Replacing or Eliminating the Aerial Ladder Truck at Jefferson Township Fire Department

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CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

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ABSTRACT

Jefferson Township Fire Department (JTFD) needs to determine rather to replace or eliminate the aerial ladder truck. A descriptive study, using research questions based on standards, cost, and benefits along with procedures that used data such as run volume, location, equipment, and maintenance cost helped to quantify the needs for JTFD. Additionally, industrial standards of Insurance Service Office (ISO) and National Fire Protection Agency, in addition to a state wide Fire Department survey, evaluated standards compliance as it related to aerial ladder trucks. All the data collected was used to formulate a cost benefit analysis (CBA), which concluded that JTFD was not compliant with maintaining an aerial ladder truck as it relates to industrial standards. However, only 50% of the departments surveyed were compliant with all industrial standards. Furthermore, most of the departments who responded to the survey with the same population as JTFD did not currently have an aerial ladder truck. CBA results also found that if JTFD replaced the aerial ladder truck with an ISO compliant fire truck equipped as a service truck, there would be significant costs saving and no insurance cost increase to the community. Additionally, the service truck could provide for redundancy for the front line engine and automatic response could be used as redundancy to supplement aerial ladder services provided by a JTFD service truck at no additional cost. Results also found that by contracting from a three to a two fire truck system, it would benefit budget, staffing, and operations. The cost benefit matrix identified in the study should be used as a basis for a strategic plan at JTFD. Recommendations concluded that all fire departments would be best served if they would follow this cost benefit analysis for vehicle allocation and other fire department operations.

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INTRODUCTION

Statement of the Problem

The Jefferson Township Fire Department does not know the cost and or benefits to the community or department in regards to replacing or eliminating the aerial ladder truck.

Purpose of the Study

The purpose of this descriptive study is to develop a quantifiable measurement that includes industrial standards (NFPA, ISO), budget expenses (training, capital), operations(vehicles, response capabilities), and staffing (amount, where to assign) that can be used to compare and contrast the cost and or benefits of replacing or eliminating the aerial ladder truck at Jefferson Township Fire Department.

Research Questions

The following questions will be answered by this descriptive research:

1. What are the standards, if any, of fire departments operating an aerial ladder service?
2. What are the benefits, if any, to the budget, operations, and staffing for Jefferson Township Fire Department to continue operating an aerial ladder truck?
3. What are the cost, if any, as it relates to the budget, operations, and staffing for Jefferson Township Fire Department by eliminating the aerial ladder truck?

BACKGROUND AND SIGNIFICANCE

The history of fire apparatus in this country dates back to the late 1600s when hand pumpers were imported from England (Bennett, Brunacini, Coleman, et al…2003). One main stay as far back as 1679 has been the fire engine. The fire engine is considered the workhorse of the fire service and its main operational goal is to facilitate getting water on the fire (Bennett et al., 2003). A fire engine's main operational goal is accomplished by transporting firefighters, water, and tools to the scene in a timely manner. As explained by Bennett et al., (2003) the fire engine was first known as a triple-combination pumper because it could haul water, pump water, and carry hose. Since 1679, what other vehicles are needed to outfit a fire department is an ongoing debate for fire service leaders.

Diversity of vehicles used in the fire service has expanded since the fire engine was introduced. The diversity of fire vehicles relates to specialized function or operational task of the vehicle. Vehicles diversity that is now common place in the fire service includes rescues, grass fighters, aerial ladders, air port crash trucks, command vehicles, and EMS vehicles just to name a few(Jones & Bartlett, 2013). An example of vehicle diversity according to Anderson (2005) is a rescue vehicle, which is used to extricate victims from all sorts of hazardous situations. On the other hand, an aerial ladder vehicle is used to help reach victims and fire from the taller buildings (Bennett et al., 2003). In summary, Bennett el al., (2003) lays out that where the fire service started with one vehicle for every emergency, now there are specific vehicles assigned to each unique emergency. These changes to vehicles and operations have sparked a need for national standards, to create a guideline for which fire service leaders could refer to when assessing their budget, operations, and staffing capabilities and needs (Bennett et al., 2003).

The National Fire Protection Agency (NFPA) first met in May of 1897 and continues today with a goal of establishing uniformed national fire standards for local government agencies to adopt (Grant, 1996). For example, NFPA 1901 *titled Standard for Automotive Fire Apparatus2009 Edition* was

established to provide safety and effectiveness for fire apparatus. All fire apparatus used under emergency conditions are defined and specified in NFPA 1901. NFPA 1710 *titled Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments, 2010 Edition* provides a national standard for manpower and vehicle deployment for fire suppression operations. Local leaders are able to use NFPA 1901 and NFPA 1710 collectively when addressing their own staffing and operational needs.

A national organization that the State of Ohio uses to assess fire departments capacity, would be the Insurance Services Office (ISO), which uses a system of checks and balances to grade a fire department on their response capabilities (Bennett et al., 2003). The system used for checks and balances is called the Fire Suppression Rating Schedule (FSRS) (ISO, 2012). As written by Bennett et al., (2003) the FSRS has went through many changes since it was introduced in 1889, but still used by ISO as a matrix to quantify the response capabilities of fire departments. The quantifiable rating is known as the Public Protection Classification (PPC), and is used by insurance companies to underwrite policies in a community. Jefferson Township Fire Department (JTFD) was last given a PPC grade in 2011, *Public Protection Classification Summary Report* (2011), which quantified JTFD response capabilities as a four in the hydrant district and a nine/ ten in the non-hydrant district. Documents such as NFPA 1710, NFPA 1901, ISO FSRS, and ISO PPC will be included in the research project; the inclusion of these documents will define national and state standards in an effort to evaluate budget, staffing, and operational needs at JTFD as it relates to the inclusion or exclusion of an aerial ladder truck.

Although National organizations such as NFPA and ISO helps guide local departments in fire department capabilities, ultimately local agencies must decide the impact to the community, budget, operations, and staffing levels in their own fire departments (Bennett et al., 2003). Budgeting is a significant factor because vehicles are expensive to purchase and maintain. Budgets need to prepare for a

vehicle purchase years before it is acquired and allocate the funds to maintain the vehicle throughout its life cycle, a life cycle for a fire vehicle is considered 20 years (Bennett et al., 2003). Operational considerations are an important element when deciding on a vehicle for purchase because those vehicles are staffed by firefighters who are then trained on specific procedures related to the vehicle (Jones & Bartlett, 2013). According to Bennett et al., (2003), staffing is a major concern and involves operational and budgetary factors. ISO (2012) adds those non-staffed vehicles that do not respond within the first five minutes of the alarm are counted as a backup for the main vehicle. Therefore, a non-staffed vehicle has operational concerns and creates a discussion on the overall budgetary value of such vehicle. For this reason; budget, staffing levels, and operations are often collectively evaluated by local fire service leaders when deciding on vehicle allocation based on community needs (Bennett et al., 2003).

JTFD serves the townships of Jefferson and Fairfield located in Madison County. According to the Madison County website (2014), the total population of the two townships is over 10,000 residents for the year of 2013. Jefferson Township consists of a small village, industrial park with wide rise buildings, and rural farms. Fairfield Township is made up of rural farms, small villages, and a large seed company. The two townships account for a total run district of 79 square miles.

JTFD is a combination fire department with a current total roster of 41 firefighters. Current staffing levels are six firefighters a day and two chiefs on forty hour schedules. JTFD currently has ten vehicles; they include a tanker, ladder, engine, three EMS, three command, and a grass fighter. From 2012 through 2014, JTFD averaged approximately 1600 emergency runs a year with 17.7% (283) of which fire response by nature (Firehouse 7.15.32 [software] 1993). The balance of emergency runs during this three year period, were EMS/ rescue runs. JTFD receives and provides mutual aid to several neighboring departments; they are London City, Norwich Township, Pleasant Township, Pleasant Valley Fire District, and Prairie Township. London City, Norwich Township, and Prairie Township all currently

run an aerial ladder truck; however London is the only fire department that has an aerial ladder truck assigned to JTFD's first alarm fire assignments.

JTFD incorporates in its vehicle staffing what the fire industry calls cross-manning As explained by Giraud (2001), cross-manning is where two or more firefighters are assigned to multiple vehicles and respond to an incident with a vehicle considered appropriate for such emergency response. Cross-manning or cross-staffing will have a bearing on readiness of a vehicle due to the firefighters being tied up on an emergency response and a separate response is dispatched with no additional staffing available to respond. According to JTFD Suggested Operational Guideline (SOG) (2014), the staffing assignment for a residential fire is six firefighters on the engine in the hydrant district and five on the engine and one on the tanker in the non-hydrant district. NFPA 1710 (2009) states four firefighters shall respond on an engine to a report of a residential fire. JTFD SOG (2014) is compliant with NFPA 1710 (2009) when responding to report of a residential fire. However, the commercial fire response suggested in JTFD SOG (2014) is not compliant with NFPA 1710 (2009) because JTFD SOG (2014) suggests that three firefighters respond on both the engine and the ladder. Therefore, staffing and operations concerns to national standards is a problem that this applied research project can quantify by comparing and contrasting staffing and operations to budget capabilities. Put simply, JTFD needs to know the cost benefit analysis of replacing or eliminating the aerial ladder truck.

