Reducing the Risk of Fire Apparatus Collisions While Responding to Automated Fire Alarms

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A research project submitted to the Ohio Fire Executive Program

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CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

1. This paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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ABSTRACT

Apparatus collisions continue to be the second leading cause of firefighter line of duty deaths. The problem this study addressed is the risk of fire apparatus collisions while responding with lights and sirens to automated fire alarms.

The purpose of this study was to potentially reduce the risk of death and injury to firefighters, motorists, and pedestrians, due to collisions with fire apparatus while responding with lights and sirens to automated fire alarms in the City of Aurora, Ohio. This study examined this problem using the descriptive (survey) method.

The research questions this study investigated were:

1. What policies and practices are now utilized by the Aurora Fire Department to reduce the risk of death or injury due to motor vehicle collisions while driving fire apparatus?
2. When the Aurora Fire Department has responded to automated fire alarms, how often were the situations resolved by the crew of the first arriving engine alone versus incidents that require two or more engine companies?
3. What response policies have other fire departments successfully adopted to reduce the risk of an apparatus collision during an emergency response?
4. Is it possible to reduce the risk of apparatus collisions by reducing the number of "hot" (lights and siren) responses while still meeting NFPA standard 1710 for response time to fire alarms in Aurora?

The research revealed that the Aurora Fire Department is doing well with regard to firefighter driving practices, but also exposed the need for more current specialized training. The findings of this research also challenge the Aurora Fire Department to adopt a quiet response

policy for automated fire alarms in order to reduce the number of “hot” emergency responses thus potentially reducing the risk of responding apparatus collisions.

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Statement of the Problem

National statistics indicate that approximately 20% of firefighter fatalities annually are attributable to motor vehicle collisions while responding to alarms. Motor vehicle crashes rank second only to heart attacks as causes of line of duty firefighter deaths. A firefighter is more likely to be killed in a vehicle collision while responding to an emergency than by fire itself. Deaths and injuries to the motoring public involved in collisions with responding fire apparatus compound the tragedy (National Fire Protection Association [NFPA], 2008, July).

The problem this study addressed is the risk of fire apparatus collisions while responding with lights and sirens to automated fire alarms.

Fire departments across the United States have made significant efforts to reduce the risk of firefighter death and injury posed by responding to emergencies, including improved apparatus marking and warning devices, driver education, public education, pre-emption devices for traffic signals, and mandatory seat belt usage policies. Still, the fire service has not seen any significant statistical reduction in firefighter fatalities attributable to motor vehicle collisions. Unnecessary emergency responses to false alarms continue to represent a correctable cause of undue risk to firefighters, motorists, and pedestrians (NFPA, 2008, November). This study examined this problem using the descriptive (survey) method.

Purpose of the Study

The purpose of this study was to potentially reduce the risk of death and injury to firefighters, motorists, and pedestrians, due to collisions with fire apparatus while responding with lights and sirens to automated fire alarms in the City of Aurora, Ohio.

Research Questions

The research questions this study investigated were:

1. What policies and practices are now utilized by the Aurora Fire Department to reduce the risk of death or injury due to motor vehicle collisions while driving fire apparatus?

2. When the Aurora Fire Department responds to an automated fire alarm, how often is the situation resolved by the crew of the first arriving engine alone versus incidents that require two or more engine companies?

3. What response policies have other fire departments successfully adopted to reduce the risk of an apparatus collision during an emergency response?

4. Is it possible to reduce the risk of apparatus collisions by reducing the number of "hot" (lights and siren) responses while still meeting NFPA standard 1710 for response time to fire alarms in Aurora?

BACKGROUND AND SIGNIFICANCE

The City of Aurora, Ohio is a suburban community located in Northeast Ohio, Southeast of Cleveland and Northeast of Akron, covering an area of 25 square miles and is home to approximately 15,000 residents. Aurora is largely a residential town with four nursing homes, three retail shopping centers, and a small light industrial commercial presence. The City of Aurora Fire Department employs 15 full time and 25 part time personnel and has a daily 24 hour duty crew of 5-7 Firefighter/Paramedics as well as a full time Chief and Assistant Chief during daytime business hours. In 2009, Aurora firefighters responded from two fire stations to 1940 emergency calls, 400 of which were fire alarms (AFD, 2009).

Aurora Fire Department Standard Operating Guidelines (SOG) for response to automatic fire alarms calls for two fire engines, one from each fire station, and a single medic unit to

respond to all fire alarms in structures (Appendix 1). The standard response mode to fire alarms is for all responding apparatus to utilize warning lights and sirens at speed up to 10 miles per hour above posted speed limits and all firefighter are required to wear seatbelts while the vehicle is moving. Upon arrival of the first unit, and following a size up of "nothing showing," the units still responding are directed to continue with lights and siren until and unless specifically ordered to reduce the response to a non-emergency mode (Appendix 2).

Nationally, one in ten requests for a fire department response is a false alarm (NFPA, 2008, November). False alarms can be caused by dust, steam, or spider webs in smoke detectors, air or water leaks and pressure variations in fire suppression automatic sprinkler systems, problems with the phone lines that relay automatic alarm signals, and human errors. Many more automated fire alarms are activated by circumstances such as burnt toast, in which case there is no real imminent life safety threat. In Aurora, Ohio, and in countless fire districts across the United States, false alarms and reported minor incidents trigger calls to 9-1-1 dispatch centers prompting an emergency fire department response.

Traffic crash statistics, available from the Ohio Traffic Safety Office (OTSO) of the Ohio Department of Public Safety, show two fatal crashes involving fire trucks during emergency response in 2008, and one each in the years 2007 and 2006. (OTSO, 2009) They also show that, in Ohio, fire truck crashes during emergency response in which persons sustained injuries averaged twenty per year during the same three years.

Every emergency apparatus response represents an inherent increased risk of motor vehicle collision and potential injury or death of responding firefighters, motorists, and pedestrians. This risk is generally viewed as manageable and an acceptable trade-off when lives are jeopardized by structure fires, but represents a risk without benefit in the case of false alarms

and minor incidents.

Responding to calls for emergency response with due regard for public safety is a serious responsibility. *This study challenged the Aurora Fire Department to examine the risks and benefits of multiple engine companies responding with lights and sirens to unconfirmed automatic alarms and to consider policy changes that may reduce the risk of fire apparatus collisions.*

LITERATURE REVIEW

A literature review was conducted to examine published statistics, research, and facts relating to fire apparatus vehicle collisions and emergency response policies and practices. Academic research, government publications, and fire service trade journals were searched and reviewed for inclusion in this research project.

The United States Fire Administration (USFA) (2009) report, "Firefighter Fatalities in the United States – 2008" indicated that in 2008 the largest share of firefighter deaths, 39 of 103, occurred while responding to or returning from emergency calls. A single incident in 2008 in which nine firefighters perished in a helicopter crash while participating in wildland firefighting operations greatly impacted this statistic, however, additional statistics from recent years support the claim that firefighters are more likely to be killed responding to a fire than by fire itself. The USFA "Firefighter Fatalities in the United States" reports (USFA 2006, 2007, and 2008) indicate that, on average, more than twenty-four firefighters suffered fatal injuries in vehicle collisions each year. Vehicle collisions have continued for many years to be the second leading cause of firefighter fatalities, second only to fireground stress and overexertion.

Many more firefighters are injured but not killed as a result of vehicle collisions. For example, in 2006 in the United States there were approximately 16,000 collisions involving fire

apparatus resulting in 1250 firefighter injuries. On the road vehicle collisions of fire department apparatus have also impacted the public in the communities firefighters are sworn to protect from death and injury. The National Highway Traffic Safety Administration reported that in fatal collisions between fire apparatus travelling with lights and sirens and other vehicles between 1997-2006, 9 firefighters died while 94 deaths were occupants of the other vehicles impacted by fire trucks. In that same time period, 21 pedestrians and 5 bicyclists were killed in collisions with fire apparatus (NFPA, 2008, July).

