

**EVALUATING THE EFFECTIVENESS OF THE PEORIA FIRE DEPARTMENT
FIRE APPARATUS MAINTENANCE PROGRAM**

Strategic Management of Change

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ABSTRACT

This research project investigated the area of vehicle maintenance and the role it plays in providing fire and emergency service. It also explored the concept of how having a mechanic designated solely to the fire department for servicing and maintaining its fleet. More specifically, this research studied the City of Peoria, Arizona fire department.

An action/descriptive research technique was employed to make recommendations to the fire chief to help produce a department program. An extensive review of literature received from the National Fire Academy's Learning Resource Center was conducted. The four following research questions were developed and evaluated for this project:

1. Does the need exist for the Peoria Fire Department to have more control over its vehicle maintenance of its fire apparatus?
2. What is an acceptable amount of down time for fire apparatus?
3. Would hiring a mechanic that specializes in fire apparatus improve the level of fire and emergency medical service provided in the City of Peoria?
4. Would developing a preventive maintenance program for the fire department improve the quality of work provided?

A phone and e-mail survey was conducted with ten fire departments and districts within the Phoenix regional area to view how they operate their vehicle maintenance programs. The results of the research indicated that the Peoria fire department would benefit from having more control over its fire apparatus and that hiring a fire mechanic is imperative to reducing the amount of downtime for the department's fire apparatus. Research showed that the acceptable amount of down time in the Phoenix area is 5% and that the lower the percentage clearly raises the service delivery to the citizens of Peoria. A preventive maintenance program that is developed and implemented by both the fire

department administration and the labor union would truly improve on the level and quality of fire and emergency service.

The recommended actions include that both hiring a mechanic that specializes in fire apparatus maintenance and the development and implementation of a preventive maintenance program. These will ensure quality control and improve confidence in the work product that is imperative to reducing down time and improving the level of service provided to the citizens of Peoria.

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INTRODUCTION

Problem Statement

In the twenty-two history of the Peoria Fire Department, the departments fire apparatus vehicle maintenance has been provided by the city's fleet maintenance division. The City and the fire department have experienced explosive growth and have had trouble delivering fire and emergency services to it's citizens who have become accustomed to quick response times and have dependable fire apparatus that will perform flawlessly when called upon. The fleet maintenance division has had their own set of problems keeping up with the increase of city vehicles, therefore the fire department's apparatus has suffered from poor repair service, lack of quality control, long vehicle down times and zero preventive maintenance to keep the trucks running smoothly.

Important factors like these have forced many fire departments, including the Peoria fire department, to evaluate the way they provide the expected services and how to effectively reduce response times and increase service levels to all areas of the city. Additional requirements in the form of NFPA standards and apparatus safety requirements help make this an arduous process.

Purpose of the Study

The purpose of this action/descriptive research project was to investigate the importance and advantages of having the Peoria fire department take an more active role in overseeing the maintenance of it's fleet of fire apparatus. The goal of this research project was to examine the benefits that the department would gain by hiring a mechanic that specializes in fire apparatus and developing a preventive maintenance program to

ensure quality control that can be measured by lower vehicle down times and less repeat repairs. Additionally, The study investigated the importance of the receiving the additional professional and technical training for the fire department members to keep up with the technology of today's fire apparatus.

Research Method

A descriptive/action research method was chosen for this study to provide a list of recommendations to the fire chief and other city leaders in order to help create a future course of action for the fire department and fleet maintenance division of the City of Peoria. This will help improve our overall fire and emergency service delivery to the citizens and provide safe, reliable equipment for the members of the fire department.

Research Questions

RQ-1. Does the need exist for the Peoria Fire Department to have more control over the vehicle maintenance of it's fire apparatus?

RQ-2. What is an acceptable amount of down time for the repair of fire apparatus?

RQ-3. Would hiring a mechanic that specializes in fire apparatus improve the level of fire and emergency service provided to the City of Peoria?

RQ-4. Would developing a preventive maintenance program improve the quality of work provided?

BACKGROUND AND SIGNIFICANCE

There are several different problems with the idea of implementing any type of change in the City of Peoria and the fire department in particular. The first would be the lack of support that the city's fleet maintenance division which has continued to run its operations like a small town Peoria once was twenty years ago. The fire department

also shares in the blame for not sharing information about its fire apparatus with the fleet division due to its lack of trust based on past performance. Several drivers would rather run the fire apparatus until it fails instead of turning it in to be fixed. On several occasions the truck would be returned with either the original problem not corrected or with an additional problem. Many times when an apparatus went down for repair, our choice of apparatus to switch into would be a choice of what is “less broken”. All of these factors have contributed to an overall lack of a quality in the servicing of our fire department fleet and the assurance of having reliable apparatus that we can count on to help us provide the level of service our citizens now require. The fire department has not asked for a higher level of work product by our city fleet maintenance division and has not been consistent in the area of quality control as required. Therefore the two divisions have been feuding, passing blame and have failed to correct the problems due to a severe lack of trust. The failure to recognize the need for a mechanic that specializes in the repair of fire department apparatus and the need for a program that includes quality control and assurance is a necessity for the fire department and its members. Currently our department places a heavy emphasis on fire and emergency response times to all of our fire service areas with placing our fire stations strategically in order to provide the needed coverage.

The fire department must look at all aspects of providing its service to see if other factors were needed to be taken in consideration; like the downtime that is created by the servicing of its fire apparatus fleet and the number of reserve vehicles needed to cover that down time. Lastly, fire departments need to require special certifications to

work on its unique and expensive fire apparatus to ensure it is running properly and in a safe manner.