The applied research project is of more immediate concern because JTFD has come to a point in time when they need to research replacing or eliminating an aerial ladder truck. The township of Jefferson is governed by three township trustees. The trustees have the ultimate authority and responsibility to make all purchasing decisions. However, the trustees have agreed to allow this applied research project to become part of their overall research into replacing or eliminating the aerial ladder truck. The aerial ladder truck in question is a 1993 Sutphen front mount 75 foot stick ladder truck

(Ladder 251). Ladder 251 is now 21 years old, and as Bennett et al. (2003) points out, the normal life expectancy is 20 years for fire trucks. Ladder 251 continues to have maintenance issues. Over the past 21 years, Ladder 251 has had long periods of time where it has been out of service. The applied research project will not be able to quantify the amount of time that the aerial ladder truck has been out of service because that was not recorded in the fire department records. However, given the time period that is examined in the applied research (2008-2014), a daily cost of maintenance has been quantified for the vehicles at JTFD (See Appendix 1) (Firehouse 7.15.32 [software], 1993). For example, the daily cost of maintenance for the aerial ladder truck is $23.30/day (Firehouse 7.15.32 [software], 1993). For the purpose of comparing and contrasting, the daily cost of the engine during the same period was $13.18/day (Firehouse 7.15.32 [software], 1993). Recent examples of maintenance issues are in November and December 2014, Ladder 251 was out of service for a week each month. In November 2014, Ladder 251 had a fuel leak that resulted in the ladder being out of service seven days and costing $539.50 to repair (Firehouse 7.15.32 [software], 1993). According to Firehouse 7.15.32 [software] (1993), Ladder 251 was again out of service for six days for brake issues and cost the township $803.67. Regular maintenance and updating L-251 has been a means of malcontent between the chiefs and trustees for the past ten years. It is generally accepted by higher administration personnel and members of the board of trustees that increased maintenance cost over the past 10 years have limited the ability to buy needed equipment and to maintain competitive compensation to personnel.

In 1992, it was decided that the JTFD needed to replace a fire truck from 1972. It was a tele-squirt fire truck. A tele-squirt is a fire truck that has a pump, hose, water, and an elevated master stream device on an articulating boom. The leaders at the time decided to replace the tele-squirt with an aerial ladder truck that had a 75 foot straight stick ladder for the cost of $343,812.00. The basis for this purchasing decision was the possible industrial park development within the village of West Jefferson. Over the past

fifteen years, the industrial park has become a reality. There has been eight wide rise distribution centers built and more are scheduled to come in the future. However, all except one building is currently receiving fifteen or thirty year tax abatement. A tax abatement is an agreement between a company and a local government where as the company doesn't pay a portion of their tax responsibilities in exchange for job creation (Byrnes, Marvel, & Sridhar, 1999). The tax abatements for the industrial park have not allowed for an increase in funding for the fire department. More specifically, the current tax abatements for the industrial park, accounts for more than $600,000.00/year (D. Duffey, personal communication, April 30, 2015). The current leaders will compare and contrast the data within this applied research project to review past decisions and make a comprehensive informed decision going forward. Decisions such as apparatus purchasing are major responsibilities of leaders because they represent a sizable 20 year investment of a community's fund (Bennett et al., 2003).

The applied research project evaluates a seven year period from 2008-2014. The reason for basing the research on seven years is due to the record keeping at JTFD the years prior to 2008. The record keeping was not as substantial as it has been since 2008 and the data would not be as reliable. The research project will define the amount of emergency runs that L-251 was involved with. Also, the research project will define the maintenance cost incurred during the research time period. The research will compare and contrast the way that the three decision making factors of budget, staffing levels, and operations influence on the results of the study's three research questions, based on the purpose statement, to answer the problem of purchasing or eliminating Ladder 251. To help identify industrial standards, the applied research project will create, distribute, and compile the data from a survey (See Appendix 2). The data collected through the survey (See Appendix 2) will be used to compare and contrast JTFD to other fire departments that currently have an aerial ladder truck.

As described earlier, the purpose of this descriptive study is to identify state and national standards of aerial ladder service, along with developing a quantifiable measurement that can be used to compare and contrast the benefits and/or consequences of continuing or eliminating an aerial ladder truck at JTFD. The research project will identify industrial standards for aerial ladder vehicles design, staffing, and operations, which will allow JTFD to evaluate how compliant JTFD is with those standards. Along with standards, by identifying cost versus benefits, JTFD will be able to make an informed comprehensive decision on determining the impact to the department and community, of replacing or eliminating the aerial ladder truck. The completion of the research project will create a framework for the department to use not only now, but also in the future, with significant decisions on budget, staffing levels, and operations.

LITERATURE REVIEW

There are 1,143 fire departments in the state of Ohio, all of which may have different methods of how to equip their particular department with vehicles (FEMA, 2012). There is not an all encompassing directive on vehicle allocation for fire departments: however, there are several national standards such as the National Fire Protection Agency (NFPA) that local leaders can reference to formulate a vehicle allocation system. The NFPA has gone through many changes since it was first developed in 1893 (Grant, 1996). The goal of the creators of the NFPA was to reduce how fire and other hazards affected the quality of life on the general public (Bennett, Brunacini, Coleman, et al…2003). Bennett, et al., (2003) explains that to accomplish the goals of the creators, NFPA is constantly evolving and creating codes, standards, and education for the fire service. For example, NFPA 1710 (2009) and NFPA 1901 (2013) starts to lay the ground work for vehicle allocation within a fire department. NFPA 1710 (2009) provides the standards for response in a particular vehicle. Where-as NFPA 1710 (2009) focuses on the overall response of a vehicle, NFPA 1901 (2009) is a collection of standards that deal with the individual vehicle itself. Each NFPA standard is referenced by a number that corresponds with the section within NFPA that the standard is located NFPA (NFPA, 2014). The year that is associated with each NFPA standard is an indication of the year in which the standard was created or last updated by NFPA (NFPA, 2014).

Standards

NFPA 1710 (2009) creates the framework for staffing and responding to fires. According to NFPA 1710 (2009), staffing is defined as the amount of firefighters on a particular vehicle. NFPA 1710 (2009) also directs what type of vehicle firefighters should use to arrive at the fires. For instance, NFPA 1710 (2009), recommends that an engine company shall consist of four firefighters and arrive at a fire within 240 seconds (4 Minutes) on 90% of incidents. Furthermore, NFPA 1710 (2009), recommends that

an aerial ladder vehicle shall consist of four additional firefighters and arrive in 480 seconds (8 minutes) on 90% of incidents. To help define the differences between engine and ladder companies, Mahoney, Rickman, Wallace (2008) explain that an engine company is defined as a vehicle that has hose, pump, and water. Mahoney, Rickman, Wallace (2008) explains that an engine company's basic objective is to locate, confine, and extinguish fires. In contrast, an aerial ladder company is a fire vehicle that has an elevated system on it such as a boom, straight ladder, or platform ladder. Aerial ladder trucks are normally provided by larger fire departments and are tasked with certain operations such as laddering, overhaul, controlling utilities, ventilation, forcible entry, and rescue (Mahoney, Rickman, Wallace 2008). These functions are important to safety and survival at a fire scene, but can be accomplished by a later arriving engine company, if a ladder company is not available (Mahoney, Rickman, Wallace 2008).

Where as staffing, deployment, and function are illustrated in NFPA 1710 (2009), NFPA 1901 (2013) defines the individual vehicle. Each vehicle used in the fire service can be referenced in NFPA 1901 (2013). For instance, NFPA 1901 (2013) addresses several general requirements for design, manufacturing, and equipping engine and aerial ladder trucks. NFPA 1901 (2013) have additional recommendations added to the standard for vehicle development that affect vehicles created after January 1, 2009. Examples of the new standards are on board vehicle data recorders (VDR), a system to address vehicle roll over stability, and a diesel particulate filter, just to name a few (NFPA 1901, 2013). NFPA also includes other national standards and recommendations within its own standards. As an example of this inclusion, NFPA 1901 (2013), includes national standards for vehicles that were originated within the Environmental Protection Agency (EPA). The EPA focuses on mainly emissions systems and it has been noted that, in 2010, the EPA estimated that an additional $5,000.00 to $15,000.00 would need to be added to the price of a vehicle to be compliant with the new EPA standards for vehicles (Peters, 2010). When local leaders write specifications, purchase, and equip an engine or aerial ladder truck, they can

reference standards such as NFPA 1901 (2013) to ensure that the design and equipment meets what the fire industry has accepted as a standard and that they can afford such a purchase for their department.

Similar to NFPA, Insurance Services Office, Inc. (ISO) creates national standards that can be referenced by local leaders when formulating a vehicle allocation system. ISO is a nationwide for profit organization that provides services to the insurance industry in 44 states (Bennett, et al., 2003). Ohio is included in the 44 states that are serviced by ISO (ISO, 1980).The suggestions and standards created in ISO (1980) have not changed but the verbiage and writing format has evolved into different versions over the years. The version used for the research project is ISO (2012). ISO covers a broad spectrum of insurance standards separated by divisions within the organization; the fire service is accounted for in one of ISO's divisions (Bennett, et al., 2003). Standards that are referenced by ISO and important to the fire service include property surveys and public protection surveys (ISO, 2012). According to Bennett et al., (2003), ISO was formed in 1971 and distributed what is known today as the *Fire Suppression Rating Schedule* (FSRS) in 1980. The FSRS is a matrix used by ISO to quantify the response capabilities of a fire department (ISO, 2012). Once a fire department has its response capability quantified, the fire department is given a number that represents its *Public Protection Classification* (PPC) (ISO, 2012). The rating scale for the PPC is from one through ten, with one being the best rating achievable, thus giving that area the lowest insurance premiums (Bennett et al., 2003). The advantage to having a quantifiable number such as the PPC (ISO, 2012), is that the PPC number gives a fire department the ability to compare and contrast changes that may affect their PPC (ISO, 2012). As explained by Bennett et al., (2003), fire departments need to compare and contrast things such as staffing, vehicles, and operations to ensure that the decrease in the PPC (ISO, 2012) will actually result in a tangible insurance savings on premiums for the tax payer. According to an ISO Mitigation Specialist (personal communication, November 29, 2014) during a phone interview, there would be a decrease in

the current PPC as reported in ISO (2011). The decrease to the PPC would go from a four in the village of West Jefferson to a five. To measure the impact the change in PPC would have on insurance rates, an underwriter for an insurance company (Motorist Mutual) that writes policies in the village of West Jefferson was contacted. Gail Williams (personal communication, November 29, 2014), an underwriter with Motorist Mutual, explained how the insurance industry uses a range of the ISO PPC as opposed to one certain number. For example, Motorist Mutual has a scale that drives the insurance premiums. Motorist Mutual uses the range of ISO PPC 1-2, 3-6, and over seven to determine insurance rates. With that said, changing from a PPC four to PPC five would not have an effect on insurance premiums within the village of West Jefferson.