The Ohio Traffic Safety Office (OTSO) maintains data related to all reported motor vehicle collisions in the State of Ohio. A parameterized report culled from their database showed that in 2008 there were two fatal crashes involving fire trucks in emergency use. There was one such crash per year in 2006 and 2007 as well. OTSO statistics also showed that there was an average of 20 crashes per year in which persons were injured in Ohio in crashes involving fire trucks in emergency use (Appendix 3).

In spite of driver education efforts and public service announcements, motorists do not always react appropriately when they suddenly become aware of the presence of an emergency vehicle operating with lights and sirens. Some drivers panic and cannot decide whether to suddenly stop, swerve, continue, or pull over (Wolfburg, 1996). Such inappropriate reactions can lead to a “wake effect” in which many more vehicles must suddenly brake and swerve to avoid rear ending those ahead of them. A 1984 study conducted in Salt Lake City, Utah, concluded that there were five times as many “wake effect” collisions occurring as result of passing emergency vehicles as the actual number of responding emergency vehicle collisions (Lucia, 1993). The operation of sirens and lights can also have undesirable effects on emergency vehicle operators. Firefighters are trained to respond quickly and have a genuine deep seated desire to save lives

and property. With that in mind, even seasoned responders may develop an “emotional sense of power and urgency when running lights and siren. This sense can block out reason and prudence, leading to the reckless operation of the emergency vehicle” (USFA, 2004).

On April 29, 2000, a 43 year old career Lieutenant of the Chicago Fire Department was killed when his fire truck collided with a pickup truck at an intersection while responding to an automatic alarm at a residential structure. The incident turned out to be a false alarm. The National Institute of Occupational Health and Safety (NIOSH) investigated the circumstances of the collision and the line of duty death, and one of their recommendations was that “fire departments should consider utilizing a quiet dispatch system until it has been determined that life is in danger, persons are injured, or there is a working fire” (NIOSH, 2001).

On March 31, 2009 in Houston, Texas, two Houston Fire Department fire apparatus were responding with lights and sirens to a report of smoke in a structure when they collided at an intersection. The spectacular collision partially ejected one firefighter from the cab, sent nine firefighters to the hospital, two with broken bones, killed a bicyclist who had to be extricated from the dual rear wheels of the overturned ladder truck. The colliding apparatus also crushed a four door sedan, and snapped a utility pole which created the additional hazard of downed power lines over hundreds of gallons of water on the pavement that leaked from the damaged pumper. It was later determined that the reported smoke was caused by a public utility crew smoke testing sewer lines. (Lezon, Wise, & Turner, 2009)

Reducing the number of instances when emergency apparatus are unnecessarily travelling on the road with lights and sirens activated may be one way to reduce the number of fatalities and injuries caused by responding fire apparatus. The National Fire Protection Association (2008) report “False Alarm Activity in the U.S., 2007” indicated that fire departments across the

United States responded to over 2 million false alarms in 2007, and that false alarms account for approximately 10% of fire calls. The USFA (2004) publication, “Emergency Vehicle Safety Initiative” stated that calls for an emergency response to true emergencies are limited, yet tradition is that all calls to 9-1-1 get an emergency response. NFPA standard 1710 sets out a recommended standard for career staffed fire departments to turn out within one minute of receiving a fire alarm and to take no more than four minutes for the first engine company to arrive at a fire suppression emergency. Eight minutes are allowed for the arrival of the balance of the full first alarm assignment (NFPA, 2010). Thomas Campbell (2002) suggested that emergency calls to fire department dispatch centers such as alarms with no indication of fire or smoke, gas leaks, brush fires, lock-ins, and electrical emergencies only require an emergency response from a single piece of apparatus rather than a multi company response. Rick Markley (2009) wrote that there are an increasing number of fire departments, including St. Louis, LA., Ann Arundel County, MD., and Pleasant View, TN., where administrators are adopting “on the quiet” response policies for many reported emergencies. Specific employment of the concept can be tailored to suit the locality, but it basically involves limiting the number of apparatus that are running hot to incidences that have a low likelihood of being life threatening emergencies, while the alarm can always be upgraded if more information becomes available indicating a more urgent or greater response is appropriate.

Two years after the St. Louis Fire Department adopted their “on the quiet” response policy, accidents were down 35% to a rate of 2.6 accidents per 10,000 runs. St. Louis also realized reductions in firefighter injuries, apparatus down time for repairs, and savings in repair expenses. (Schaper & Gerner, 1997) Ernest F. Hargett Jr. studied the St. Louis Fire Department’s “on the quiet” policy as well as the Detroit Fire Department’s “go easy” response policy and

reported an incident that occurred in his own Philadelphia Fire Department, in which a ladder truck responding to a reported gas leak struck and killed a civilian driver at an intersection. Based on his applied research, he recommended that the Philadelphia Fire Department adopt a quiet dispatch for calls until it is determined that life is in danger, persons are injured, or that there is a working fire (Hargett, 2005).

The United States Fire Administration and the National Volunteer Fire Council cooperated on an initiative to implement strategies to increase safety in volunteer and small combination fire departments. They published the booklet "Emergency Vehicle Safe Operations for Volunteer and Small Combination Emergency Service Organizations" which contained recommended standard operating guidelines. One of those recommendations is an "On-The-Quiet Response" policy whereby local jurisdictions identify incidents that, in their experience, require a response, but not at emergency speed. No audible or visual warning devices would be used responding to these calls, but upon further notification that the incident is a true emergency, responding units would upgrade their response to an emergency fashion. (USFA, 2009)

According to the Volunteer Firemen's Insurance Services (VFIS), "Research has shown that the average time saved by lights and siren use is 43 seconds" (VFIS, 2006).

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* directs fire department administrators to have a risk management plan to identify actual and potential hazards, the potential and severity of risks, and an evaluation method and control techniques for all the risks associated with fire department operations. Further it puts forth that "activities that present a significant risk to the safety of members shall be limited to situations when there is a potential to save endangered lives" (NFPA, 2007). NFPA 1002, *Standard for fire apparatus driver/operator professional qualifications,* recommends that firefighters who

drive fire apparatus should participate in an Emergency Vehicle Operator Course (EVOC) course every three years (NFPA, 2009). NFPA 1451, *Standard for a fire service vehicle operations training program*, emphasizes that it is an administrative responsibility of a fire department to establish standard operating procedures for safely driving or operating emergency vehicles during an emergency or non-emergency response (NFPA, 2007). Fire departments should have a clear and formal policy on emergency and non-emergency responses, and when such policies are established by chiefs as department policy, they typically enjoy immunity from suit. A fire department's risk for civil or criminal suits is actually higher for running lights and sirens on a "good intent" call when a collision occurs versus running without lights and sirens to what later turns out to be an emergency (Markley, 2009).

This review of the literature available on the topic of reducing the risk of fatalities and injuries during emergency apparatus response indicated that there is still much work to be done. As a cause of death, emergency vehicle collisions continue to account for approximately 20% of firefighter deaths in the line of duty year to year. Some fire departments have adopted quiet or reduced response policies for certain incidents to reduce their exposure to the risk of vehicle collision. However, with thousands of fire districts across the United States, the adoption of such policies that conflict with long standing traditions and behavior have been far from universal.

PROCEDURES

This research project began with a written questionnaire survey (Appendix 4) distributed to thirty-eight firefighters who drive apparatus in the Aurora Fire Department. The anonymous survey was designed to reveal awareness of policies and gauge behaviors exhibited by firefighters when driving fire apparatus to emergency calls.

As a part of this research, all fire report documentation in the City of Aurora from the

previous three years was reviewed to determine how often fire alarm incidents required the action of more than one engine company. This data is not readily available from an electronic database and must be completed manually. From the total number of fire engine responses for each of the previous three years, non-emergency calls, service calls, motor vehicle accidents, mutual aid responses, gas leak responses, car fires, wires down, carbon monoxide investigations, dumpster fires, and any other non structure fire alarm responses were filtered out to determine the true number of instances when the Aurora Fire Department was summoned to respond to a structure fire alarm each year. From this remaining pool of reports, an analysis was performed to determine in how many of these cases there was no hazard or the hazard was minor and was ultimately abated by the intervention of the first due engine company alone, versus incidents that ultimately required the emergency interventions of two engine companies or more.