The Peoria fire department is a relatively new department. The department has quadrupled in size in less than eighteen years. The City's population has gone from twelve thousand five hundred to one hundred and ten thousand in the same time frame. The department's area of coverage has gone from thirty-five square miles to over one hundred and seventy-six square miles. Variables like these make this problem an interesting and complex one. With Peoria being relatively new, the department has not thought about ways of improving our fleet maintenance problems. However, the number of new vehicles needed to keep up with station openings along with the number of reserve apparatus needed to have continued service provided to our citizens.

Third, a large and influential portion of our problem is the failure of the City's fleet maintenance division to run its operations like a business. Instead of the approach to just replacing parts and making repairs, there needs to be a system approach to the whole fire department fleet needs that includes looking at the life expectancy of a fire apparatus and the types of preventive maintenance that it requires.

Peoria's new Fire Chief has set his priorities to include efficiency in all levels and areas of the department. He wants to increase the quality of service we provide our citizens on all levels. However, this has been an arduous process in the area of fire apparatus maintenance. The members of the firefighter's labor union have played a major role in our department's development but has not been a large supporter of the city's fleet maintenance division to provide this service. They have no trust at all in the mechanics that work on the fire trucks. All with good reasons, there have been several

incidents that have contributed to this lack of trust. Firefighter safety plays a larger role in their decision to fight for fire department control over the fleet maintenance of the departments apparatus.

The City of Peoria provided money in last year's budget for a comprehensive study of the fleet services division. Historically, with these audits of a department has provided the ammunition to address their needs to acquire new personnel and equipment to improve their operations. However, even though the fleet division has seen a considerable increase in city vehicles to maintain within the last year they have not acquired any additional specialized mechanics or quality control personnel. Therefore, the need for this study is obvious and how it relates specifically to the executive fire officer program strategic management of change course. The probability of the Peoria fire department benefiting by formulating a new maintenance program is a direct result of this study.

LITERATURE REVIEW

Historical

In the history of the fire service maintenance of fire apparatus and other vehicles have always taken a back seat to the more obvious and important tasks of providing fire protection, ems and rescue services to its citizens. Recently members in the fire service recognized the importance of vehicle maintenance and how it relates to safety, efficiency and cost reduction. Fire departments across the country have established requirements for preventive maintenance programs as well as certifications in the areas of emergency vehicle technicians. Vehicles are our most frequently used tool, our heaviest piece of

equipment and the most technically dependent device we utilize in today's fire service (Wright,1992, p.60). Although the existing standards have been in effect for many years, their main focus is on areas other than emergency vehicle maintenance, and their references to maintenance have been secondary. As a result, many organizations have been unaware of their implications and requirements (Steffens, 2000, p.1).

The National Fire Protection Association (NFPA) has collected data which tells us that 262 deaths of on-duty firefighters occurred between 1980 and 1989 as a direct result of motor vehicle accidents while en-route to or returning from an alarm. Poor maintenance contributed to many of these (Wright,1992, p.60). Fire departments must realize it is their responsibility to ensure the safety of its fleet and see that they are maintained to required standards. The National Transportation Safety Board (NTSB) has released its March 19, 1991 Special Investigation Report on Emergency Fire Apparatus, which investigates the mechanical condition of the vehicles in eight separate accidents involving responding apparatus. Again, poor maintenance was a contributing factor in nearly all accidents (Wright,1992, p.60). The safety of our firefighters and the citizens we serve should be a top priority when responding to emergency calls because if we do not make it to the emergency we will not be very effective at providing the service we are there to provide. We must not put the public in danger by being negligent in maintaining our fleet. Firefighters and citizens become more confident in the community's equipment, and response capability, because it doesn't break down all the time (Elliott, 1999, p.1). Fire protection is already a very dangerous occupation without making it more dangerous through inaction. Ignoring apparatus maintenance does not lend itself to providing an acceptable level of protection for everyone (Wagner,1994, p.28).

Fire departments must take on the responsibility of developing a comprehensive apparatus maintenance program that includes a preventive maintenance and certified emergency vehicle technicians. The development of a regular apparatus maintenance program is becoming increasingly necessary for today's fire service. Gone are the days when we enjoyed a level of immunity from various governmental regulations. Today's fire service is being scrutinized by internal health and safety personnel, state regulators (OSHA) and various other concerns with the goal of providing a safe work place for all employees (Wagner,1994, p.138). Carlson (1994) states, Fire department units must get to the scene to function at the emergency. If your department does not have a good maintenance program, organize one immediately (p.11).

An extensive review of literature received from the National Fire Academy's Learning Resource Center was conducted. This review proved to be fruitful as it provided the author with several professional journal articles dealing with the issues of fire apparatus maintenance and how it regards to the fire service. The findings in the literature have been broken down to three important areas as they relate to the maintenance of fire apparatus and how the department can better serve its citizens. The three are Vehicle Maintenance Program, Specialized Fire Mechanic and Preventive maintenance. Each of these areas were addressed in effort to determine the advantages or disadvantages of taking the lead in the maintenance of our fire department apparatus, as well as increasing the level of service to our customers.

Vehicle Maintenance Program

A vehicle maintenance program is essential to the fire department mission in keeping the trucks on the road where they can provide the best service. Lowering the repair down

time for fire vehicles has an indirect effect on response times and the availability of the units to respond to emergencies. A mediocre fleet maintenance program is the same as having no fleet maintenance program (Brown,1992, p.18).