In reference to fire department vehicle allocation, ISO guides local leaders on things such as staffing, purchasing, and equipping vehicles (ISO, 2012). ISO has a mathematical matrix to determine the amount of water needed for municipal fire protection (ISO, 2005). The mathematical matrix includes several factors such as: gallons per minute, occupancy, construction type, exposures and the distance between structures (ISO, 2005). For example, ISO (2012) states that if the fire department responds to an area that has five buildings with the required fire flow of 3,500gpm, then an aerial ladder truck shall be added to the first alarm assignment. In contrast, if there are less than five buildings with a required fire flow on 3,500/gpm, then a service truck is needed instead of a ladder company. A service truck is defined as an engine that carries the equipment of a ladder truck without having the aerial device atop the vehicle (ISO, 2012). Where an aerial ladder truck comes from is often an on-going debate since ISO accepts, with certain conditions, that mutual aid and automatic response can account for a department's requirement for an aerial ladder truck. Chief Robert Bates of Madison Township Fire Department explains that without having automatic-response partners, his department would not be able to provide the minimum national standard response of vehicles and personnel to a fire scene (Sullivan & Rinehart,

2014). Automatic-response partner is defined as two departments have a written agreement that the two departments will respond to each others fire incidents upon first dispatch (Bennett et al., 2003). As listed on the United States Fire Administration (USFA) website, a mutual aid agreement declares that fire departments will respond to an emergency within the other fire departments district upon being requested. Mutual aid and automatic-response agreements should include items such as: description of services to be provided, liability coverage, and circumstances under which resources can be refused (Bennett et al., 2003). ISO (2012) states that if a fire department supplements with mutual aid or automatic-response within their first alarm assignment, the fire department should have quarterly half day multiple company drills with those fire departments. Additional operational tasks to complete when supplementing with mutual aid or automatic-response, according to Sparks (1989), are: body of agreement between agencies, dispatch procedures, and a response map. Although mutual aid and automatic-response can be complex, by agreeing to respond together, departments can make greater use of their pooled resources (Bennett et al., 2003). This will influence decisions and add flexibility to budgets, operations, and staffing.

Needs Assessment

National standards become only a starting point for developing a vehicle allocation system. As explained by Bennett et al., (2003), one of the most important steps of the process is to complete a needs assessment. According to Bennett et al., (2003), a needs assessment will identify things such as primary function, secondary functions, expected personnel needed, and also how much funding is needed for the vehicle being debated. Vehicles that have primary and secondary functions are considered to be multi-purpose vehicles. According to VanSolkema (2000) an example of a multi-purpose vehicle is the quint fire truck, defined by VanSolkema (2000) as a fire vehicle that has both engine and aerial ladder features, such as a pump, water, hose, ground ladders, and an aerial devise. There has been research done

in the broad area of vehicle allocation. Upham (2007) concluded that there were two significant ways to determine if a vehicle needs to be replaced. The first way to determine if a vehicle needs replaced is the age of the vehicle, while the second is based on the mileage of the vehicle. In contrast, Anderson (1998), stated that age should not be a sole factor for replacement, but the work load and preventive maintenance of the vehicle should dictate rather it be replaced or not. For JTFD or any fire department to follow Bennett et al., (2003) recommendations for a needs assessment, departments must consider budgeting, staffing, and operations (Bennett et al., 2003).

Budget

According to Bennett et al., (2003), budgeting is the broadest and most complex of the three important considerations of fire department management. Budgets create the foundation that drives staffing and operational decisions (Bennett et al., 2003). Budgets are dependent on the revenue that is collected by the local government agency. As William, R. & Shadunsky, Y., (2013) explain there are several sources from which local governments can collect revenue. However, the four main sources of revenue for the local governments are intergovernmental transfers, sales and gross receipts taxes, individual or corporate income taxes, and property tax (William & Shadunsky, 2013). Property tax is the main source of revenue for JTFD.

Intergovernmental transfers are transfers of funds from one government body to another government body (William & Shadunsky, 2013). For example, the state of Ohio government collects an estate tax, after which the state of Ohio would distribute these funds to local governments (Siegel, Rowland, & Johnson 2011). Problems arise, however, when local governments use funds received from a governmental transfer as a permanent part of the budget, as opposed to, a supplement. When this is the case the local government has become out of balance with budgeting and funds received (Bennett et al., 2003). As explained by Siegel et al., (2011), the out of balance budgeting happened for some local

governments in 2011. In March of 2011, governor Kasich of Ohio released the two year state of Ohio budget (Siegel et al., 2011). Siegel et al., (2011) continues to explain, that included in the budget was a 50% cut to the estate tax that had been collected by the state and distributed to the local governments. Some local government leaders went public with the difficulty that the reduction in governmental transfer would cause. As an example, Siegel et al., (2011) reported that Mayor Chuck Taylor of Circleville, Ohio explained that the reduction of governmental transfer would be devastating and mostly affect public safety within the community. Ohio Office of Budget and Management & Ohio Department of Taxation (2015) reported that the reduction in the intergovernmental transfer of tangible personnel property tax (TTP) accounted for $1.65 billion to local governments and school districts. The TTP tax reduction was actually passed into law in the year 2005. However, there was a hold harmless clause from 2006-2010 where local governments and school districts would continue to receive the funds from the state. In summary, Ohio AFL-CIO president Tim Burga declared that local governments will have no choice but to cut services or raise taxes to off-set the reduction of intergovernmental transfer from state government to the local governments (Siegel et al., 2011). In budget creation, funding options must be considered not only on the amount that is collected, but as Bennett et al., (2003) teaches us, the long term reliability of the funding source. JTFD is not unlike other fire departments and experienced a reduction in revenue received from the state of Ohio. However, JTFD was not currently using the funding as the primary source of revenue at the time of the reduction. The reduction has accounted for less than 5% of the total budget.

Some local government's budgets are funded by sales and gross receipts taxes (Bland, 2013). Sales taxes are known as consumption taxes that are levied on all general sales of goods and services (Bland, 2013). As explained by Bland (2013), an example of gross receipt taxes for local governments, are funds that are raised by selling government owned real estate or property such as

vehicles. In the state of Ohio, the sales tax is currently 5.75% of all sales, leases, rental agreements, and sales of selected services, however, counties and regional transit authorities can levy additional tax for their own purposes (Ohio Department of Taxation, 2014). Sales tax would be acceptable to Bennett et al., (2003) as a reliable source of funding because the source can be quantified and projected over a period of time. The opposite would be said for gross receipt tax collection; because gross receipt tax collection would be completely reliant on the amount of real estate and/ or property transactions available for given budget cycle (Bennett et al., 2003). Madison County, where JTFD is located, currently collects an additional 1.25% sales tax (total of 7%), but no portion of the revenue is transferred to JTFD.

Income based taxes are an additional funding source for local governments, such as individual and corporate income taxes (Bland, 2013). Williams and Shadunsky (2013) point out that all levels of government are potentially funded by income based tax collection. Income taxes include taxes levied against wages, interest earned, dividends, pensions, and so forth (Bland, 2013). Corporate income taxes are taxes that are levied against corporations reported profits for a given year (Bland, 2013). However, in Ohio, less than one percent of state and local tax revenue comes from collecting corporate taxes (Malm & Kent, 2013). JTFD has been investigating the possibility of imposing an individual income tax within the business park that was previously discussed in this applied research project. The problem arose, however, when the village of West Jefferson was opposed to the idea and would not participate in exploring this funding option. As a result, JTFD does not currently collect any income based taxes.

Local and state governments in every state impose property taxes that become a source that is a reliable and stable form of funding for budget creation (Williams & Shadunsky, 2013). Property taxes are based on the assessed value of the actual property and any structure that is located on that property (Bland, 2013). Property tax rates are based on a mathematical formula that uses millage (Bland,

2013). Millage is multiplied times a percentage of that properties value and the total tax responsibility is for the owner is determined (Bland, 2013). JTFD relies mainly on property taxes to fund the fire department. Property tax has been a stable and reliable form of funding for JTFD.

As discussed earlier, JTFD's main source of revenue is property tax. For JTFD, property tax accounts for 88.66% ($2,095,052.00) of a 2.3 million dollar budget. Property tax has been a stable and reliable source of funding for JTFD budgets as described by Bennett et al., (2003). JTFD is currently operating under an 11 mil levy, which is multiplied times per $100,000 of property value. Property tax levies can be term levies or permanent levies. Term levies would expire after a set amount of time such as ten years. JTFD is currently operating under a permanent fire levy. The current fire levy for JTFD is a permanent levy which means that it does not expire. A drawback for a permanent levy is that as property values increase or new construction is developed, the value of the levy does not increase. However, permanent levies do offer that stability and reliability that Bennett et al. (2003) suggest.

While taxes are the main source of funding for JTFD it is not the only source. JTFD also collects funds from EMS billing, contractual agreements, intergovernmental transfers, and grants. Hatley (2007) describes that EMS billing is supplementing EMS services as an additional source funding. Over the last three years, on average, JTFD collects $245,956.67 annually from EMS billing. In the state of Ohio, township governments must use the funds collected through EMS billing on EMS related expenses only (Reasonable Charges for use of Ambulance or Emergency Medical Services, 2011). Due to these spending restrictions, the EMS fund has not been routinely used for regular budgetary items at JTFD. Instead, JTFD generally uses EMS billing as a way to purchase large capital expenses such as new EMS vehicles.

Similar to EMS billing, JTFD supplements its main source of revenue with a contract agreement with Fairfield Township for fire and EMS services. Fairfield Township collects a property tax from its

residents and pays JTFD $125,000 annually. This amount accounts for less than 6% of the total budget. The three year average of emergency runs taken into Fairfield Township is 128, which accounts for 8% of the total runs annually. The agreement between Fairfield Township and JTFD was last updated in May of 2014. Even though this is a relatively small portion of the budget, it is considered a reliable and stable form of funding, according to Bennett et al., (2003).