This research also entailed soliciting fire service professionals across the State of Ohio to request information about response policies implemented to reduce the risk of apparatus collisions. This started with an email message request for input sent to all alumni from eight previous graduating classes of the Ohio Fire Executive Program. Following responses to the request, ten fire officers were interviewed by telephone and asked a series of questions relative to their fire alarm response policies and reducing the risk of collisions (Appendix 5). The interview responses and anecdotes served as a reference for comparison with practices in cities across the nation as described in the literature review. First hand information obtained by direct interview with other Ohio fire service professionals was very helpful in forming recommendations for action within the Aurora Fire Department.

This research project also examined response times in an emergency lights and sirens mode versus driving with traffic. Eight destinations spread out across the City Aurora were

selected as representative of common response routes. The chosen destinations are outlying locations representing worst case scenarios in terms of response times. Emergency response times to these locations was queried from computerized records (AFD, 2007-2009), and non emergency response times were compiled by field testing. A database was generated to determine if an emergency response by the first due engine company coupled with a non-emergency response from the second due company would meet NFPA 1710 standards for response time to these points.

Definition of Terms

Apparatus. A term for a dedicated fire service vehicle such as a pumper or a ladder truck.

Automated Fire Alarm. For the purpose of this report, and to clarify confusion between terms with local meanings, this refers to fire alarms sent to an emergency dispatch center by electronic detection equipment and without human initiation or without confirmation of an actual fire by a person at the scene. It does not apply to situations in which a person called 9-1-1 to report a fire or a situation where a person manually activated a fire alarm.

Emergency Vehicle Operator Course (EVOC). A sixteen hour (two day) course developed around national standards to teach emergency driving skills, accident prevention, and accident avoidance. Such courses are typically comprised of one day of classroom instruction and one day of practical driving exercises.

Engine Company. A fire pumper with a compliment of (ideally) four including a company officer, an engineering (driver/operator), and two firefighters.

Quiet Response Policy. A fire department response policy that directs some apparatus, under some circumstances, to respond to alarms with the flow of traffic and without using

emergency lights and sirens. Also known as on-the-quiet, go slow, go easy, first hot – second not, non-emergency, negative two-seven, and other colloquial names.

RESULTS

Thirty-eight firefighters from the Aurora Fire Department completed surveys (Appendix 4) with questions designed to gauge their attitudes about safe emergency vehicle driving and to explore the current compliance with safe emergency vehicle driving practices.

Answers to the first survey question reveal that almost all the respondents had participated in an Emergency Vehicle Operators Course (EVOC).

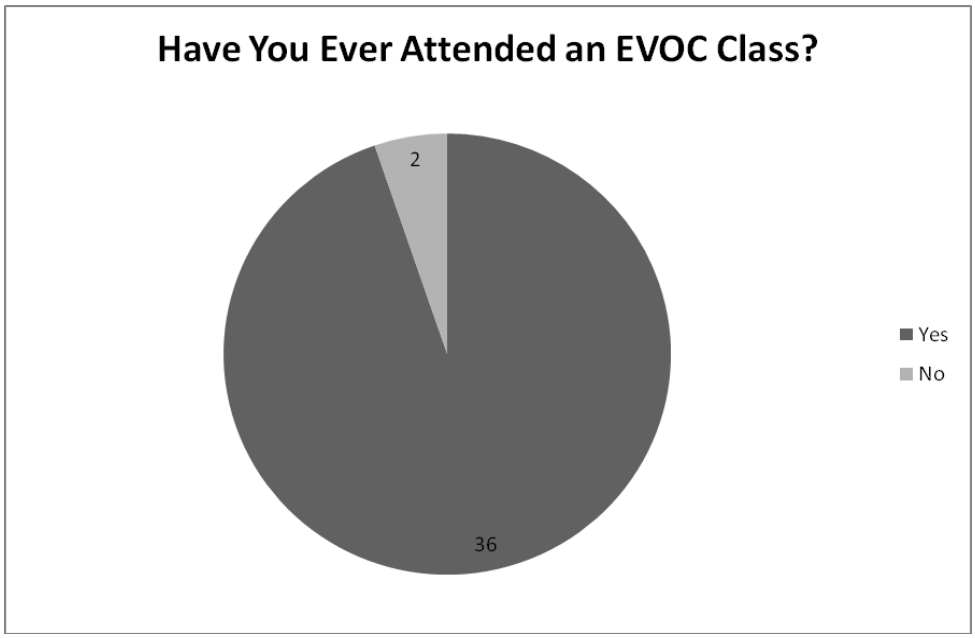

Figure 1.

Answers to Survey Question Number One

Responses to survey question number two measured how recently firefighters had particpated in the EVOC training course. For the majority of respondents, four to five years had passed since they last attended such training.

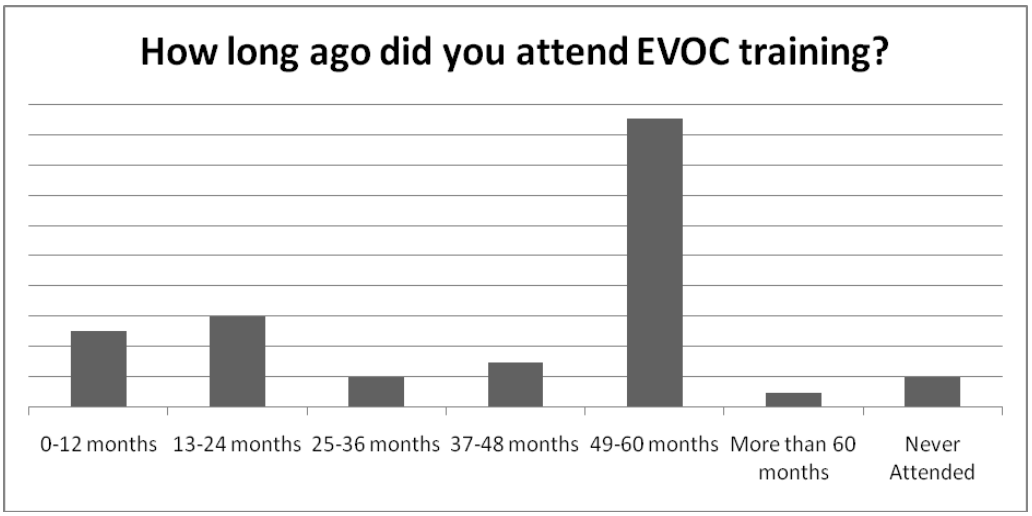

Figure 2.

Answers to Survey Question Numer Two

Survey question number three was designed to explore firefighters attitudes about the responsibility involved in driving an emergency vehicle in response to an emergency. Results reveal that all of those surveyed recognize the great responsibility associated with driving an emergency vehicle.

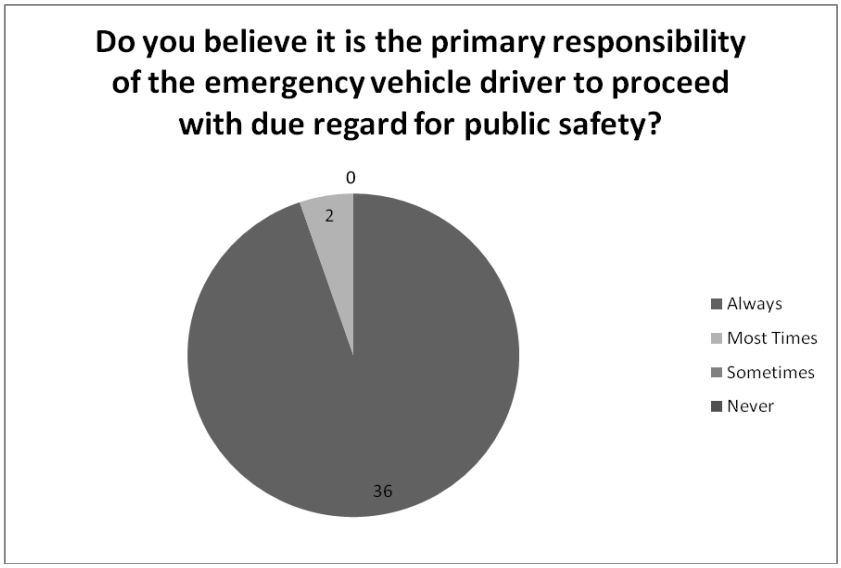

Figure 3.