Fire departments and cities feel that developing a comprehensive vehicle maintenance program is cost prohibitive and not necessary. Research shows that it is more costly not to ensure your fire department fleet is well cared for. A well maintained fleet costs less in the long run than one that isn't maintained. There's a longer vehicle replacement cycle, which ultimately saves the community money (Elliott,1999, p.1). Steffens (1995) states, Emergency vehicle maintenance must be consciously managed, or accidents may occur, vehicles may wear out prematurely, and extensive amounts of money can be lost (p.8).

Doing proper maintenance is just as essential to reducing failures and saving money (Brown,1992, p.18). Spending money up front to maintain emergency vehicles offers a number of financial advantages. With good preventive maintenance a qualified technicians doing the job, you have less downtime, which means you may need fewer pieces of expensive reserve equipment (Elliott,1999, p.1). Potential savings from unfavorable litigation are probably the hardest to put a dollar figure on (Wagner,1994, p138).

Civil litigation also plays a large part in the reasoning of developing a comprehensive maintenance program. The need for emergency vehicle maintenance and associated programs is being pushed into the lime light with the enactment of various laws and standards, and through the litigation process. The fire service has enjoyed exemption from several statutes and rules in the past. With modern society expecting and rightfully

demanding a safe and healthy workplace, we are no longer able to hide behind the shield of “government immunity” or the opinion that we are exempt from the same standards being applied to other industries (Wagner,1993, p.84). Wagner (1994) also states, Potential savings from unfavorable litigation are probably the hardest to put a dollar figure on (p.138).

To ensure that fire departments comply with safety laws, standards and state regulations it is essential to have a maintenance program that comply with the requirements that directly involve emergency response vehicles. With the passage of NFPA 1071 and 1915, these new standards directly address the subject of maintenance and require immediate attention of emergency service organizations. Compliance with the new standards is expected to become a significant consideration for determining liability in the future lawsuits involving emergency vehicles (Steffens,2000,p.1).

Specialized Fire Mechanic

Having someone with the training, knowledge and experience working on fire apparatus is the keystone to an effective maintenance program. Not all mechanics have the ability to work on the specialized fire equipment we operate today. Many apparatus have increased in technology over the past few years so it is not just a matter of turning a wrench or replacing a part. It is necessary for the mechanic to be knowledgeable in the areas of engines, pumps, hydraulics and sensitive electronics that make it all work.

As stated above, one of the components of a maintenance program is having a qualified person working on fire department vehicles. NFPA 1071 establishes the minimum job performance requirements for a person to be considered qualified to

inspect, diagnosis, maintain, repair and test emergency response vehicles (Steffens,2000,p.1). The need to have persons specifically trained in the area of fire truck maintenance and repair makes good sense because of all requirements that need to be followed. Many states and municipalities are enacting legislation to require specific inspections and maintenance programs for fire equipment. As these laws and standards become officially recognized, so does the need to understand the liabilities associated with them. Can we continue to allow untrained or unqualified individuals to perform specific services on emergency apparatus? (Wagner,1993,p.86). According to Steffens, (1995) all maintenance will be performed at a maintenance facility by a trained vehicle technicians (p.7). Wagner (1993) also states, decisions have to be made to provide for proper maintenance and repair of apparatus. Many departments are opting to operate their own shop facilities due to the specialized needs of our industry (p.86).

Training of mechanics to work on specialized pieces of fire apparatus is imperative to ensure a quality maintenance program. Maintenance training is just as important as training firefighters and officers for their jobs in your department. A course for trouble shooting a transmission can pay back in big savings later (Cook,1994,p.4). Mechanics who are trained properly in the use of the equipment can become familiar with the infrequency of a part or system. Mechanics recognize that lack of use does not mean something isn't subject to breakage or wear (Wagner,1994,p.138). Consider all the changes to apparatus systems and components that have taken place over the past 20 years. Can your mechanics service the latest electronic engines and pump governors? Do they know how to trouble shoot modern aerial ladder hydraulic systems? How about anti-braking systems or foam proportioners? (Steffens,2000,p.5). These are all very good

questions the fire service has to ask if we feel confident that the people who are working on our very expensive pieces of equipment. Are they trained properly and qualified to not only repair but provide the maintenance need to keep them running efficiently for the next 10 to 20 years? Wagner (1993) tells us that programs coupled with the basic mechanic training and certification can ensure that we have qualified and responsible people working on our equipment (p.86).

Keeping abreast of changes in NFPA standards, OSHA regulations, insurance recommendations and liability issues involving equipment and maintenance is of paramount importance (Cook,1994,p.5).

Preventive Maintenance

Through the research that I have done on vehicle maintenance, one premise is constantly is stated throughout the literature is preventive maintenance. Preventive maintenance is the cornerstone to an effective vehicle maintenance program. It ensures quality control, safety and cost efficiency in a program. Departments that have placed preventive maintenance into their program have seen the dividends pay off. David Looney (1995) writes, Preventive maintenance programs can keep more rigs on the road for more miles by making fewer repairs necessary. They save money and can even lift morale (p.1). Preventive maintenance programs for apparatus may not seem as exciting as the extinguishment of a fire, but it nevertheless plays a vital role in accomplishing our mission of saving lives and protecting property. The critical nature of our service demands that fire apparatus always be in top condition and ready to perform at a moments notice (Peters,1991,p.57).

