The internal survey respondents indicated in 100 percent of the surveys that the minimum staffing for squad companies should be four personnel. The external surveys indicated minimum staffing of 4 personnel in 60 percent of the responses, five personnel were indicated in 20 percent of the responses, 10 percent indicated a minimum of 6 personnel and 10 percent indicated a minimum of 3 personnel.

## 2. How do other fire departments utilize squad companies?

NFPA 1710, *the Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2001), discusses squad companies as those equipped with specialized apparatus and equipment to assist engine and ladder companies as part of established practice. Departments nationwide employ many different configurations in order to get the necessary personnel and equipment to the incident scene. Although there are many formats for deployment



of squad type companies, the concept is thought to be beneficial by 100 percent of the external respondents.

One hundred percent of the respondents to the external surveys utilize squad companies in their departments in some arrangement. Four of the outside organizations have a single squad company, and two of these have plans for a second. Five outside organizations run two squads in their deployment format and the tenth organization utilizes 3 squad companies. All of the internal respondents (100 percent) agreed that the VBFD should employ squad companies in the response matrix.

### 3. What would be the benefits of utilizing squad companies in Virginia Beach?

The literature review highlights several consensus standards that impact the utilization of squad companies. All of the referenced NFPA standards have descriptions of the tasks and duties that these types of specialty companies should perform. In the areas of hazardous materials and technical rescue, both the internal and external survey respondents felt it an important value to have trained personnel with the necessary equipment available for deployment to the incident scene. In addition, several authors (Norman, 1997; Cobb, 1998; Crawford, 1999) highlight the need for rapid intervention teams (RIT). It was clear in a personal interview (Endrikat, 2001), that a RIT was felt to be a benefit to the incident commander and the crews operating on an incident scene. The internal survey respondents indicated the RIT function as the first priority of squad companies.

The VBFD officers felt in 55.5 percent of their replies that a squad company would be very critical to fireground operations. The remaining 44.4 percent of the respondents from the VBFD survey felt squad companies would be somewhat critical to fireground operations. The

internal respondents supported the dispatch of squad companies to the incident scene early in the process, as opposed to a special call scenario. The majority (77.7 percent) indicated they would want a squad company on the original dispatch of a structure fire. The remaining 22.2 percent of respondents thought the squad company should respond upon notification of a working incident. The internal respondents felt the VBFD should place a high priority on implementing the squad company concept; 77.7 percent rated implementing the concept in the high range and 22.2 percent rated implementing the concept in the medium range.

The clear theme between the literature review, internal instrument and the external instrument was firefighter safety. Providing for firefighter safety on the fireground is believed to be a major driving force for the utilization of squad companies.

#### 4. What organizational theories substantiate the utilization of squad companies?

As far back in history as the early 1900's, authors such as Federcik Taylor supported the theory of scientific management (Gordon and Milakovich, 1995). This theory is focused on the concept of specialization of tasks associated with a particular job function or group of functions. Three of Taylor's tenants of specialization support the squad company concept. They are: maximum benefit or gain from a given set of resources, arrangement of work in direct relationship to the objective sought and maintaining high production levels. Leavitt, 2000 and Famularo, 1986 indicate the principle behind specialization is that workers will be able to maximize efficiency by repeating and perfecting tasks.

As a portion of the procedures for this project, simulated fireground RIT search procedures were implemented during a training evolution. Four different engine companies were placed in the exact same structure and asked to perform RIT operations that consisted of

breeching an interior wall to effect the rescue of a simulated trapped firefighter. The time it took to reach the simulated downed firefighter ranged from fifteen minutes, fifteen seconds to five minutes, forty seconds. This represents a nine minute, thirty five second variance in time it took to reach the trapped firefighter.

## **DISCUSSION**

The research completed for this project suggests that fire departments nationwide are increasingly engaging in the specialty fields. Technical rescue and hazardous materials are two prominent specialty areas in which fire departments are being asked to become more and more proficient. The number of calls involving these disciplines are increasing and consensus standards and risk analysis studies indicate that fire and rescue organizations must be capable of mitigating incidents involving technical rescue and hazardous materials. All of the external departments surveyed deliver technical rescue capabilities from squad companies and 80 percent of those surveyed deliver hazmat capabilities utilizing squad companies.

In addition, another area found to concern the members of the VBFD, as well as members of other departments, is the ability to provide rapid intervention teams for firefighters operating on the fire scene. Several authors (Norman, 1997; Cobb, 1998; Crawford, 1999) in the literature review highlighted the necessity of utilization of RIT personnel on fire incidents. In the survey delivered to departments across the country, 90 percent of the respondents indicated that RIT should be a priority of the squad company. This was substantiated by the VBFD survey, as 100 percent of the respondents agreed that RIT should be the first priority of squad companies. The simulated firefighter down scenario completed as part of the procedures for this project, shows a wide variance of time (9 minutes, 35 seconds), in which it took engine companies to reach a

trapped firefighter. The safety of working firefighters is a driving force when considering utilization of squad companies.

Specialization is an organizational theory model that supports the utilization of squad companies. The literature review suggests arrangement of work in direct relationship to the objective sought, coupled with high levels of productivity, in order to get the maximum benefit from a given set of resources (Gordon and Milakovich, 1995), in order to substantiate specialization. The RIT exercise conducted by the author suggests that the amount of time it took to reach a simulated downed firefighter could be minimized through specialization. Organizational theory suggests that crews training together on a specific objective can minimize the time required to perform certain tasks. Whether performing technical rescue and hazmat disciplines, or RIT search procedures, specialization is a theory that supports the formulation of squad companies.