Answers to Survey Question 3

Survey questions four, five, six, and seven assessed apparatus driver compliance with commonly accepted and Aurora Fire Department SOG (Appendix 2) directed safe emergency response driving practices. These include the wearing of seat belts, stopping at and visually clearing intersections before proceeding, and controlling speed. Results show that most drivers, in most cases, are compliant with expected safe driving behaviors.

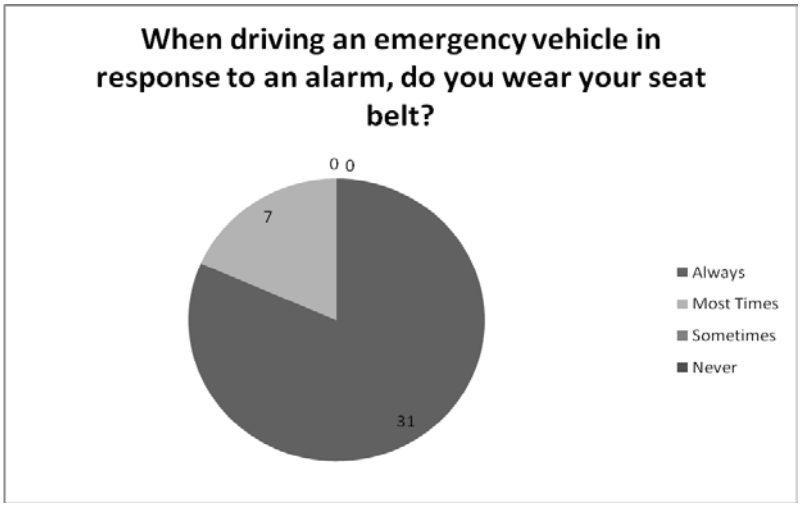

Figure 4.

Answers to Survey Question Number Four

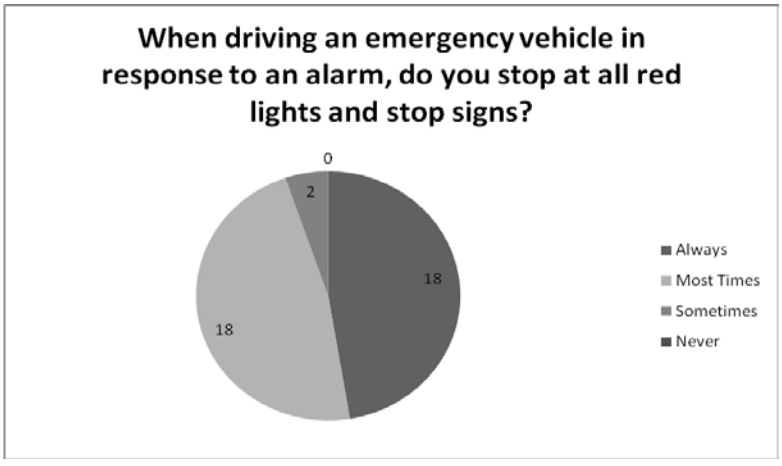

Figure 5.

Answers to Survey Question Number Five

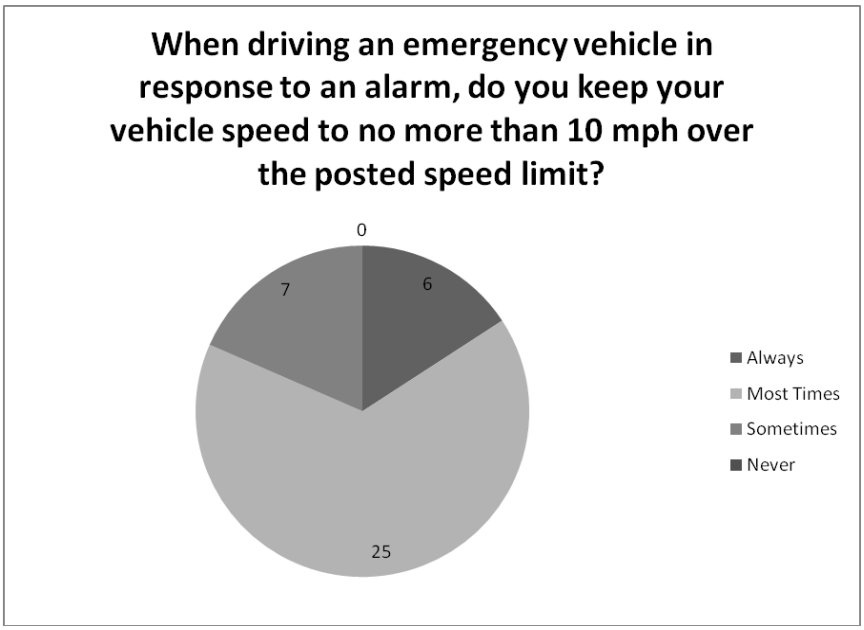

Figure 6.

Answers to Survey Question Number Six

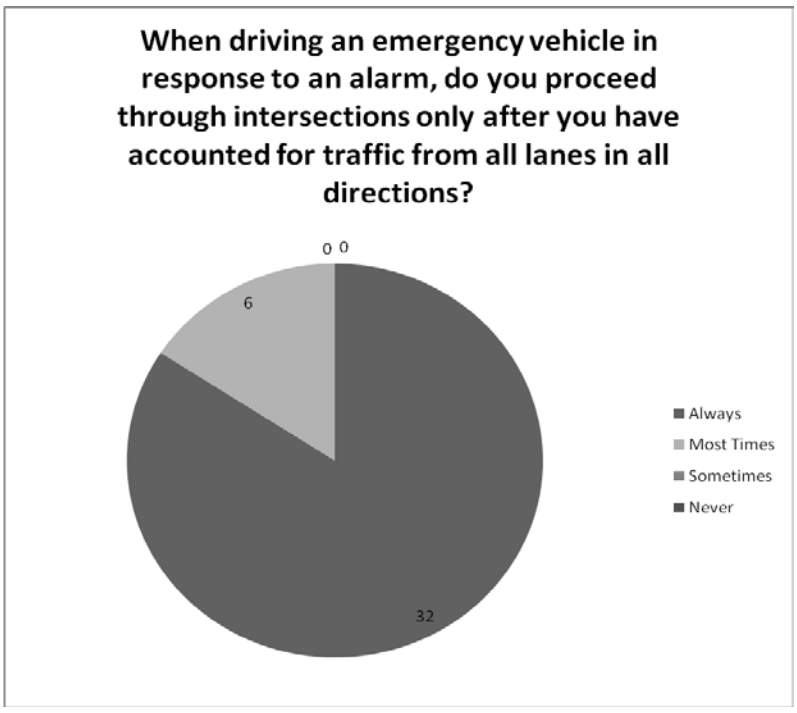

Figure 7.

Answers to Survey Question Number Seven

Survey question number eight examined whether or not there is a uniform understanding of the Aurora Fire Department's SOG with respect to automatic fire alarm responses. Results indicated that approximately one quarter of the respondents have been following procedures that are different from those practiced by the other three quarters of the department.