Preventive maintenance requires a mechanic to think a head. He should be looking for parts to change out before they go out. It requires the knowledge of the expected life of a part or system and takes a proactive stance on keeping the trucks on the road instead of waiting for them to show up at the shop when they are broken. Taking a proactive approach rather than a reactive one will pay off in the long run by keeping the units in service to provide minimal response times and better area coverage. Planned, periodic maintenance of apparatus will cut the cost of maintaining the fleet. All the little things down the road will be taken care of during the early stages, so you're going to avoid a lot of major emergency repairs that are very costly (Elliott,1999,p.4). Now more than ever before, fleet maintenance must be fiscally responsible. The answer to this is comprehensive preventive maintenance, utilizing solid, proven maintenance techniques and procedures (Brown,1993,p.25). Wagner (1994) states that it is not uncommon to have a fire apparatus cost in excess of \$200,000 in today's market. The initial investment itself should dictate a need for preventive and ongoing maintenance (p.138). Good preventive maintenance of the rolling stock of an emergency agency is essential element of a well-managed organization (Steffens,1995,p.8). Preventive maintenance (PM) is a program of routine and planned maintenance designed to make repairs before equipment fails. They succeed in reducing downtime and costly repairs, increasing vehicle availability, and decreasing vehicle operator inconvenience and frustration. And creating financial savings for the service (Matteo,1992,p.20). Looney (1995) agrees with Matteo by stating A PM program is a schedule to perform regular maintenance to prevent repairs. By preventing repairs, downtime on vehicles is reduced and can in many cases be eliminated. If repairs are prevented and downtime is reduced, vehicle operating cost are

reduced (p.1). Peters (1991) also concludes that a PM apparatus program also helps to extend a vehicle's working life and protect a major capital investment (p.57).

Preventive maintenance programs have a lot of hidden savings related to their overall cost to the organization. A PM program can also do some things that can't be measured in dollars, at least directly. It can ensure the safe and efficient performance of emergency vehicles. It can raise employee morale by promoting a quality image to the public and by having vehicles in service and on the road, not at the shop or on the tow truck (Looney,1995,p.1). Remember, some emergency vehicle warranties can be voided if certain inspections, checks or preventive maintenance activities are not completed at certain intervals, with a record being kept to document compliance (Steffens,1995,p.8). And last but not least, Wagner (1994) states that dollar savings from preventive maintenance, less exposure to litigation, better working conditions and ultimately providing responsible service can all presented in a positive fashion (p.138).

PROCEDURES

General Methodology

First the research focused on the value the Peoria fire department places on fire apparatus maintenance, on the amount of apparatus downtime, and how these are related to providing excellent fire, rescue and ems services to the citizens of the City of Peoria.

In effort to address the research questions specifically designed for this study a descriptive analytical research methodology was employed. Additionally, a phone and E-mail survey was designed and ten Phoenix regional fire departments and districts were contacted to see how they handle their apparatus maintenance programs.

The information received from the survey questionnaire (Appendix B) was also used in a memorandum to the fire chief (Appendix E) for recommendations on changes of the Peoria Fire department's existing apparatus maintenance program practices.

With the help of Peoria Fire department's Management Analyst, Karen Daines a survey was designed. The questions were devised to help measure the validity of the research questions that were developed for this descriptive/action research project. Each survey question was directly related to one of the four research questions.

Specific Procedures

A cover letter (Appendix A) was read to the participants, which stated the intent of the survey and what the information was to be used for. When the phone survey was conducted the participants were instructed to provide the answers as they related to them.

Participants were asked to include number of front line pumpers, number of reserve pumpers, Percent of front line pumpers to reserve to provide a ratio, life span of a front line apparatus and the number of years the apparatus is used in a reserve capacity.

Surveys also included the number of estimated apparatus downtime and whether or not the fire department had its own specialized fire mechanic to oversee its fleet and performed preventive maintenance. The numbers were used for the data input into a Microsoft Access data base program.

It was anticipated that ten questionnaires would be distributed to fire departments in the Phoenix area similar in size to the City of Peoria. Permission to conduct the survey was received from the Fire Chief two weeks prior to the distribution of the surveys. The Union Vice president was also notified that the survey would take place.

It was estimated that the questionnaire took approximately fifteen minutes to complete. All contacts were made with the competent person responsible for fire apparatus maintenance within their fire department. Surveys were completed and returned to the analysis within one week of the start of the survey.

Research Population/Sample

The sample population in this research paper consisted of ten Phoenix regional fire departments or districts similar in size to the city of Peoria in population, number of stations, vehicles and area of coverage in square miles. The fire department and districts included Apache Junction, Sun City, Sun City West, Mesa, Tempe, Goodyear, Glendale, Gilbert, Chandler and Phoenix.

The researcher informed the participants that the results of this survey would be shared with them in the way of a report by the end of 2001. Explanations were given that the results would be used for the evaluation of our existing maintenance program. They were informed that all data gathered for the project would be held in strict confidence and the results of the project would not be sold, or used for any commercial profit.

Finally, they were informed that they would be helping structure the future of the Peoria fire department vehicle maintenance program by the information that they provided in the survey questionnaire. Recommendations to the Fire Chief as well as City leaders, would be made from the information gathered from the results of the survey. They were thanked for their cooperation in this study.

Treatment of Data

Ten returned surveys out of ten surveys completed with the sample population represents a very high return rate of 100%. It demonstrated that a large portion of the departments surveyed took it seriously and that they were interested in the outcome of the research. The Cities of Glendale, Phoenix, Flagstaff, Gilbert, and Chandler do not track their downtime of their fire apparatus therefore were not included in the downtime graph (Appendix C). The City of Goodyear and the Fire District of Apache Junction did not provide all data requested therefore were not included in the ratio and averages graph (Appendix D). Apache Junction, Sun City West, Mesa and Tempe have their own fire department mechanic and have lower percentage of downtime of 4% as shown in (Appendix C).