There will be some impacts upon the VBFD if a squad concept is implemented. The personnel issues include; hiring an additional Captain for placement at the hazmat station, adding training into the training matrix for the squad companies and re-appropriating the staffing from one engine at the technical rescue company to the squad company. There would be apparatus needs to be addressed in the future. There is a squad type apparatus already on order for the technical company and the same contract could be upgraded to support the necessary hazmat squad in the future. Traditional engine company programs would need to be modified for the squad companies. Policies and procedures would also need to be revised to incorporate squad companies in the response plan of the organization.

The climate seems to be conducive to implementing the squad concept within the VBFD.

There is support from the operational chief officers, as 100 percent of the internal respondents feel the VBFD should utilize squad companies. Externally, every department surveyed utilized the squad company concept. The accreditation process and the staffing and deployment study completed last year support the concept. There is a correlation between the response of adequate resources and success on the fireground according to the staffing study. Squad companies could be a single platform utilized to deliver critical resources to the incident scene more effectively.

### **RECOMMENDATIONS**

Based upon the findings of this project, the Virginia Beach Fire Department should place into service two squad companies. This process is substantiated in this applied research project based on national standards, programs in place in fire departments nationwide, support from within the VBFD and accepted organizational theory models. The following recommendations are offered to aid in the development and implementation of the squad company concept:

- Determine the response areas for the two squad companies. The current arrangement of the technical rescue and hazardous materials companies are on opposite sides of the city, which should facilitate this process.
- One squad should be set to deliver advanced technical rescue needs and the other squad should be equipped to deliver advanced hazmat needs. Both squads should be capable to deliver RIT activities, thermal imaging, atmospheric monitoring capabilities, vehicle extrication and breathing air and scene lighting needs.
- The squad companies should be automatically dispatched to all structural incidents in their first and second due response areas. One of the two squad companies should be dispatched to every working structural incident in the city.

- The response units currently in place at the two proposed sites should be utilized until the apparatus currently on order is delivered to the technical company (within 12 months) and the new squad for the hazmat company should be moved up in the procurement process.
- The traditional workloads at the proposed stations needs to be re-assessed as these companies will be charged with developing and implementing the squad program.
- The second engine currently housed at the technical station should be removed from the company and the personnel utilized to staff the proposed squad company.
- An additional company officer should be placed in the budget process in order to increase the staffing at the hazmat station to that of two complete companies.
- Update all policies, procedures and dispatch protocols to reflect the status of the squad companies within the response package for the VBFD.
- Monitor the program for effectiveness and adjust as necessary in order to deliver the best possible service to the internal and external customers of the VBFD.
- Communicate the necessity of the squad concept to all levels of the organization and increase awareness of the benefits and impacts of the program to all members of the organization. The program can have a positive influence on increasing the overall market share of the VBFD.

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## APPENDIX A

### Internal Operational Chief Officer Survey

**Do you feel the VBFD should utilize squad companies?**

100% of respondents answered yes.

**In your opinion, how critical to fireground operations would a squad company be?**

Very Critical 55.5%

Somewhat Critical 44.4%

Neutral \_\_\_\_\_

Not that Critical \_\_\_\_\_

Not needed \_\_\_\_\_

**What operational functions should a squad company perform on the incident scene?**

100% identified RIT operations

78% identified special operations functions

56% identified search and rescue functions.

**How do you think squad companies should be dispatched?**

77.7% indicated on the initial dispatch of a structure fire,

22.2% indicated on notification of a working incident.

**In your opinion, what type of priority should the department place on implementing squad companies?**

High 77.7%

Medium 22.2%

Low \_\_\_\_\_

**What do you feel the minimum staffing on a squad should be?**

100% answered 4 personnel.

**APPENDIX B****External  
Telephone Survey  
Squad Company Concept**

1. Population served by your department?
2. Does your department utilize squads or heavy rescue companies?
3. If so, how many are utilized in your department?
4. What job functions are performed by the personnel assigned to the squads?
5. How are the companies dispatched?
  - Initial alarm
  - Special Call
  - On report of a working incident
6. Do you feel this type of resource is beneficial?
7. How many personnel staff the squad companies?
8. Do different companies handle different specialties?
9. How does your organization choose the personnel for the specialty companies?

10. Do you feel specialty companies benefit morale in your department?

### APPENDIX C

<b>EXTERNAL SURVEY RESULTS</b>				
<b>LOCATION</b>	<b># OF SQUAD COS.</b>	<b>HOW DISPATCHED</b>	<b># OF PERSONNEL ASSIGNED</b>	<b>TASKS PERFORMED</b>
Anaheim, CA	2	initial, special, WI	4 minimum	Tech, HM, USAR
Denver, CO	2	initial, special	4	Tech, HM, Dive, Collapse
Ft. Worth, TX	2	initial	4	Tech, HM, EMS, Firefighting
Kansas City, KS	1	special	4	Tech, Firefighting
Knoxville, TN	4	initial, special	3	Tech, HM, Assist truck cos.
Minneapolis, MN	1 plans for 2	initial, special, WI	6	Tech, Firefighting
Orange Co, FL	1 plans for 2	initial, special	4	Tech, HM
Orlando, FL	1	special, WI	4	Tech, HM, EMS
Richmond, VA	3	initial, special, WI	5	Tech, HM, Dive
Tucson, AZ	2	initial, special	5	Tech, HM
		<i>*WI=Working Incident</i>		<i>*HM=HazMat</i>

## APPENDIX D

### Results of Proficiency Evolutions

#### Time taken to reach simulated downed firefighter - Three person crews

**Engine 10**

15:15

**Engine 3**

8:00

**Engine 4**

8:30

**Engine 23**

5:40