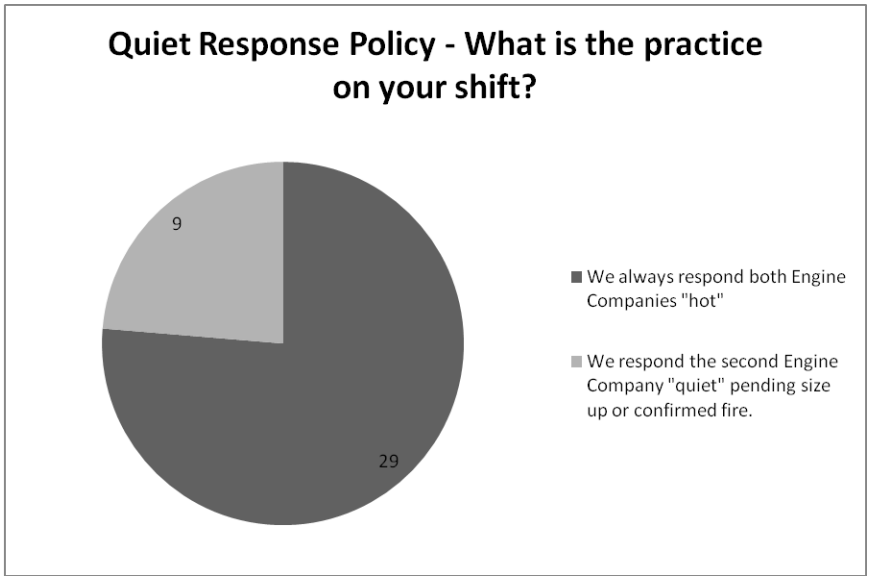

Figure 8.

Answers to Survey Question Number Eight

As part of this research project, fire reports from the past three years were manually sorted and evaluated to determine how frequently fire alarms relate to an incident where an emergency intervention is required by more than simply the first due engine company. In 2007, there were 443 fire reports, of which 185 were fire alarms. Of the 185 fire alarms that the Aurora Fire Department responded to in 2007, 180 were cases where the first due engine company abated the hazard alone, and 5 incidents were situations which required emergency intervention by more than the first due engine company alone (AFD, 2007-2009).

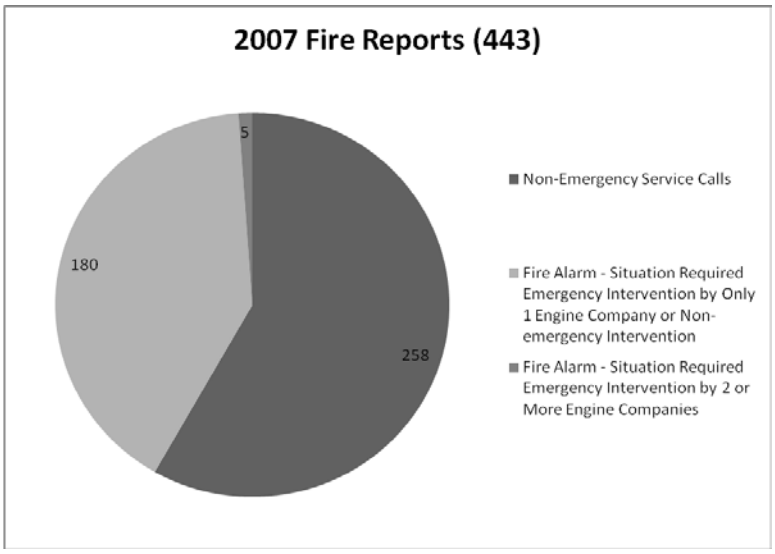

Figure 9.

Analysis of Year 2007 Fire Reports

In 2008, there were a total of 402 fire reports filed. Of those, 152 reports were based on fire alarm responses. Of the 152 fire alarm responses, in 148 cases the first due engine company was able to resolve the emergency without assistance, and in 4 cases emergency intervention by by more than just the first due engine company was required (AFD, 2007-2009).

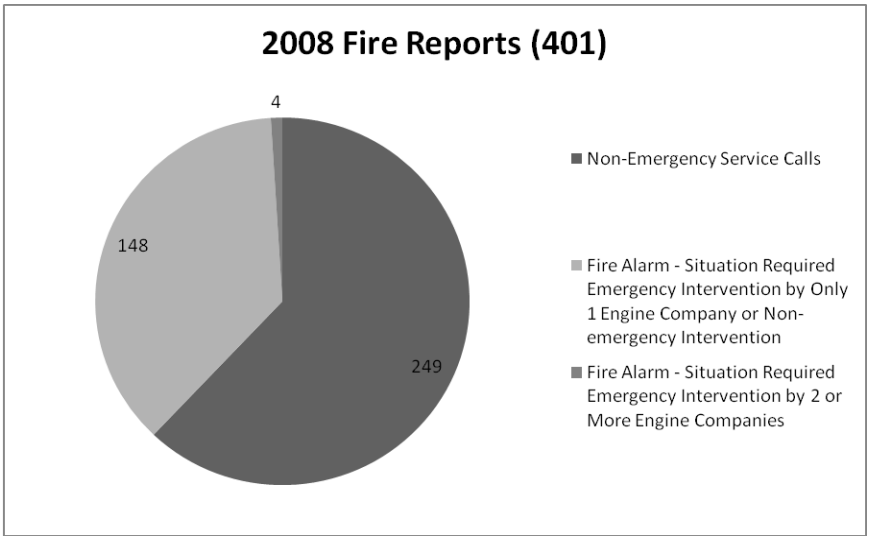

Figure 10.

Analysis of Year 2008 Fire Reports

In 2009, out of 312 fire reports generated, 94 were from fire alarm responses. Of the 94 fire alarm respopnses, 91 were incidents resolved by the first due engine company without assistance, and on 3 occasions additional resources beyond the first due engine company were required (AFD, 2007-2009).

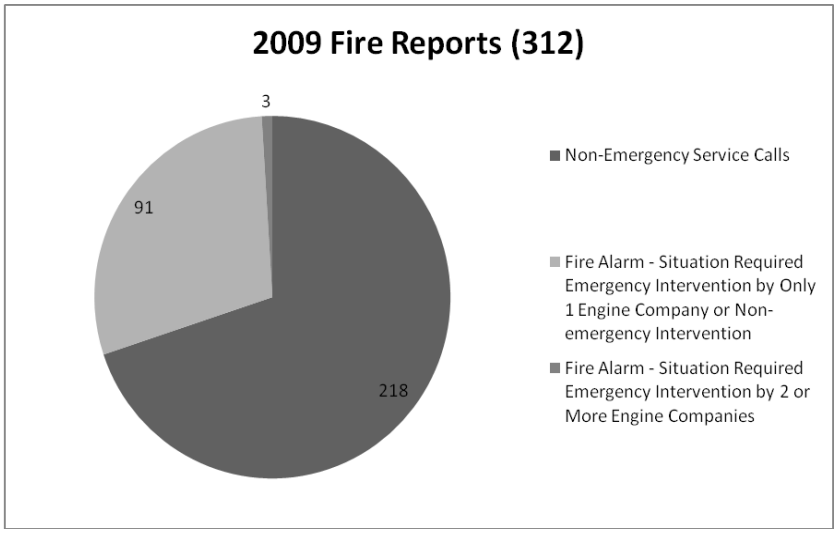

Figure 11.

Analysis of Year 2009 Fire Reports

The literature review associated with this research project brought to light a growing trend nationally toward the implementation of quiet or reduced response policies aimed at reducing the risk of emergency apparatus collisions while responding to fire alarms. In order to gather more local input on fire alarm response policies, approximately 200 fire service professionals, all alumni and current students of the Ohio Fire Executive Program, were solicited by email for comments and experiences on the topic of quiet response policies. This lead to ten personal interviews (Appendix 5) with fire officers from across the State of Ohio who responded and were willing to share their experiences with quiet response policies.