The data was entered into a Microsoft access data base program that was created specifically for this research project by Peoria Fire Department's Management Analyst Karen Daines. This program then sorted through all the information and calculated the downtime into percentages and averages.

The information was then divided into a graph representing the question asked (Appendix D). The graph was then divided into categories that represented the different answers that were given on the survey. After calculating the percentages the data was then combined both answers that were represented. All percentages and numbers were check and rechecked for accuracy. The survey results, in percentages, were then cross-referenced with the correlating research questions that they represented to measure the results.

Limitations of the Study

The limitations of the study were commensurate with the enormity of this study. The questionnaire was limited to nine questions to encourage increased participation among the respondents. A longer, more comprehensive questionnaire could have provided more in depth information.

The research population only included ten area fire departments and did not include departments from other areas of the country to see how they handle their apparatus maintenance programs. Therefore, the study did not represent the entire fire service. Additionally, the research population only included ten fire departments in the Phoenix metropolitan area. Populations that would have included members of other valley fire departments would have given the study more information on how fire apparatus maintenance programs are managed in this area and how they are related to providing fire service from a more regional perspective.

A pre-study was not conducted. Many of the limitations could have been reduced or eliminated if a pre-study had been conducted.

Definition of Terms

To adequately study the research questions noted above, certain items must be defined. Terms will be defined as follows:

Fire Chief-the director that is in charge of all aspects of the fire department.

Deputy Fire Chief-the manager in charge of all aspects of a division within the fire department.

Battalion Chief-the middle manager in charge of one of the three shifts of fire companies in the operations division. Also known as shift commander.

Fire Captain-the front line supervisor that is in charge of a fire company in the fire operations division. Also known as company officer.

Fire Engineer-the apparatus operator that drives the fire truck to the scenes and operates the fire suppression equipment to provide water to the firefighters.

Firefighter-the entry-level position in the operations division.

Fire Operations-the division which provides the fire suppression, emergency medical services, performs fire inspections and provides public education to its citizens.

Fire suppression-the act of extinguishing a fire.

Emergency medical service-the paramedic services the fire department provides.

Company officer-the Captain who is in charge of an engine or ladder company.

Fire apparatus-are the fire engines and ladder trucks that the fire department uses to respond to fires and emergency scenes.

Fire Engine-carries and pumps water to fight the fires.

Fire Mechanic- A mechanic who is trained specifically in the areas of fire apparatus repair and maintenance.

Ladder truck- is an aerial apparatus that carries the ladders and other equipment to support engine companies with the fighting of fires.

Fire ground- the scene where fire suppression activities are taking place.

Fire ground Commander-person who is in charge of fire suppression activities.

NFPA- National Fire Protection Association

NTSB- National Transportation Safety Board

Downtime- The amount of time that a fire apparatus is out of service for repair.

Fire District- Fire service protection in an unincorporated area.

Fire Department- A city department within a municipality that performs fire and Emergency services for that city of jurisdiction.

RESULTS

General Results

The number of departments contacted verses the number of surveys completed confirmed that there were no duplications of responses.

The questionnaires were distributed by phone and e-mail to the sample population for their individual input on their particular fire apparatus maintenance program.

Results

Of the ten-fire department and districts surveyed the average number of front line pumpers is 12.1. The average number of reserve pumpers is 4.8. The percentage of front line pumpers to reserve pumpers is 43.6%. The average ratio of front line pumpers to reserve pumpers is 2.4. The average life span of a front line pumper is 10.2 years and the average for a reserve pumper is 3.5 years (See Appendix D). The average downtime for fire apparatus (see Appendix C) for fire departments and districts in the Phoenix regional area is 5.3%. Of the departments and districts surveyed, the ones with their own Fire Mechanics that track their apparatus downtime, the average is 4%.

The nine questions asked in the survey (Appendix B) were divided up to correlate with the four research questions asked in this paper. Questions one through four directly relate to

RQ-1 and show how important managing the fire department fleet is. Questions five, six and nine are related to RQ-4 and how a preventive maintenance program could help a department prolong the life of its fleet (see Appendix D). Question seven, is directly related to RQ-2 that addresses apparatus downtime (see Appendix C). Question number eight is directly related to RQ-3 concerning hiring a fire mechanic that specializes in the repair and maintenance of fire apparatus. In addition, every fire department and district stated that they take part in a preventive maintenance program with their apparatus.

DISCUSSION

Conclusions

The data gathered through this study demonstrated that Phoenix regional fire departments and districts recognize the importance and benefits that can be obtained from maintaining a fire apparatus program. Future leaders in the fire service and more specifically the Peoria fire department will be better qualified with maintaining its own fire apparatus fleet. The leaders of the Peoria Fire department will have the background to be able to make the complex decisions that they need to make in managing the fire department fleet efficiently and safely. Additionally, safety of the apparatus is also valued in the Peoria fire department and should be included in the maintenance program criteria.

Finally, when speaking on the enhancement of the Peoria Fire department maintenance program, it was concluded that by combining a preventive maintenance program along with acquiring a fire mechanic that specializes in the repair and maintenance in fire apparatus is essential in lowering fire apparatus downtime. Thus, increasing the level of standards of professionalism in the fire and emergency service

provided to the citizens of Peoria. Lastly, it was concluded (via the literature review) that the need for participation from all ranks is imperative for the survival and growth of a successful fire apparatus maintenance program. More interactions are needed with engineers, apparatus operators and fire mechanics to enhance the area of quality control of the work being performed on the apparatus as well as the reporting and repairing of malfunctions in the first place. Fire service leaders have to be able to continually assess the needs of the community and the goals of the department to make sure that they are aligned. The City of Peoria needs to strategically manage change in the area of fire apparatus maintenance.