As mentioned earlier, JTFD, like many other local governments, has seen a reduction in intergovernmental transfers since 2011. However, JTFD still receives some funding from intergovernmental transfer which accounts for less than 3% (67,602.00) of the budget. The funding received from intergovernmental transfers is routinely used to supplement expenses. The funds received from intergovernmental transfers were not used as a main source of funding for the budget, which has allowed JTFD to absorb these reductions without affecting operations and/or staffing. In a letter to the editor of the Columbus Dispatch (2014), Delaware City manager Tom Homan, points out that the state of Ohio has added ten million dollars into a fund for distribution to townships throughout Ohio. The matrix for distribution was not known at time of this applied research paper. If JTFD receives funding from the state out of the ten million dollar fund, JTFD will have discretionary funds for a one time purchase.

JTFD has received funding from grants that has been used for things such as training, radio equipment, SCBA's, and a bay floor exhaust system. As an example, JTFD received a grant for approximately $18,000, in order to send two individuals to the Ohio Executive Officer training. Without the funding from the grant, it would not have been feasible to send the two individuals to the Ohio Executive Officer training. Grants can help supplement expenses, but shouldn't be counted on as a main source of funding, due to the usually one time installment into the fire departments funding. In his news paper article on December 7, 2014, Bauer (2014) discusses the negative effect that the Urbana Fire Department is experiencing because they used grant funding as part of their primary funding strategy. As

he explains, the Urbana Fire Department had to lay off two firefighters after a federal grant had expired. Funding being the main driver for staffing and operations, it is the responsibility of local leaders not to allow any of these factors to get out of balance (Bennett et al., 2003). JTFD being primarily funded by property tax (88.66%), allows for the stability and reliability that Bennett et al., (2003) explains it is important to ensure funding for operations in the future. However, it is also important to explore other means of funding to supplement expenses that may arise over time; as evident in the negative experience that the Urbana Fire Department had by allowing temporary funding to become the main source of funding for staffing of two firefighters.

Staffing

Jones & Bartlett (2013) asserts that fire departments must have a sufficient amount of trained firefighters to respond to all emergencies. Therefore, staffing concerns have the potential to affect all fire departments, one of many reasons national standards were created to help local leaders make staffing decisions. For example, NFPA 1710 (2010), gives fire departments a response model for fire emergencies, where-as four firefighters shall be on the first arriving engine company. However, staffing comes at a cost. According to Bennett et al., (2003) associated costs with staffing include: pay, health care, pension, and training just to name a few. Therefore, local leaders must weigh staffing needs with the available funding in determining how the fire department will respond to incidents. The relationship between funding and staffing is one of the main reasons why Bennett et al. (2003) believes funding is the foundation for staffing and operations decisions. To complicate the decision making process, Mahoney, Rickman, and Wallace (2008) suggest that operational goals must match up with the staffing decisions in order to accomplish such goals, while at the same time, becoming compliant with national standards.

Operations

Fire department operations encompass everything from activities around the fire station, prevention, and emergency runs (Bennett et al., 2003). As stated by Bennett et al., (2003), the actual time spent on emergencies is actually a lot less time compared to the time spent doing other things. However, emergency operation capabilities are what fire departments consider when developing their operational goals and expectations such as JTFD Suggested Operation Guidelines (SOG), (2014). SOG's are created to give guidelines to the actions expected for a given emergency situation. Operations at a fire are known as fire ground operations as explained by Norman (2012), these fire ground operations are normally assigned to vehicle types that are arriving at the fire scene. Norman (2012) continues to lay out that engines are normally responsible for suppression and aerial ladder trucks would be responsible for rescue, utilities, and ventilation. Local leaders need to lay out their operations, in an effort to be compliant with national standards, depending on budgets and staffing capabilities (Mahoney, Rickman, Wallace, 2008). To reiterate what Bennett et al., (2003) stated: budgets, staffing, and operations must be in balance with each other when creating a community fire defense plan.

A community fire defense plan or organization strategic planning is overall means to which the organization will deliver the safety services that the community expects to be delivered (Bennett et al., 2003). According to Wallace (2006), the overall strategic plan should include three strategic goals; life safety, incident stabilization, and property conversation. National standards such as NFPA 1710 (2009) and ISO (2012) will help local leaders compare and contrast methods to achieve the three strategic goals outlined by Wallace (2006). Bennett et al., (2003) teaches us the strategic plan also needs to include considerations for budget, staffing, and operations. The goal of the fire chief is to remain compliant with national standards and meet the objectives included in the strategic plan, while operating within the available budget and staffing levels (Bennett et al., 2003).

One problem with strategic planning that fire chiefs can experience is that the fire chiefs are operating within a strategic plan that was put into effect prior to the fire chiefs' arrival (Bennett et al., 2003). Strategic planning needs to be dynamic in the sense that the strategic plan can adapt and change as the fire department and community change (Bennett et al., 2003; Wallace, 2006). Strategic planning that has not remained dynamic is evident at JTFD. The fact that the vehicle allocation system is not defined within some long term planning can be a result of an outdated or non-existent strategic plan. The leaders at JTFD have been operating under decisions that were made prior to the current leaders being in the positions that they currently are in. JTFD does not currently have a documented strategic plan. The lack of a strategic plan has led to indecision with things such as vehicle allocation. Since JTFD does not have a documented strategic plan, JTFD is unable to have "proactive futuring", a term used by Wallace (2006). According to Wallace (2006), proactive futuring is when a fire department can create the future as opposed to reacting to the future. A fire department needs to identify possible future changes within the community and department, with national standards in mind, and should be able to manage budget, staffing, and operational concerns to deal with those demands (Bennett et al., 2003; Wallace, 2003). An example of future changes to the community, that would affect strategic planning, would include changes to construction and the furnishings within the structures (Kerber, 2012). More specifically, Kerber (2012) explains that the increase of open spaces and synthetic fuel loads have increased the chance for the fire to be bigger and hotter upon firefighters arrival to the scene. To combat the changes in the environment and the way the fire behaves, Kerber (2013) suggests that the fire department control the ventilation to the fire and put large amounts of water on the fire quickly. The modern fire environment needs to be considered when creating or modifying the community fire defense plan as part of strategic planning. A fire engines primary function is to transport personnel, water, and a pump to the fire scene for initial fire attack (Bennett et al., 2003). As Bennett et al., (2003) explains when it comes to vehicle allocation, the first step

is to identify the needs based on the community. Along with community needs, Kerber (2013) points out that the science of fire fighting is also an important consideration when doing strategic planning. Kerber's (2013) assumptions of changing fire environments suggest the need for more water to control the fast growing fires that the fire service faces today. To effectively match the community make up with vehicle allocation, as pointed out by Bennett et al. (2003), fire department leaders must take the current fire science into consideration when deciding what type of vehicles to equip their fire departments with.

JTFD does not currently have a matrix in place to know the cost and or benefit of replacing or eliminating the aerial ladder truck. JTFD needs to develop a quantifiable measurement that can be used to make a comprehensive decision on the aerial ladder truck. NFPA 1901 (2009) provides the design, manufacturing, and equipping standards. In addition, NFPA 1710 (2010) illustrates the framework for staffing and response standards to fires. ISO (2012) takes fire departments response capabilities and uses a mathematical equation to quantify their response capability; however, the quantification does not provide a clear matrix for fire departments to stay in balance with their own budget, staffing, and operations (Bennett et al., 2013). Furthermore, the quantification provided by ISO (2012), does not lend a framework for a decision on replacing or eliminating the aerial ladder truck at JTFD.

The data collected within the applied research project used individually, does not provide the answers to the problem at JTFD. However, when the data that will be collected in this applied research project is used collectively, JTFD will be able to answer the research questions included in the applied research project. Furthermore, JTFD will have the framework for future vehicle allocation. In addition, JTFD will have a model for making decisions that has a direct affect on budget, staffing, and operations.

PROCEDURES

The objective of the applied research project is to develop a quantifiable measurement through a cost-benefit analysis of replacing or eliminating the aerial ladder truck at Jefferson Township Fire Department (JTFD). To accomplish the procedures, the applied research project will identify, compare, and contrast national standards to the cost benefit of replacing or eliminating the aerial ladder truck, based on variables of budget, staffing, and operations.

Research Design and Approach

The problem statement and corresponding literature review, guided the development of the research questions that focused on evaluating the need for an aerial ladder truck at JTFD. The research design is a quantitative, non-experimental design, using a survey (See Appendix 2) along with historical data in which data is manipulated to address the research questions. The research questions will be compared and contrasted for the purpose of the applied research project. The purpose is to develop a quantifiable measurement that includes industrial standards, budget expenses, operations, and staffing that can be used to create a complete cost benefit analysis of replacing or eliminating the aerial ladder truck at JTFD.

Data Collection and Analysis

Data for this applied research project will come from several sources. Data for issues related to ISO will be gathered from three documents ISO (2005), ISO (2010), and ISO (2012). Along with the documents, a phone interview will be conducted with an ISO mitigation specialist. Related to ISO, an insurance underwriter for the area will also be phone interviewed for the purpose of collecting data on insurance rates. NFPA codes 1710 and 1901 will be accessed via the fire department library. Statistical data that relates to budget, staffing, and operations will be gathered from the fire department information management system data base (Firehouse (7.15.32) [Software] (1993) and also a survey (See Appendix

2) that will be distributed to fire departments. Upon the completion of data collection, the data will be analyzed via procedure 1.1 through procedure 5.1 as follows.

Statistical Analysis of Research Questions

Question 1

What are the standards, if any, of fire departments operating an aerial ladder service?

Procedure 1.1

Procedure 1.1 evaluates research question one by comparing and contrasting current and proposed JTFD management system data to ISO (2005), (2011), (2012) and mitigation specialist interview as it relates to JTFD operating an aerial ladder service.

Procedure 1.2

Procedure 1.2 evaluates research question one by comparing and contrasting current and proposed JTFD management system data to NFPA 1710 (2010) and NFPA 1901 (2009) as it relates to JTFD operating an aerial ladder service.