Those responding indicated experience with quiet response policies that had been in effect for as little as one and a half years and as long as over ten years. None of the organizations

waited for an accident to address this issue, rather they were aware of national statistics and trends and adopted these policies proactively. One of the ten respondents reported high resistance within the organization to adopting the new policy, while the rest indicated a relatively smooth transition. None of the ten Ohio fire service professionals interviewed reported any incident in which there was an untoward outcome attributable to a delay caused by the quiet response policy, and universally all believed that the policy was successfully reducing their risk of responding apparatus collisions.

This research also sought to determine if the adoption of a quiet response policy for second due engine companies responding to automatic fire alarms would degrade the Aurora Fire Department's response times to a level below the standard set forth in NFPA 1710. In order to answer this question, response times to six occupancies that were among the most frequent fire alarms over the past three years (AFD, 2007-2009) were queried from an electronic database. In addition, response routes from the second due station were driven and timed without lights and sirens to these six occupancies. This data was collected to represent a probable response time for the second due engine responding under a quiet response policy.

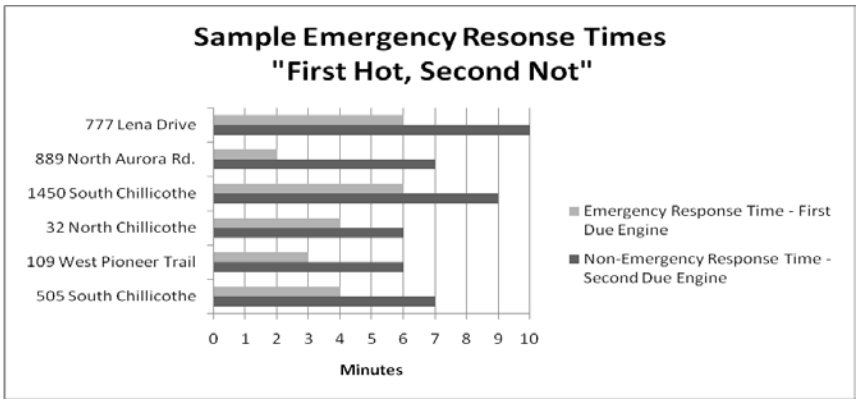

Figure 12.

Response Times to Six Sample Occupancies in Aurora, Ohio

In order to meet the NFPA 1710 standard fire alarm response times, the first due engine company must arrive on scene within five minutes of receiving the alarm at the station, and the second due apparatus must arrive on scene within nine minutes of receiving the alarm, in 90% of cases. The data compiled shows that when responding in a non-emergency fashion, the second due engine company would miss the targeted nine minute response time in one case. This one case is a location which represents a five mile drive for the second due engine, and even the first due engine misses the targeted five minute response while responding with lights and sirens.

DISCUSSION

The survey completed by 38 firefighters revealed that the vast majority of firefighters within the Aurora Fire Department have participated, at some time in their career, in an Emergency Vehicle Operators Course, although for many members this training took place nearly 5 years ago. The National Fire Protection Association recommends that firefighter driver/operators repeat this course every three years (NFPA, 2009). Commendably, survey results indicate that the firefighters understand the responsibility associated with driving an emergency vehicle in response to fire alarms. For the most part, they comply with safe emergency vehicle operating procedures such as wearing seat belts, limiting speed, stopping at intersections, and visually clearing intersections before proceeding through. However, the goal for compliance with these behaviors is 100% since they are outlined clearly in the fire department standard operating guidelines.

The final survey question reveals that there is confusion as to what the official policy is with regard to fire apparatus response to fire alarms. By the SOG book (Appendix 2), the default response is two engine companies responding “hot” (with lights and sirens) to fire alarms and a default “quiet’ or “slow” response for the second due engine company is not mentioned. Rather,

the SOG directs that upon the first arriving unit finding no fire, the second due company may be ordered by radio to reduce their remaining response speed if the first arriving officer determines it would be appropriate. Previously, at a departmental officers' meeting, the Chief of the Aurora Fire Department indicated verbally to the shift officers that, much like a football quarterback who uses his experience and judgment to call a play change at the line of scrimmage, they could advise the second due responding engine company by radio to respond in a non-emergency fashion whenever they suspected that there was low likelihood of the fire alarm amounting to a real working fire incident, even prior to the arrival of the first due engine company. This policy was embraced by some shift officers more than others, it was never placed in print in the SOG manual, and the practical application of the Chief's suggestion has been sporadic. Anecdotally, some firefighters have even expressed the fear that the policy was never printed in black and white so that the Fire Chief could maintain a degree of plausible deniability in the event that the second due engine arrived late to an incident where there was an untoward outcome. For many firefighters, there is a cultural resistance to the idea of responding quietly or slowly to a fire alarm, and a fear of being second guessed when left to use their judgment to determine the appropriate response to a fire alarm. The survey reveals that three quarters of the department is by default responding two engines companies "hot" to all fire alarms and while one quarter of the department follows a quasi-quiet response policy. A standardized policy on emergency responses to fire alarms, stated clearly in the SOG manual, and administered uniformly throughout the department would be beneficial to the orderly and efficient operation of the Aurora Fire Department.

Analysis of the fire report data over the past three years shows that the number of incidences in which two or more engine companies were needed to abate the hazard was very

small. In 2007, it was five out of 185 fire alarms. In 2008, it was four out of 152 fire alarms, and in 2009, it was three out of ninety-four fire alarms that required the intervention of more than the first due engine company (AFD, 2007-2009). It appears from this data, that in the vast majority of cases, only one engine company is needed and that reducing the number of "hot" responses attributed to the second due engine company may represent an opportunity to reduce the exposure to the risk of an apparatus collision. Research has shown that motorists do not always react appropriately, and even when firefighters follow safe driving standards, the very presence or passing of a fire engine with lights and sirens activated can lead to accidents even when the apparatus driver has done nothing wrong (Lucia, 1993) (Wolfburg, 1996).

The literature review undertaken at the outset of this research project revealed that many fire departments across the United States have adopted quiet response policies for certain incident types and conditions. Cities where these policies are in place include St. Louis, LA., Ann Arundel County, MD., Pleasant View, TN, and Detroit, MI. (Rick Markley, 2009) (Hargett, 2005). Typically, such policies allow that unless dispatch has secondary confirmation that a fire alarm is indeed a working fire or life hazard, the first due engine company responding to a fire alarm will proceed "hot" and second due or follow on units are to respond without the use of lights and sirens. Under such response guidelines, the officer-in-charge may order the second due resources to upgrade their response at any time if additional information becomes available indicating the need. Policies such as these set a default response mode that is appropriate for the vast majority or incidents, while allowing the officer-in-charge the latitude and judgment to increase the urgency of additional units when he or she judges it appropriate.

This research included interviews with professional fire service officers in Ohio who had experience with the implementation of quiet response policies, and the positive impressions and

reports from these Ohio fire service professionals concur with accounts uncovered in the literature review from their counterparts across the United States. The ten Ohio fire officers interviewed did not wait for a tragic apparatus collision to disrupt the operation of their agencies, rather they proactively adopted unorthodox quiet response policies and they reported a perceived benefit of a reduced risk of collisions and reported no negative impact on their delivery of fire suppression service to their communities.

One of the cultural obstacles to adopting a quiet response policy is the fear that the fire department will not be able arrive quickly enough and with enough resources when the fire alarm is relative to a genuine working fire. The NFPA standard 1710 for career staffed fire department suggests that firefighters should be able to don their gear and depart from the fire station within one minute after receiving an alarm, and that the first due apparatus should arrive within four minutes driving time, and that second due apparatus should arrive on scene within eight minutes driving time. A fire department that can meet these times in 90% of cases is considered to meet the standard. As a part of this research, response times to the six most frequent occupancies for fire alarm responses over the past three years were analyzed to determine whether or not a quiet response from the second due engine company would still fit within the NFPA response standard. In all but one case, the second due engine company would arrive on time in compliance with the standard even if responding “on the quiet.” The one case outside of the standard represented a 5 mile trip for the second due engine company, and it would seem reasonable that once advised of a confirmed fire by additional callers to dispatch or by radio report of the first arriving engine company, they would be able to step it up and arrive within an acceptable window of time.