In the areas of numbers of front line pumpers and reserve the Peoria Fire department is close to average at 40% with the average being in the 50% range. In the numbers of years pumpers are used in a front line and reserve status we also need some adjustment. Where we fall drastically behind is the area of apparatus downtime, the Phoenix area average is 5.3% and Peoria's is at 16%. This is unacceptable due to the fact we are in business to provide a service on a 24/7 basis.

The fire departments and districts that have their own mechanic in charge of their fleet have an average downtime of 4%. This is considerably less than the City of Peoria currently provides to its citizens. If the City takes a proactive stance on this issue and follows the recommendations of this study, this could help bring those goals to fruition.

This study was significant due to the fact that both the Peoria fire department and the City of Peoria are growing at an extremely rapid rate. With the rapid growth comes the need to open more fire stations to provide the service in areas that are not covered by

existing stations. The fire department will then need to add three new fire engines for each station built.

There are three stations in the planning stages, projected to be built in the next five to ten years. Along with that, the fire department will be experiencing the need to establish a plan that is both comprehensive and economical in the area of fire apparatus maintenance requirements for the department. This program is now incumbent on the fire department management team. The department must immediately start developing the plan to take over the maintenance of the fire apparatus for the future.

This research project will be utilized as a basis to construct a comprehensive report on fire apparatus maintenance for the fire chief and provide the needed recommendations for developing a vehicle maintenance program that provides the requirements for the fire department mechanic and a preventive maintenance program.

The department administration will then take the results of this report and share them with the labor union. Through the labor/management process the two will come up with guidelines to put the plan into effect. This should give the department a chance to raise the expectations of the ranks. It will also give employees a concise target for what they will need to accomplish in the areas of safety. Putting this program in place will help in the areas of providing the fire department with a way to lower downtime of vehicles making them more available for service. It also will lower response times to emergencies in service areas and should provide the department with higher quality of apparatus performance. Confidence in our fire apparatus performance would then filter through to the rest of the organization and eventually to the citizens that they serve.

Creating a plan for the whole organization that maps out the strategies for a fire apparatus maintenance program should give the department a common direction as well as provide a solid base to improve on for the future. Finally, having the ability to implement a plan that effects the entire rank and file of the department and by including them in the process should only enhance and solidify the relationship between labor and management.

Future research could investigate several areas in which this study did not examine in detail. This study did not investigate other fire departments that have gone through similar rapid growth problems. Fire chiefs and members of fire departments that have experienced a similar level of growth could have provided valuable information to any future study.

A study of other fire departments' and districts in the country and how they address these same issues (and what are the benchmarks for the industry) would have provided more valuable information in the study for comparison and relevancy.

RECOMMENDATIONS

The Peoria fire department is currently at an organizational crossroads regarding the development of a fire apparatus maintenance program. It can take the easy way out and say that we already have a fleet maintenance division and mechanics to serve the fire department. They can say these are not important factors and issues in becoming a professional fire department or it can embrace these recommendations and become a leader in the fire service in providing quality maintenance of its fire department fleet.

The Peoria fire department should take the necessary steps to improve its effectiveness in the area of its fire apparatus availability for service. If the current system is left in place to provide this service, a high apparatus downtime will not only cause us service delivery problems in the future but also severe labor issues due to lack of confidence in the fleet division past performance and concerns on safety.

Additionally, hiring specialized fire mechanic needs to be addressed when considering our fire department fleet. Having someone whom knows what he or she is doing and also knowing when to have the work done elsewhere is invaluable. This will ensure the work is done correctly the first time, therefore, requiring less repeat repairs and providing a high level of quality control.

Finally, the Peoria fire department must develop a consistent way to maintain its fire department fleet that will serve the department and be used, as a guide for our mechanic to achieve the optimal skills required doing the job with a high success rate. This should raise the comfort level of the whole organization with its leaders and should, therefore, provide the citizens with a higher level of service.

The following recommendations are suggested:

1. That the Peoria fire department devise a clear and concise plan to take over the maintenance and repair of its' fire apparatus fleet.
2. The Peoria fire department recognizes the need to hire a mechanic that specializes in the repair and servicing of fire apparatus.
3. The Peoria fire department implement incremental increase in training for our fire mechanic to ensure that they stay current on today's equipment and tomorrow's technology.

4. That both the Peoria fire department administration and labor union work together to come up with acceptable plan that will benefit the organization and ensure firefighter safety.
5. The City of Peoria Fire department develops a comprehensive preventive maintenance program to ensure the durability of the apparatus and prolong the use of its fleet.
6. That the Peoria Fire Department increase its percentage of front line pumpers to reserve pumpers to at least 50% which will decrease its ratio to 2.0 and increase the availability for service of the fire department fleet.
7. That the Peoria Fire department lower the number of years that a pumper runs front line from twelve to ten years and increase the number of years of reserve status from three to five to meet the valley average and prolong the over all effectiveness of the fire apparatus fleet.
8. A regional fire service consortium consisting of fire departments and districts in the Phoenix metro area to be assembled to address and evaluate the need for a fire apparatus maintenance committee to discuss common needs and problems.