Question 2

What are the benefits, if any, to the budget, operations, and staffing for JTFD to continue operating an aerial ladder truck?

Procedure 2.1

Procedure 2.1 evaluates research question two by evaluating the benefits from the JTFD management system data, more specifically, ladder emergency run activity as it relates to JTFD budget, in continuing to maintain an aerial ladder service.

Procedure 2.2

Procedure 2.2 evaluates research question two by evaluating the benefits from the JTFD management system data, more specifically, ladder emergency run activity as it relates to JTFD operations, in continuing to maintain an aerial ladder service.

Procedure 2.3

Procedure 2.3 evaluates research question two by evaluating the benefits from the JTFD management system data, more specifically, ladder emergency run activity as it relates to JTFD staffing, in continuing to maintain an aerial ladder service.

Question 3

What are the cost, if any, as it relates to the budget, operations, and staffing for JTFD by eliminating the aerial ladder truck?

Procedure 3.1

Procedure 3.1 evaluates research question three by evaluating the cost from the JTFD management system data, more specifically, ladder emergency run activity as it relates to JTFD budget, in continuing to maintain an aerial ladder service.

Procedure 3.2

Procedure 3.2 evaluates research question three by evaluating the cost from the JTFD management system data, more specifically, ladder emergency run activity as it relates to JTFD operations, in continuing to maintain an aerial ladder service.

Procedure 3.3

Procedure 3.3 evaluates research question three by evaluating the cost from the JTFD management system data, more specifically, ladder emergency run activity as it relates to JTFD staffing, in continuing to maintain an aerial ladder service.

Procedure 4

Procedure 4 will allow for the cross comparing and contrasting of data from research question to research question to better answer the applied research project as it relates to budget, staffing, and operations.

Procedure 4.1

Procedure 4.1 compares and contrasts the standards from research question 1 to findings of research question 2 and 3 as it relates to budget, staffing, and operations.

Procedure 5

Procedure 5.1

Procedure 5.1 will develop and use a survey (See Appendix 2) to gather data from participating fire departments on the purchase, maintenance, staffing, and operations of an aerial ladder truck. The data will be used to compare and contrast what other fire departments are doing as it relates to budget, staffing, and operations.

Limitations of the Study

A limitation to this applied research project is that the data for comparing and contrasting was collected during a seven year span as opposed to the life span of the vehicle. The fact that the records for expenses and runs were not available prior to the year 2008 diminishes the quantifiable nature of the data for the research project. In conjunction with the lack of record keeping prior to 2008, the amount of time the aerial ladder truck has been out of service was also not recorded by JTFD.

Ladder 251 is used as the back-up for Engine 251 when it is out of service. However, JTFD does not record the amount of time a vehicle is out of service. Therefore, it is not possible to quantify how many days Ladder 251 was used as a back-up for Engine 251.

Staffing levels for JTFD is currently six firefighters 24 hours a day, seven days a week. When staffing levels drop below regular staffing levels, operational changes take place. Such as, staffing Ladder 251 and how we respond to emergencies. There is not a current report or a way to extract data from the JTFD management system data base (Firehouse (7.15.32) [Software] (1993), which would show how many days JTFD was under staffed.

Created in the Procedures section and reported in the Results section, the survey (See Appendix 2) was distributed to 185 fire departments in Ohio and 73 fire departments responded. Of the 73 respondents, not all the questions on each survey were answered by each respondent. This created a variance in the number of responses to each individual question.

RESULTS

Standards

Procedure 1.1

ISO (2005), (2011), and (2012) were compared and contrasted and certain determinations were made such as identifying the needed fire flow for JTFD first alarm district as 2,500/gpm based on the formula found in ISO (2005). Based on 2,500/gpm fire flow needed, ISO (2012) states that two engine companies are needed for first alarm district responses. In addition, ISO (2012) states that due to the amount of buildings requiring 3,500/gpm a ladder company is not required. However, ISO (2012) states that a service company is required for the fire flow needed. ISO (2011) states that zero ladder companies are needed and also, zero additional ladders are needed because 10% or less of the responses outside the district result in a reduction of the ladder companies left in the district to 50% or less of the normal strength level. ISO (2011) identified that JTFD scored 2.68 out of a possible five for ladder service credit and .48 out of a possible one for a service truck. ISO mitigation specialist (personal communication, November 29, 2014) stated that if the ladder was removed for the fleet at JTFD, the FSRS reported in ISO (2011) would be reduced from four to a five. Gail Williams (personal communication, November 29, 2014) states that the premiums on insurance policies in the West Jefferson area would not be affected with the reduction in the ISO FSRS score.

Procedure 1.2

To complete procedure 1.2 data was extracted from the JTFD management system data base (Firehouse (7.15.32) [Software] (1993) which was used to compare the inventory of ladder 251 to what is recommended by NFPA 1901 (2009). The data displayed in Appendix 3 identifies the equipment that is compliant and non-compliant in the current way that ladder 251 is equipped.

Data was extracted from NFPA 1710 (2010) that identified national standards on response. NFPA 1710 (2010) recommends that engine companies shall have a minimum staffing level of four firefighters. In addition, NFPA 1710 (2010) stated that ladder companies shall consist of four firefighters also. The data collected from the JTFD management system data base (Firehouse (7.15.32) [Software] (1993) shows that the staffing level daily consist of six firefighters. According to SOG (2012), the standard response to residential fire emergency is six on the engine or five on engine and one on the tanker for the non-hydrant district. However, on commercial fire emergencies, three firefighters respond on both the engine and ladder. According to NFPA 1710 (2010), the first alarm engine company shall arrive within four minutes from dispatch to the first alarm district. Along with the engine company, a ladder company shall arrive within eight minutes (NFPA 1710, 2010). According to JTFD management system data base (Firehouse (7.15.32) [Software] (1993), JTFD had an engine arrive at fire emergencies within the suggested standard of four minutes, 44 out of 207 times (21%). Another area that was identified as a JTFD being non-compliant with NFPA 1710 (2010) is the training standards. NFPA 1710 (2010) states that a fire department shall have a training program and policies that ensure that the firefighters are capable to execute all responsibilities consistent with the departments organization and deployment model. Currently JTFD does not have any type of training standard for the firefighters.

Benefits to budget, operations, and staffing

Procedure 2.1

According to the JTFD management system data base (Firehouse (7.15.32) [Software] (1993), Ladder 251 took a total of 466 emergency runs during the research period (See Appendix 4, Figure 4.1). Of those 466 runs, Ladder 251 was cancelled 304 times (See Appendix 4, Figure 4.1). Of the 162 emergency runs that Ladder 251 actually arrived on the scene, 125 runs were in JTFD first alarm district (See Appendix 4, Figure 4.2).

Procedure 2.2

To identify benefits of continuing aerial ladder service at JTFD, statistical run data was accessed from the JTFD management system data base (Firehouse (7.15.32) [Software] (1993). During the seven years of the research period, Ladder 251 took 125 emergency runs located within the first alarm district. Two of the emergency runs were elevated rope rescue runs. Another benefit for operational purposes is the fact that Ladder 251 has been used as a back-up engine when the front line engine has been out of service. The JTFD management system data base (Firehouse (7.15.32) [Software] (1993) was unable to quantify the amount of time that ladder 251 was used as front line because that time is not recorded.

Procedure 2.3

Benefits of maintaining aerial ladder service as they relate to staffing include ways the ladder is currently being staffed. According to the Jefferson Township Fire Department (2014), the daily staffing level is six firefighters. That allows for three firefighters to respond on Ladder 251 and three firefighters on Engine 251 for commercial fire runs. Ladder 251 is crossed staffed with the medic crew. Lastly, a staffing benefit for Ladder 251 is its availability for off duty firefighters to respond to the station and staff it for runs. The time that Ladder 251 has been staffed by off duty personnel is also not recorded, therefore, unable to quantify in anyway.

Cost to budget, operations, and staffing

Procedure 3.1

According to the JTFD management system data base (Firehouse (7.15.32) [Software] (1993), emergency run data for Ladder 251 (See Appendix 4, Figure 4.1) was compared and contrasted to the maintenance cost to quantify the budgetary effect. The data showed that the maintenance cost for each emergency run Ladder 251 took during the research period equals $127.75. However, if only the emergency runs that Ladder 251 made it to the scene were used the cost is $367.47. Furthermore, if only the emergency runs inside JTFD first alarm district are used the cost is $476.24. Another way the data collected was compared and contrasted is with the creation of a daily cost for maintenance (See Appendix 1). The data identified the daily cost for Ladder 251 as $23.30/day. For Comparison, Engine 251 had a daily maintenance cost of $13.18/day.

Procedure 3.2

The JTFD management system data base (Firehouse (7.15.32) [Software] (1993) identified that Ladder 251 responded and arrived on 125 emergency runs within JTFD first alarm district (See Appendix 4, Figure 4.1). The total amount of runs taken by JTFD during that same period was 1,969 within JTFD's first alarm district (JTFD management system data base) (Firehouse (7.15.32) [Software] (1993). There are no SOG guidelines for responding to residential fire emergencies with Ladder 251 when JTFD is operating with maximum staffing levels (SOG, 2012). Along with the lack of SOG, there are no training guidelines for L-251 identified within the research project.

Procedure 3.3

When evaluating the cost of staffing for Ladder 251, certain variables were identified. The variables included the fire department not always being at full staffing on a given day. Full staffing for JTFD is identified as four full time and two part time firefighters that equals six on duty 24 hours a day (SOG, 2012). The lack of full staffing leads to Ladder 251 being out of service due to cross staffing system that is used. Furthermore, whenever the medic is on a run, it only leaves enough staffing for the front line engine to be staffed for emergency runs.

Cross comparing data from the results to the research question 1 to questions 2 & 3

Procedure 4.1

Budget.