In light of NFPA 1500, *Standard on fire department occupational safety and health program*, which directs fire department administrators to have a risk management plan to identify actual and potential hazards, the potential and severity of risks, and an evaluation method and control techniques for all the risks associated with fire department operations (NFPA, 2007) and NFPA 1451, *Standard for a fire service vehicle operations training program*, which emphasizes that it is an administrative responsibility of a fire department to establish standard operating procedures for safely driving or operating emergency vehicles during an emergency and non-emergency responses (NFPA, 2007), it is incumbent upon the executive leaders of fire departments to weigh the necessity and the risk of every emergency response. NFPA standard 1500 further states that "activities that present a significant risk to the safety of members shall be limited to situations when there is a potential to save endangered lives" (NFPA, 2007).

Year after year, motor vehicle collisions while responding to fire alarms continue to represent the second leading cause of firefighter deaths. These deaths are preventable and the cause correctable by modifying the behavior of firefighters.

This research shows that firefighters who drive fire apparatus for the Aurora Fire Department have received driver training based on federal standards and that, in the performance of their duties as apparatus drivers, they generally follow safe driving practices. The data collected in this research indicate that so called "first hot – second not" responses to automatic fire alarms, in which the nearest responding engine company responds in an emergency fashion and the second due engine company responds non-emergency, have been successfully adopted in many cities across the United States and in Ohio to further reduce the risk of responding apparatus collisions. Further the research shows that such a policy could be put in place in

Aurora, Ohio, potentially reducing the risk of a responding apparatus collision and without compromising the necessary emergency response required in the instances when the automatic fire alarm is indeed relative to a working structure fire.

RECOMMENDATIONS

Based on the research compiled here, it is recommended that the Aurora Fire Department host “in house” another Emergency Vehicle Driving Course to refresh and reinforce the knowledge and skills required of all apparatus drivers. Participation in this program should be mandatory for all apparatus drivers. In the future, it is recommended to schedule this course to be repeated at least once every three years in compliance with the NFPA recommended interval for this training (NFPA, 2009).

Based on the research, it is also recommended that the Aurora Fire Department adopt a quiet response policy (Appendix 6) for second due engine companies responding to automatic fire alarms. Under such a policy, a quiet response would be the default response mode for the second due engine company, with the understanding that upon the receipt of additional information indicating a structure fire or true life threat situation, the response shall be upgraded to an emergency lights and sirens response. Also, under this proposed policy, the shift officer-in-charge shall retain the authority to order an upgrade in the response of second due resources in any instance that is advisable in his judgment. This policy should be clearly and plainly stated in the department Standard Operating Guidelines manual and should be disseminated to all department members for review and SOG update training.

It is further recommended that, for each of the next three years, statistics representing the number of fire incidents relative to the number of automatic fire alarms and the response times to automatic fire alarms be analyzed, as they were compiled for this research, to determine whether

the Aurora Fire Department is continuing to meet NFPA 1710 standards for response times to fire alarms.

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APPENDIX 1 – AFD APPARATUS RESPONSE SOG

AURORA FIRE DEPARTMENT
STANDARD OPERATING GUIDELINE

APPARATUS RESPONSE

(#) Denotes manning

Squad Calls:
Zone 1 – Squad 1 (2)
Zone 2 – Squad 2 (3)
*If the call is dispatched as a full arrest or serious nature additional manpower may be sent as necessary by the O.I.C. Second calls shall be handled by the remaining squad.

Traffic Accidents:
Zone 1 - Squad 1 (2) & Rescue Engine
Zone 2 – Squad 2 (3) & Rescue Engine
*If additional squad is needed send the remaining squad.

Car Fires and Dumpster Fires:
Zone 1 – Engine 1 (3) & Squad 1 (1)
Zone 2 – Engine 2 (3) & Squad 1 (2)

Grass Fire:
Zone 1 – Engine 1 (3), Squad 2 (3) & Car 4 (1)
Zone 2 – Engine 2 (3) & Squad 1 (2) & Car 4 (2)

Structure Fire – Vehicles in Garages:
Zones 1 & 2 – Engine 1 (3), Engine 2 (3) & Squad 1 (1)
*Additional apparatus to respond when needed by off duty personnel.
*Engine 3 should respond to areas without hydrants before the Ladder

Mutual Aid:
Squad: Closest squad to location needed (2 or 3)
Engine: Closest engine to location needed – Engines shall respond with all on duty Manpower. If Station 1 responds, Station 2 shall monitor radio traffic and move up to Station 1 if necessary. If Engine 2 responds with less than 3 personnel, Car 4 may be sent with 2 additional personnel.
*Contact O.I.C. at Station 1 if you are not sure who to send.
Ladder: Ladder 1 (4)
Station 2 shall monitor radio traffic and move up to Station 1 if necessary.
Heavy Rescue: Rescue Engine from Station 1 (2 or 3)

Investigations, Open Burning:
Zone 1 – Engine 1 (2)
Zone 2 – Engine 2 (3)

APPENDIX 2 – AFD DRIVER SAFETY SOG

AURORA FIRE DEPARTMENT
STANDARD OPERATING GUIDELINE
DRIVER SAFETY PROGRAM

It is the responsibility of the driver of each Aurora Fire Department vehicle to drive safely and prudently at all times. Vehicles shall be operated in compliance with all applicable State of Ohio traffic laws. These laws provide specific legal exceptions to regular traffic regulations which apply to Fire Department vehicles only when responding to an emergency incident or when transporting a patient to a medical facility. Emergency response does not absolve the driver of any responsibility to drive with due caution. The driver of the emergency vehicle is responsible for its safe operation at all times.

When responding "emergency response", warning lights must be on and sirens must be sounded to warn drivers of other vehicles as required by Ohio Motor Vehicle Laws.

The use of sirens and warning lights does not automatically give the right-of-way to the emergency vehicle. These devices simply request the right-of-way from other drivers, based on their awareness of the emergency vehicle presence. Emergency vehicle drivers must make every possible effort to make their presence and intended actions known to other drivers and must drive defensively to be prepared for the unexpected inappropriate actions of others.

Fire Department vehicles are authorized to exceed posted speed limits only when responding "emergency response" under favorable conditions. This applies only with light traffic, good road, good visibility and dry pavement. Under these conditions ***a maximum of 10 mph over the posted speed limit*** is authorized. Under less than favorable conditions, the posted speed limit is the absolute maximum permissible.

When emergency vehicles must travel in the center or oncoming traffic lanes, ***the speed shall be adjusted to meet the conditions, but shall not exceed the posted speed limit.***

Intersections present the greatest potential danger to emergency vehicles. When approaching and crossing an intersection with the right-of-way, ***drivers shall not exceed the posted speed limit***.

When emergency vehicles must use the center or oncoming traffic lanes to approach controlled intersections (traffic light or stop sign), ***they must come to a complete stop before proceeding through the intersection, including occasions when the emergency vehicle has green traffic lights***.

When approaching a negative right-of-way intersection (red light, stop sign), the vehicle ***shall come to a complete stop and may proceed only when the driver can account for all oncoming traffic in all lanes yielding the right-of-way***.

"EMERGENCY RESPONSE" is authorized only in conjunction with emergency incidents. Unnecessary emergency response shall be avoided. In order to avoid any unnecessary response, the following rules shall apply:

1. When the first unit reports on the scene with "nothing showing" or an equivalent report, any additional units ***shall continue "emergency response" but shall not exceed the posted speed limit***.
2. The first arriving unit will advise additional units to respond "nonemergency" (no lights or sirens) whenever appropriate.