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APPENDIX A—COVER LETTER

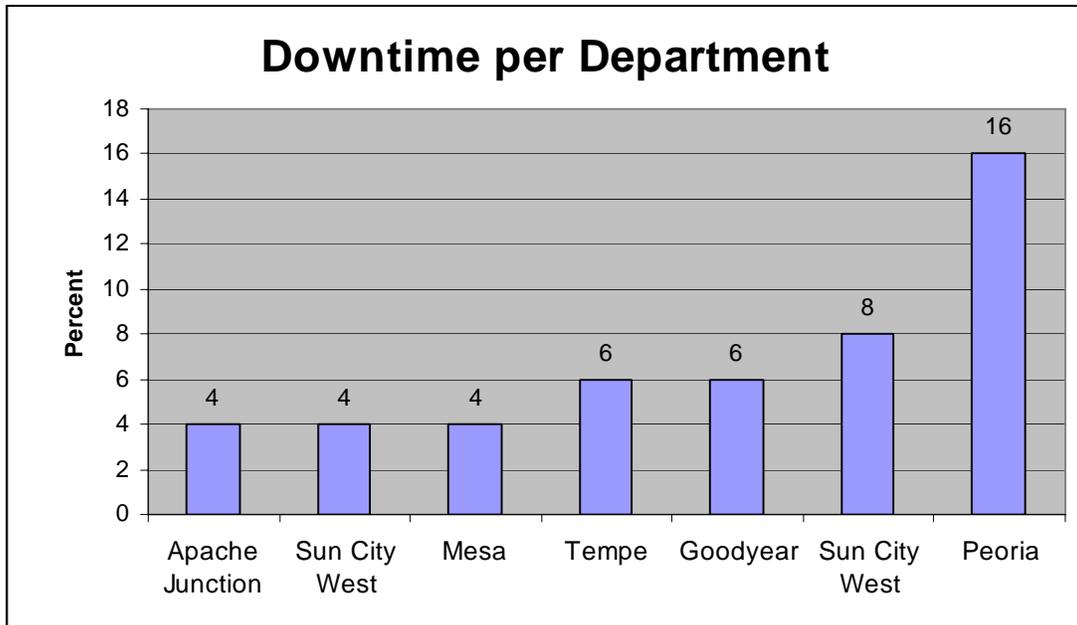
My name is Larry Rooney and I am a Deputy Fire Chief in the City of Peoria. I am required to complete a research project as part of my completion requirements for an executive fire officer course. The Fire Chief took a look into our departmental needs in the areas of fire apparatus maintenance programs and has also given me this as a goal to complete. I have chosen to combine these two tasks and I am asking for your help for and input into this study by answering a few quick questions. Please take a moment of your time to share your important information for this study.

All data gathered for the project are held in strict confidence. Your name and other identification are not requested. The results of this project will not be sold, or used for any commercial profit.

This questionnaire will also be used in helping the fire department structure our future by making the needed recommendations based on the information you provide in this study. Please take this survey in the serious nature that it is intended. By completing this questionnaire you are giving consent for this information to be used in research. Thank you for your cooperation in this matter.

APPENDIX B--QUESTIONNAIRE

1. What is the number of front line pumpers that you currently have?
2. What is the number of reserve pumpers that you have on stand by?
3. What is the percentage of front line vs. reserve pumpers?
4. What is the ratio of front line vs. reserve pumpers?
5. What is your expected life span of your front line pumpers?
6. How many years do you expect to get out of your reserve pumpers?
7. What is the percentage of downtime for you fire department vehicles?
8. Does your department/district have your own fire mechanic?
9. Does your fire department perform preventive maintenance?