The research project established that the driver for national standard compliance is budget. The budget for JTFD is $2,362,980.00 for the year 2014. Budget becomes the determinant for staffing levels which drive operations. JTFD has a staffing level of six firefighters 24 hours a day plus two chiefs on a forty hour a week schedule. The cost of the staffing in 2014 was $1,821,683.71. However, due to the staffing deployment identified in SOG, (2012), JTFD is unable to staff L-251 to a NFPA 1710 (2010) compliant level. In order to staff to a compliant level, JTFD would need to add four firefighters. Depending on the type and or combination of employee used, the cost would be approximately $100,000.00/year for a full time firefighter and $50,000.00/year for a part time firefighter (JTFD management system data base) (Firehouse (7.15.32) [Software] (1993). Budget becomes the catalyst of compliance for national standards such as ISO (2012), NFPA 1710 (2010), and NFPA 1901 (2009). However, budget alone does not dictate compliance; the research project identified several variables. One of the variables is maintenance cost. Procedure 3.1 calculated the daily maintenance cost of the ladder truck at $23.30/ day. In contrast, the daily maintenance cost of the engine is $13.18 (See Appendix 1). Additional variables

that were identified included training cost, community make up, and fleet allocation within the fire department.

Staffing.

National Standards and staffing were identified to be closely related. NFPA 1710 (2010) recommends that four firefighters staff both the first arriving engine and the first arriving ladder at the scene of fire emergencies. Procedure 2.3 identified current staffing levels for JTFD of six firefighters which allows for different combinations of staffing for the vehicles using the cross staffing system. SOG (2012) states that for residential fire emergencies, six firefighters respond on E-251 within hydrant district. In addition, SOG (2012) states that five firefighter's respond on E-251 and one on Tanker 251 outside the hydrant district. Ladder 251 therefore, would be staffed by off duty personnel or extra staff if available. The times that L-251 has been staffed by off duty or extra personnel have not been recorded in the data management system, therefore, the research project was unable to quantify the results. JTFD meets ISO (2011) staffing levels for first arriving engine company response. However, when ISO (2012) and NFPA 1710 (2010) are used to measure response compliance, JTFD does not meet the standard of two engine companies arriving on the scene with a minimum of four firefighters each.

Operations.

The research project identified operational standards for emergency response. Emergency response standards were identified to fall into two categories; they were NFPA and ISO standards. The operations at JTFD are also defined in the SOG (2012). Procedure 1.2 defines the standard for response as a minimum of four firefighters on engines and ladders used on residential fire emergency responses. The standard response identified in procedure 1.2 for JTFD becomes affected when there is an EMS run in progress at the time of the fire emergency. If another run is in progress, the amount of firefighters responding on Engine 251 is reduced to three. At which time, JTFD will become non-compliant with the

standard of NFPA 1710 (2010) identified in procedure 1.2. The recommended national standard for response identified in procedure 1.2 states that a ladder company with four firefighters shall arrive within eight minutes of alarm to residential fire emergencies. This standard however is contrast to procedure 1.1, more specifically ISO (2011), which states that JTFD does not have to have a ladder company arrive on residential fire emergencies. Procedure 1.1 identified that JTFD did not have to have an aerial ladder but instead a service truck. Procedure 2.2 that Ladder 251 is used as a back-up vehicle for the front line engine on occasion. The research project was unable to quantify the amount of times that Ladder 251 has been used as a back-up, because the data was not recorded in the data management system.

OFCA OFE 14 Research Survey

Procedure 5.1

Survey Q1 (N=73), Yes (n=50), No (n=23)

Survey Q2 (N=72), 0-9,999 (n=26), 10K-24,999 (n=28), 25K-Plus (n=18)

Survey Q3 (N=71), 0-1,999,999 (n=33), 2,000,000-4,999,999 (n=17), 5 million-Plus (n=21)

Survey Q4 (N=53), 0-5 years (n=17), 5yrs+1day-15 years (n=25), 15yrs+1day-Plus (n=11)

Survey Q5 (N=52), 0-399K (n=13), 400K-750K (n=20), 751K-Plus (n=19)

Survey Q6 (N=50), 0-199 (n=24), 200-499 (n=16), 500-Plus (n=10)

Survey Q7 (N=53), 0-99 (n=26), 100-299 (n=14), 300-Plus (n=13)

Survey Q8 (N=73), ns

Survey Q9 (N=54), 0-99 (n=46), 100-299 (n=7), 300-Plus (n=1)

Survey Q10 (N=53), 0-1,999 (n=10), 2,000-3,999 (n=22), 4,000-Plus (n=21)

Survey Q11 (N=54), Staff all the time (n=14), Cross-Staff (n=26), Don’t regularly staff (n=14)

Survey Q12 (N=53), Yes (n=39), No (n=9), Not Sure (n=5)

Survey Q13 (N=65), Yes (n=25), No (n=36), Not Sure (n=4)

The results of procedure 5.1 survey were compiled using a list of fire departments that was obtained from the Ohio Fire Chiefs Association. The list contained 217 fire departments, of those, 32 addresses were not delivered to the fire departments. The departments that were eliminated, seven did not have ladder trucks, 10 did not have email addresses, and 15 were returned undeliverable. The total of delivered surveys was 185. There were a total of 73 responses from 185 emailing. The responses were collected over a two week period from June 17, 2015 through July 1, 2015 at 4pm. Variances identified in the responses include that not all fire departments had an aerial ladder truck included in their fleet and not all respondents answered all of the questions.

DISCUSSION

The Jefferson Township Fire Department does not know the cost and/ or benefits to the community or department in regards to replacing or eliminating the aerial ladder truck. The purpose of this descriptive study is to develop a quantifiable measurement that includes industrial standards (NFPA, ISO), budget expenses (training, capital), operations (vehicles, response capabilities), and staffing (amount, where to assign) that can be used to compare and contrast the cost and/ or benefits of replacing or eliminating the aerial ladder truck at Jefferson Township fire Department (JTFD). The descriptive study was based on three research questions. The questions are as follows. What are the standards, if any, of the fire departments operating an aerial ladder service? What are the benefits, if any, to the budget, operations, and staffing for JTFD to continue operating an aerial ladder truck? What are the cost, if any, to the budget, operations, and staffing for JTFD to continue operating an aerial ladder truck?

Standards

Based on the procedures created in the Procedures section and reported in the Results section, two administrators of consensus national industrial standards were identified. The administrators of the standards were Insurance Services Office (ISO) and National Fire Protection Agency (NFPA). The data collected in the Procedure section and reported in the Results section identified how JTFD conformed or did not conform to these national standards.

Data collected in the Procedure section and reported in the Results section identified key components of ISO (2011). First and foremost, ISO (2011) identifies that JTFD does not meet the criteria for needing an aerial ladder truck due to the needed fire flow of 2,500/gpm, as calculated in ISO (2005), in the first alarm response district. In addition, ISO (2011), states that JTFD would need to have a service truck respond to any report of a fire within the first alarm district. In regards to what is suggested in ISO (2012) as a needed response, JTFD should be responding with a two engine response to the first alarm

district. ISO (2005), ISO (2011), and ISO (2012) when used in conjunction with each other; define the needed response for JTFD to report of a fire as two engines and a service truck. However, to achieve the suggested vehicle response, ISO (2012) does not specify where those vehicles come from. For instance, ISO (2012) states that part of the response could come from an automatic aid agreement with another fire department. ISO (2012) does not count mutual aid trucks, but it does count automatic aid responses when figuring fire departments public protection classification (PPC).

ISO (2011) provided JTFD with public protection classification (PPC) of a four within the hydrant district and a nine outside of the hydrant district. For the purpose of this discussion, the applied research project will focus on the hydrant district portion of the PPC, only due to relevancy of the project. Data collected in Procedure 1.1 and reported in the Results section identified that the PPC reported in ISO (2011) would change from a four to a five with the removal of the aerial ladder from service at JTFD. However, Gail Williams (personal communication, November 29, 2014) an insurance underwriter, stated that the premiums would not be affected for the village of West Jefferson with the reduction of PPC. ISO (2012) suggest that back up truck is needed for the front line vehicles used at fire departments. The data collected in Procedure 2.2 pointed out that the current ladder had been used as a back-up for the front line engine when it was out of service. The data reported however was not quantifiable due to there not being a way to track this data. ISO response criteria was also part of the survey (See Appendix 2) used to help identify industrial standards across the State of Ohio. When fire departments were ask if their aerial ladder met ISO response criteria, 39/73 (53.43%) fire departments responded yes. In addition, when fire departments were asked if the closest mutual aid ladder met ISO response criteria, 25/73 (34.25%) fire departments responded yes. ISO (2012) is recognized as a consensus standard across the United States, however, as the data collected in the Procedure 5.1 survey (See Appendix 2) and reported in the Results section only slightly above half of the fire departments surveyed used ISO (2012) as a basis

for their fire departments response matrix. For this reason, fire department leaders could do cost benefit analysis on how they allocate vehicles for their fire department. Furthermore, according to Bennett et al., (2003), fire department leaders should identify the community needs when deciding vehicle response matrix that is to be used. More specifically, if half of the Ohio fire departments including JTFD are not meeting ISO (2012), then how do we justify purchasing a million dollar aerial ladder truck that is not even suggested in ISO (2011)? ISO (2011) suggest a service truck, which according to State of Ohio Contracts (n.d.), would be cheaper to purchase and maintain (See Appendix 1).

Data collected in the Procedures section and reported in the Results section identified two NFPA standards that help answer the research question for standards. The two NFPA standards that were identified within the Procedures section and reported in the Results section were NFPA 1901 (2009) and NFPA 1710 (2010). In procedure 1.2, the data collected, identified that JTFD was not compliant with NFPA 1901 (2009), due to equipment that was lacking from the aerial ladder truck (See Appendix 3). Procedure 1.2 and procedure 4.1 both produced data, which was reported in the Results, which showed JTFD met the response criteria suggested in NFPA 1710 (2010) 21% of the time. Procedure 3.2 identified that JTFD did not have a training program that would be in compliance with NFPA 1710 (2010). Furthermore, the non compliance is exacerbated by the lack of full staffing not always being met which is identified in the data collected during Procedure 3.3 and reported in the Results section. Due to the cross staffing system used at JTFD, data collected in Procedure 3.3 and reported in the Results section, further points out that when the medic vehicle is on a run, staffing the fire vehicles is increasingly compromised.