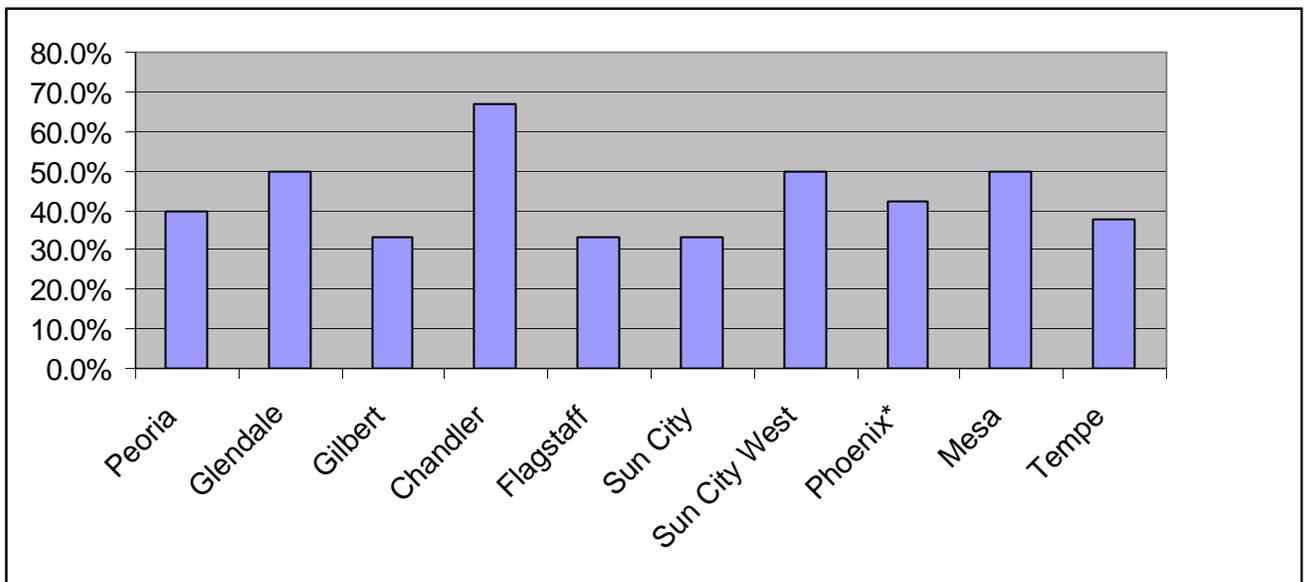
APPENDIX C—APPARATUS DOWNTIME GRAPH

**Apache Junction, Sun City West, Mesa & Tempe have their own FD mechanics.

APPENDIX D----SURVEY RESULTS & GRAPH

Front Line/Reserve Pumper Ratio Analysis
City of Peoria vs. Phoenix Regional Fire
Departments.

City	Number of Front Line Pumpers	Number of Reserve Pumpers	Percent of Front Line to Reserve Pumpers	Ratio of Front Line to Reserve Pumpers	Front Line Service Life Span (Yrs)	Reserve Life Span (Yrs)
Peoria	5	2	40.0%	2.5	12	3
Glendale	8	4	50.0%	2.0	7	5
Gilbert	9	1	33.3%	3.0	10	5
Chandler	6	4	66.7%	1.5	10	5
Flagstaff	6	2	33.3%	3.0	17	3
Sun City	9	1	33.3%	3.0	10	5
Sun City West	2	1	50.0%	2.0	10	0
Phoenix*	52	22	42.3%	2.4	8	0
Mesa	16	8	50.0%	2.0	10	7
Tempe	8	3	37.5%	2.7	8	2
Average	12.1	4.8	43.6%	2.4	10.2	3.5



APPENDIX-E**M E M O**

*From the desk of
Larry Rooney, Deputy Fire Chief*

Date: 12/04/2001

To: Robert McKibben, Fire Chief

Subject: Recommendations for Vehicle Maintenance Requirements

The following recommendations are based on the results of a study that was conducted choosing several Phoenix area fire departments and districts, evaluating the need for a fire apparatus maintenance program for the City of Peoria. Surveys were completed along with a review of literature obtained from the National Fire Academy resource learning center. The study was developed to help our department implement a program for fire department apparatus as well as completing a required research project for the National Fire Academy, Executive Officer Program. These recommendations will enhance the Peoria fire departments vehicles needs as well as provide safer more reliable apparatus to provide fire and emergency services to our citizens.

It is imperative that the Peoria fire department develops a program regarding apparatus repair and maintenance to limit the high amount of downtime our apparatus are currently experiencing. Research completed in this study should provide the department with the vital information concerning the best way to accomplish the goal of taking over the maintenance of our apparatus within our department. By comprising a balanced

approach that will include a preventive maintenance program, hiring a mechanic that specializes in the repair and maintenance of our apparatus.

The following recommendations are suggested:

1. That the Peoria fire department devise a clear and concise plan to take over the maintenance and repair of its' fire apparatus fleet.
2. The Peoria fire department recognizes the need to hire a mechanic that specializes in the repair and servicing of fire apparatus.
3. The Peoria fire department implement incremental increase in training for our fire mechanic to ensure that they stay current on today's equipment and tomorrow's technology.
4. That both the Peoria fire department administration and labor union work together to come up with acceptable plan that will benefit the organization and ensure firefighter safety.
5. The City of Peoria Fire Department develops a comprehensive preventive maintenance program to ensure the durability of the apparatus and prolong the use of its fleet.
6. That the Peoria Fire Department increase its percentage of front line pumpers to reserve pumpers to at least 50% which will decrease its ratio to 2.0 therefore increasing the availability for service of the fire department fleet.
7. That the Peoria Fire department lower the number of years that a pumper runs front line from twelve to ten years and increase the number of years of reserve status from three to five to meet the valley average and prolong the over all effectiveness of the fire apparatus fleet.

8. A regional fire service consortium consisting of fire departments and districts in the Phoenix metro area to be assembled to address and evaluate the need for a fire apparatus maintenance committee to discuss policies, procedures and common areas that affect fire apparatus maintenance programs.

In taking a closer look into the results of this study, specifically, the fire departments and districts that have hired their own mechanics, have been able to lower their apparatus downtime to a minimum of 4%. This is an encouraging sign to our fire department in that we would be moving in the right direction. By lowering our apparatus downtime we would be able to keep our rigs on the road and provide fire and emergency services in a timelier fashion, more economically and in a safer manner than we currently do now. A copy of my research project is available for your review upon request.

APPENDIX-F-Biography

Lawrence Rooney is a 17-year veteran of the Peoria Fire Department, Peoria, Arizona. He serves as the Deputy Fire Chief responsible for the Support Services division, after completing a four-year tour as the Operations Deputy Chief. He has served the fire department as a firefighter, engineer, engine and ladder captain, technical rescue technician, recruit training officer at the Phoenix regional fire academy and battalion chief as a shift commander. He has been responsible for both promotional testing and firefighter recruitment for the department for the last eleven years. In addition, he has served as an instructor of fire science courses at Glendale Community College. He earned a Associate Arts degree in 1980 in General Education from Orange Coast College, a Associate Science degree in 1982 in Fire Technology from Santa Ana College, and a Bachelors of Science degree in Public Safety Administration from Grand Canyon University in 1999. He is currently attending his second year of a Masters program in Educational Leadership at Northern Arizona University.