The implications of the data collected in the Procedures section and reported in the Results section as it relates to standards is that 100% of the fire departments aren't 100% compliant with NFPA and ISO codes (See Appendix 2). However, ISO and NFPA are the consensus industrial standard for how fire departments rate themselves and are used as the basis for a cost benefit analysis (Procedure 1.1 and

Procedure 1.2). Research question one ask, what the standards were, if any, of a fire department operating an aerial ladder truck. The standards identified in the Procedure section and reported in the Results section are ISO (2012), NFPA 1901 (2009), and NFPA 1710 (2010). As collected in the Procedure section and reported in the Results section, JTFD is not completely compliant with any of the standards identified. Furthermore, according to Procedure 5.1 (See Appendix 2), only about half of the departments surveyed were compliant. If fire department leaders are concerned with compliance with national and local standards, they could first try to identify the standards that the fire department will attempt to become compliant with. This could allow the fire department to compare and contrast how the cost of compliance could possibly affect budget, staffing, and operations.

Budget

To answer research questions two and three, the Procedure section collected data and reported it in the Results section as to cost and/ or benefit of having the aerial ladder truck at JTFD. Procedure 4.1 reported that the driver for national standard compliance is budget. In order for JTFD to be compliant with NFPA 1710 (2010), the data collected during Procedure 4.1 and reported in the Results section, found that JTFD would need to increase the daily staffing levels to eight fire fighters a day from six fire fighters a day. Procedure 4.1 also identified the cost of increasing staffing, showing that a full time fire fighter would cost $100,000.00/year and a part time fire fighter $50,000.00/year. Data collected in the Procedure 5.1 survey (See Appendix 2) and reported in the Results section identified staffing standards in the state of Ohio. Procedure 5.1 survey Q 11 ask the fire departments how they regularly staffed their aerial ladder. The data reported in the Results section showed that out of the 73 fire departments surveyed; only 54 fire departments responded to question 11. The data collected during the survey and reported in the Results section showed that 14/54 (25.9%) staffed the vehicle all the time. In addition, the data collected showed that 26/54 (25.9%) used a cross-staffing system and 14/54 (25.9%) did not staff

their aerial ladder truck at all. Of the fourteen fire departments that stated they staff their aerial ladder all the time, 10/14 (71.4%) also reported a budget of five million plus.

Staffing is only one facet of budgetary effects for cost benefit analysis on replacing or eliminating the aerial ladder truck from JTFD. Another area the data collected in the Procedures section and reported in the Results section was the cost of maintenance on the aerial ladder. The data reported in the Results section for Procedure 3.1, showed that the daily cost for maintenance of the aerial ladder at JTFD is $23.30/day. In contrast, the engine had a daily maintenance cost of $13.18/day. The difference of the two vehicles is $10.12/day cheaper for the engine as compared to the aerial ladder (Procedure 3.1). Procedure 3.1 goes on to show that the average run costs for the aerial ladder $142.00/ per all runs taken by the aerial ladder. In Addition, Procedure 3.1 reports that if only runs taken in JTFD first alarm district are used, then the amount per run balloons to $566.95/ per run. Procedure 5.1 survey Q 10 asks how much fire departments spend annually on vehicle maintenance for their aerial ladder truck. The data reported in the Results section showed that out of the 73 fire departments surveyed; only 53 fire departments responded to question 11. The data collected during the survey and reported in the Results section showed that 10 (18.9%) spent less than $2,000.00, 22 (41.5%) spent between $2,000.00- $3,999.00, and 21 (39.6%) of the fire departments spent over $4,000.00 annually for maintenance on their aerial ladder. In comparison, according to JTFD management system data base (Firehouse (7.15.32) [Software] (1993), JTFD averaged over the research period $8,504.58/yearly in maintenance on the aerial ladder truck, which would put JTFD in the 39.6% range of the other fire departments surveyed (See Appendix 2). To compare and contrast the data collected in the Procedures section and reported in the Results section, of the fire departments that spent over $4,000.00/ year in maintenance on their aerial ladder truck, 14/21 (66.67%) of them had budgets of over five million dollars (See Appendix 2). In contrast, only 6/21(33.33%) reported a budget fewer than five million dollars and one was unreported (See Appendix

2). In comparison, according to the data collected in Procedure 4.1 and reported in the Results section, the annual budget for JTFD was $2,362,980.00. The annual budget for JTFD along with the average maintenance cost for the aerial ladder truck, would put JTFD in the lower percentile of the state of Ohio fire departments surveyed (See Appendix 2).

Staffing

Data collected in the Procedures section and reported in the Results section, identified staffing for JTFD and the variables that affect staffing. The data collected during Procedure 4.1 identified the daily staffing level of six fire fighters. The daily staffing levels have variables as identified in Procedure 3.3 that JTFD is not always fully staffed. Staffing for the aerial ladder truck with the cross staffing system identified in Procedure 4.1 also has circumstances that affect it as reported in the Results section of Procedure 2.3 and Procedure 3.3. Whereas the Procedure 2.3 concluded that three fire fighters are available for staffing the aerial ladder for commercial fire runs, the results for Procedure 3.3 point out that when station staffing levels are low or an EMS run is in progress, there are not three fire fighters to staff the aerial ladder. The cost benefit analysis of replacing or eliminating the aerial ladder truck has some correlation to staffing levels which become difficult to quantify due to all the variables reported in the Results section. For instance, Procedure 2.3 found that the aerial ladder in question (L-251) is considered to be available for off duty personnel along with on duty personnel. However, this was found to be unquantifiable due to the fact that there are not stats kept on how many times off duty personnel responded to an emergency in L-251. If staffing levels were at maximum, like reported in the Results section of Procedure 4.1, JTFD meets ISO (2011) staffing levels for first arriving engine company response. However, when ISO (2012) and NFPA 1710 (2010) are used to measure response compliance, JTFD does not meet the standard of two engine companies arriving on the scene with a minimum of four firefighters each. For JTFD, as described earlier in the Standards section, it is not possible at the current

time to meet all the standards identified in the Procedures section and reported in the Results section. However, including staffing as part of a cost benefit analysis, allows for the cost benefit analysis to be more complete. When fire department leaders are identifying the community needs assessment they must also consider the staffing levels to accomplish meeting those needs (Bennett et al., 2003). If a fire department is made up of multiple trucks without proper staffing to use said trucks, then the community needs may not be mitigated. By doing so, a fire department is not putting their strategic planning into operational planning as pointed out by Wallace (2006). JTFD has a current staffing level of six as identified in the Procedures section and reported in the Results section. If the current vehicle allocation was changed from three fire trucks to two fire trucks, then JTFD would be able to staff both of the fire trucks with three fire fighters each. If JTFD staffed two fire trucks with three fire fighters, that would fulfill the suggestion by ISO (2012) to have a two engine response matrix for JTFD. In the future, if funding would increase, it would be possible for JTFD to staff each fire truck with four fire fighters each to achieve NFPA 1710 (2010) compliance.

Operations

Data collected in the Procedures section and reported in the Results section was used to do a cost benefit analysis of replacing or eliminating L-251 and its affect on the operations of JTFD. According to the Procedure 2.1, L-251 responded to 466 emergency runs during the applied research project time line. However, L-251 was cancelled 304 times and arrived on the scene 162 times. Furthermore, L-251 responded and arrived on emergency runs within JTFD first alarm district 125 times (26.83% of the total runs taken) (Procedure 2.1). During the same period of time, Procedure 3.2 reports that the total number of fire runs taken by JTFD was 2,878 emergency runs. Moreover, L-251 took 16.19% of the total fire runs taken by JTFD (Procedure 3.2). The data for Procedure 2.2 that was recorded in the Results section identified that L-251 took two elevated rope rescue runs during the applied research project; however,

neither emergency run used the aerial device from L-251 JTFD management system data base (Firehouse (7.15.32) [Software] (1993). From the fire departments surveyed in Procedure 5.1 (See Appendix 2), Q6 the total number of aerial ladder runs, the highest percentage reported was the range of 0-199 at almost 50% of the 50 fire departments that reported. Q7 the total number of first alarm runs taken by the fire departments surveyed (See Appendix 2), the highest percentage reported was the range 0-99 at 49.1% of the 53 fire departments that reported. Finally Q8, the total number of mutual aid runs taken by fire departments aerial ladder truck, the highest percentage reported was the range of 0-99 at 85.2% of the 54 fire departments that reported. When the survey data collected from Procedure 5.1 (See Appendix 2) is compared to the responses by L-251, L-251 run totals reported in the Results section of Procedure 2.1 fall outside the norm of the Ohio fire departments surveyed.

Q2 of the survey (See Appendix 2) in Procedure 5.1 explored the population of fire departments that were part of the survey. A total of 72 fire departments responded to the question and the highest percentage answer was a population range of 10K-24,999 at 38.88% (See Appendix 2). Q1 of the survey (See Appendix 2) in Procedure 5.1 asked rather or not a fire department being surveyed had an aerial ladder truck. Of the 73 fire departments that responded to the survey, 23 fire departments did not currently have an aerial ladder in their vehicle allocation (See Appendix 2). The data reported in the Results section for Procedure 5.1 shows that of the 23 fire departments without a ladder, the highest percentage of population for those fire departments is 0-9,999 at 65.21% (See Appendix 2). The population of JTFD first alarm district is on average 10,000 residents (Madison County Web Site, 2014). The current population has been averaging 10,000 residents for the last ten years according to Madison County Web Site (2014). As explained in the Background section, the original purchase of the aerial ladder truck was for future growth and the industrial park that was coming to West Jefferson. As it turned

out, now 20 plus years later, the population has not steadily increased and the industrial park is tax abated on property tax for 15 and 30 years hence limiting budgetary growth for JTFD.

The last part of the survey created in the Procedures section and reported in the Results section covers age of vehicle and the initial cost of the vehicle (See Appendix 2). The data reported in the Results section for Procedure 5.1 Q4 that asked the age of the fire departments being surveyed current aerial ladder truck, the age range with the highest percentage was 5yrs +1 day-15 years. Out of the 53 fire departments that reported, 25 or 47.2% were within the range written above (See Appendix 2). L-251 at JTFD would fall outside this range that is for the purpose of the applied research project considered the norm of the Ohio fire departments surveyed. Furthermore the survey listed in Procedure 5.1 and results recorded in the Results section, Q4 asked the initial cost of the vehicle. Of the 52 fire departments that reported on Q4, the cost range receiving the highest percentage of respondents was 400K-750K, the percentage was 38.5% (20/52) (See Appendix 2). The cost incurred by JTFD at the time L-251 was purchased was $375,000.00, which would fall into the 25% range of the survey respondents (Firehouse 7.15.32 [Software] 1993) (See Appendix 2).

The applied research project found that budget, staffing, and operations are closely related and dependent on one another to maximize the delivery system on the fire department. Budget becomes the main driver for staffing and national standard compliance (Bennett et al., 2003). In addition, staffing and national standards become the driver for operations (Bennett et al., 2003). With the purpose of deciding to eliminate or replace the aerial ladder truck the Procedures section compared and contrasted the data collected and reported the Results section while trying to balance national standard compliance along with budget, staffing, and operations.

RECOMMENDATIONS

The discussion section quantitatively and qualitatively examined the research questions. The data created from the Procedures section and reported in the Results section, allowed the researcher to compare and contrast in the Discussion section the problem statement of Jefferson Township Fire Department (JTFD) not knowing the cost and or benefits to the community or department in regards to replacing or eliminating the aerial ladder truck. Based on the analysis of the Discussion section, my recommendation to JTFD is to eliminate the aerial ladder truck from service. In doing so, change the vehicle allocation and deployment model to a two engine response, as opposed to, the current deployment model of an engine, ladder, and tanker.

As stated in the Introduction section, the purpose of the study was to develop a quantifiable measurement that includes industrial standards (NFPA, ISO), budget expenses (training, capital), operations (vehicles, response capabilities), and staffing (amount, where to assign) that can be used to compare and contrast the cost and or benefits of replacing or eliminating the aerial ladder truck at JTFD. The researcher has determined that the purpose of the study can best be accomplished through a cost benefit analysis that becomes the foundation of a quantifiable measure for a short and long term strategic plan that addresses budget, operations and staffing as it relates to a ladder truck at JTFD.

Based on the Results section and analyzed in Discussion section, the recommendation as it relates to research question one, the standards of fire departments operating an aerial ladder service, is to use the response criteria identified in Insurance Service Office (ISO), (2012) as a basis for the operational deployment standards for JTFD. The operational deployment standard would consist of a two engine response. Furthermore, I would recommend as budgetary constraints allow, the engine to be NFPA 1901 (2009) and NFPA 1710 (2010) compliant throughout the life of the vehicles.

Based on the Results section and analyzed in Discussion section, the recommendation as it relates to research question two, the benefits of operating an aerial ladder service at JTFD, is to equip one of the engines as a service truck, instead of JTFD operating an aerial ladder truck. Further, I recommend that JTFD use automatic response to help supplement aerial ladder service from both London City Fire Department and Prairie Township Fire Department to provide redundancy of equipment and task that a service truck can provide.

Based on the Results section and analyzed in Discussion section, the recommendation as it relates to research question three, the cost of operating an aerial ladder service at JTFD, is to contract the fleet to a two engine response. The recommendation to contract or reduce the size of the fleet, will address costs identified in the Results section and analyzed in the Discussion section such as the average daily cost of $23.30 and the average yearly cost of $8,504.28 for maintenance of the aerial ladder.

I recommend to future readers to analyze vehicle needs by doing a cost benefit analysis. I recommend future readers to use the data collected within this applied research project to be the foundation of a vehicle needs assessment and also deployment models for individual fire departments. Furthermore, future readers should expand on the survey used in Procedure 5.1 (See Appendix 2). By expanding on the survey, future readers can continue to identify standards for fire departments in Ohio and across the United States. Identifying state and national standards will help other fire departments stay current in their strategic planning. By continuing to identify national standards and cost benefit analysis the applied research project model can be expanded to other fire department vehicles or any function of fire department that affects budgets, staffing, and operations.

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APPENDIX 1 – MAINTENANCE COST CHART

Yearly and Daily Maintenance Cost for Fire Department Vehicles

Vehicle	Year of Vehicle	Years Surveyed	Runs Taken	Year Cost	Daily Cost
Tanker251	1998	7	389	$4,537.40	$12.43
Engine251	2002	7	2,173	$4,810.21	$13.18
Ladder251	1994	7	466	$8,504.28	$23.30
Medic250	2010	5	3,215	$5,184.83	$14.21
Medic251	2013	2	1,665	$1,750.15	$4.79
Medic252	2005	3	Unknown	$1,855.31	$5.08
Grass251	2014	1	36	0	0
Total	N/A	7	2878-Fire	$26,642.48	$72.99

APPENDIX 2 –SURVEY

OFCA OFE 14 Research Survey

1. Does your fire department currently have an aerial ladder in the fleet?

Yes No

2. What is the population range for your first alarm district?

0-9,999 10K-24,999 25K-Plus

3. What is your department's annual budget?

0-1,999,999 2,000,000-4,999,999 5million-Plus

4. How long have you had your current aerial ladder truck?

0-5years 5yrs+1 day-15years 15yrs+1day-Plus

5. What was the cost of your current aerial ladder truck?

0-399K 400K-750K 751K-Plus

6. On average, how many runs does the aerial ladder truck respond on a year?

0-199 200-499 500-Plus

7. On average, how many runs does your aerial ladder take in your first alarm district a year?

0-99 100-299 300-Plus

8. Option 1

9. On average, how many runs does your aerial ladder take a year to mutual aid districts?

0-99 100-299 300-Plus

10. What are the annual maintenance costs for the aerial ladder truck?

0-1,999 2K-3,999 4K-Plus

11. How do you regularly staff your aerial ladder truck?

Staff all the time Cross-Staff Don't regularly staff

12. Does your current aerial ladder meet the current ISO response criteria?

Yes No Not Sure

13. Does your closest mutual aid aerial ladder truck meet the criteria within five minute response time?

Yes No Not Sure

APPENDIX 3 –NFPA 1901 (2009) COMPLIANCE CHART

The Compliance with Tools and Equipment Carried on Ladder 251

Equipment	Compliant	Non-Compliant
Aerial Device	X	
Fire Pump	X	
Water tank	X	
Equipment Storage	X	
Hose Storage	X	
Ground Ladders (115’)		X (97’)
Axe’s (4)	X	
Pike Pole’s (4)	X	
Plaster Hook’s(2)		X (1)
Crow Bar and Claw Tool (4)		X (2)
Sledgehammer (2)		X (1)
Portable Hand-lights (4)		X (3)
Fire Extinguisher (2)	X	
SCBA for Every Seat (4)	X	
One Spare bottle for each	X	
First aid kit	X	
Salvage Covers (6)		X (2)
Spanner wrenches	X	

Scoop Shovels (2)	X	
Bolt Cutters (24”)		X (20”)
Ladder Belts (4)	X	
Safety and Utility Rope	X	
Box of hand tools (list upon request)		X
Wheel Chocks (2)	X	
Traffic Vest (4)	X	
Illuminating Traffic Warning (5)	X	
Automatic External Defibrillator		X

APPENDIX 4 –EMERGENCY RUN DATA

Figure 4.1

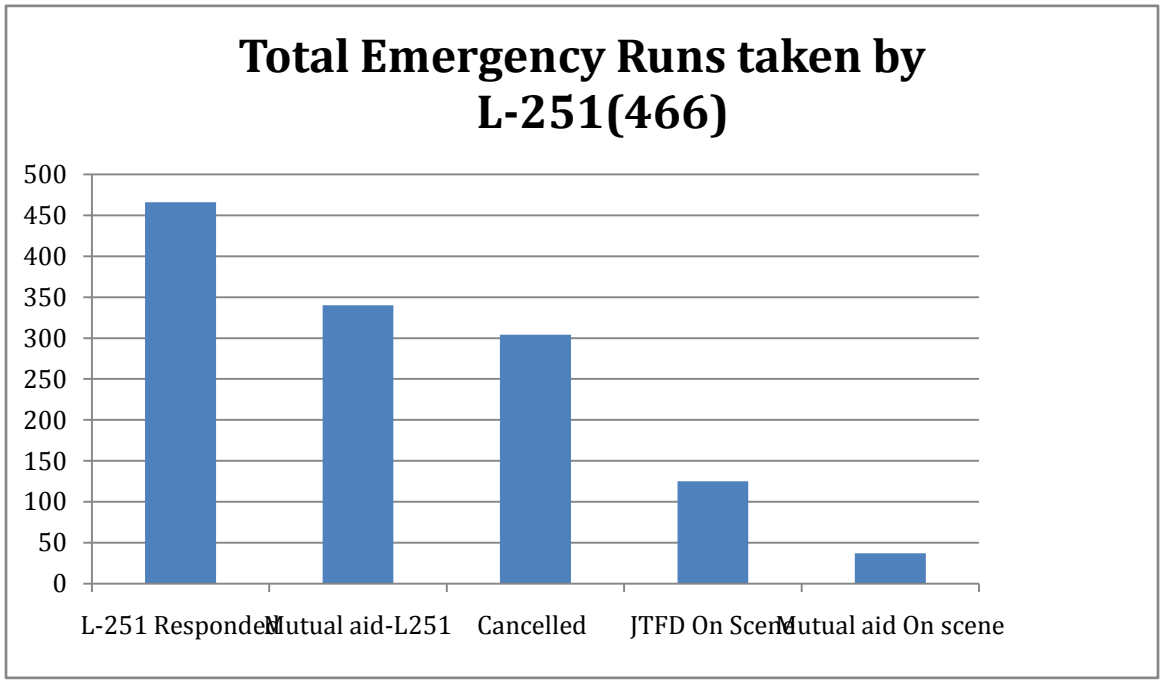

Figure 4.2