AURORA FIRE DEPARTMENT
STANDARD OPERATING GUIDELINE
DRIVER SAFETY PROGRAM

Drivers shall avoid backing whenever possible. Where backing is unavoidable, guides shall be used. If no guide is available, the driver shall dismount and walk completely around the apparatus to determine if obstructions are present before backing.

All Aurora Fire Department personnel and passengers are required to used seat belts at all times when operating a Fire Department vehicle equipped with seat belts. The ranking member of the vehicle crew will confirm that all personnel and riders are on board, properly attired and restrained before the vehicle is permitted to move. All personnel shall ride only in regular seats equipped with seatbelts. **Riding on tailboards or other exposed positions shall not be permitted on any vehicle at any time.**

During an emergency response, fire vehicles should not pass other emergency vehicles. If passing is necessary, permission must be obtained through radio communications with said vehicle.

The unique hazards of driving on or adjacent to the fireground requires the driver to use extreme caution and to be alert and prepared to react to the unexpected. Drivers must consider the dangers their moving vehicle poses to fireground personnel and spectators who may be preoccupied with the emergency and may inadvertently step in front of or behind a moving vehicle.

When stopped at the scene of an incident, vehicles should be placed to protect personnel who may be working in the street and warning lights shall be used to make approaching traffic aware of the incident. At night, vehicle-mounted floodlights and any other lighting available shall be used to illuminate the scene. All personnel working in or near traffic lanes shall wear approved bunker gear with reflective trim or reflective safety vests. If it is not necessary to park vehicles in or near traffic lanes, the vehicle should be pulled off the road to parking lots, curbs, etc. whenever possible.

THE OFFICER IN CHARGE OF THE VEHICLE IS RESPONSIBLE FOR THE SAFETY OF ALL VEHICLE OPERATIONS AND MANAGING COMPLIANCE OF THIS PROCEDURE.

EMERGENCY RESPONSE POLICY

Aurora Fire Department vehicles shall be operated in a manner that provides for the safety of all persons and property. Safe arrival shall always have priority over unnecessary speed and reckless driving en route to an emergency incident.

Prompt, safe response shall be attained by:

1. Leaving the station in a **standard** manner:
    a. quickly mounting apparatus
    b. all personnel on board, seated and restrained
    c. station doors fully open
2. Driving defensively and professionally at reasonable speeds
3. Knowing where we are going
4. Using warning devices to move around traffic and to request the right-of-way in a safe and predictable manner
5. Passing of vehicle going in the same direction shall be on the left side

AURORA FIRE DEPARTMENT
STANDARD OPERATING GUIDELINE
DRIVER SAFETY PROGRAM

Fast response shall not be attained by:

1. Leaving quarters before crew has mounted safely and before apparatus doors are fully open
2. Driving too fast for conditions
3. Driving recklessly or without regard for safety
4. Taking unnecessary chances with negative right-of-way intersections
5. Intimidating or scaring other drivers

EMERGENCY RESPONSE CRITERIA

1. Maximum 10 mph over posted speed limit except during adverse conditions
2. Traveling in center/oncoming traffic lanes:
    a. speed shall be adjusted to meet conditions
    b. speed shall not exceed posted limit
    c. complete stop at all traffic lights/stop signs
3. Posted speed limit when entering intersections with green light
4. Complete stop at all red lights and stop signs

Vehicle backing and signals

Backing of Fire Department vehicles should be avoided whenever possible. Where backing is unavoidable, spotters shall be used. In addition, spotters shall be used when vehicles must negotiate forward turns with restrictive side clearances and where height clearances are uncertain.

Under circumstances where the vehicle is manned by only the driver, said driver shall attempt to utilize any available Fire Department personnel to act as spotters. When personnel are unavailable to assist, said driver shall get out of the vehicle and make a complete 360-degree survey of the area around his vehicle to determine if any obstructions are present.

Where engine or ladder companies are backed, all crew members (except the driver) shall dismount the apparatus and act as spotters, including the Company Officer. Spotters should be located at as many corners as possible with at least one spotter at the left rear corner of the apparatus who will act as the primary spotter. Where only a single spotter is available, the spotter should be located off the left rear corner.

Spotters are not permitted to ride tailboard positions while backing fire apparatus. Spotters will discuss the backing plan with the engineer/driver before proceeding. The communication/warning process will be agreed upon prior to backing. Both door windows (driver and from passenger) will be in the down position to allow for maximum communication/hearing between spotters and the engineer/driver. Fire radio volumes will be turned down.

The vehicle shall not be backed until all spotters are in position and communicate their approval to start the backing. Spotters will remain visible to the engineer/driver. Anytime the driver loses sight of the primary spotter, the vehicle shall be stopped immediately until the spotter is visible and the communication to continue backing is processed. When vehicles must be backed where other vehicle traffic exists, the vehicle's emergency lights (if so equipped) shall be operating and bunker coats or safety vests with reflective trim shall be worn by all spotters.

APPENDIX 3 – OHIO TRAFFIC SAFETY OFFICE CRASH REPORTS

OHIO DEPARTMENT OF PUBLIC SAFETY
EDUCATION · SERVICE · PROTECTION

Parameterized Report

From Date	01/01/2006
To Date	12/31/2006
County(s)	All Counties

Parameters / Values

Unit Type	Fire Truck
Emergency Use	Yes

Crashes	
Fatal	1
Injury	17
Property Damage Only	90
Unknown	0
Total	**108**

People	
No Injury	259
Possible	6
Non-Incapacitating	2
Incapacitating	0
Fatal	0
Not Stated	8
Total	**275**

Report generated on : 10/8/2009 6:09:47 PM

OHIO DEPARTMENT OF PUBLIC SAFETY
EDUCATION · SERVICE · PROTECTION

Parameterized Report

From Date	01/01/2007
To Date	12/31/2007
County(s)	All Counties

Parameters / Values

Unit Type	Fire Truck
Emergency Use	Yes

Crashes	
Fatal	1
Injury	14
Property Damage Only	80
Unknown	1
Total	**96**

People	
No Injury	207
Possible	10
Non-Incapacitating	3
Incapacitating	0
Fatal	0
Not Stated	10
Total	**230**

Report generated on : 10/8/2009 6:11:18 PM

OHIO DEPARTMENT OF PUBLIC SAFETY
EDUCATION · SERVICE · PROTECTION

Parameterized Report

From Date	01/01/2008
To Date	12/31/2008
County(s)	All Counties

Parameters / Values

Unit Type	Fire Truck
Emergency Use	Yes

Crashes	
Fatal	2
Injury	29
Property Damage Only	95
Unknown	1
Total	**127**

People	
No Injury	307
Possible	7
Non-Incapacitating	12
Incapacitating	2
Fatal	1
Not Stated	3
Total	**332**

Report generated on : 10/8/2009 6:12:34 PM

APPENDIX 4 – SURVEY QUESTIONAIRE

Aurora Fire Department Emergency Vehicle Operations Survey

This anonymous survey is a research instrument to gather data about our firefighters' attitudes toward the safe operation of emergency vehicles and to gauge their knowledge of and compliance with department standard operating policies and guidelines. Please answer truthfully and to the best of your knowledge. Your reply will be combined with all others to produce statistical results for the department and will not reflect personally on you. All results will be shown as grouped responses in the form of percentages.

Select the correct answer for each of the following questions:

1. Have you ever participated in an emergency vehicle operator's course of instruction? Y / N

2. If yes, how many months has it been since you completed the course? #_____ months.

3. Do you believe it is the primary responsibility of the driver of an emergency vehicle to proceed with due regard for the safety of the public?
   Always ___. Most times ___. Sometimes ___. Never ___.

4. When driving an emergency vehicle in response to an alarm, do you wear your seat belt?
   Always___. Most times___. Sometimes___. Never___.

5. When driving an emergency vehicle in response to an alarm, do you stop at red lights and stop signs?
   Always ___. Most times ___. Sometimes ___. Never___.

6. When driving an emergency vehicle in response to an alarm, do you keep your vehicle speed to no more than 10 mph over the posted speed limit?
   Always ___. Most times ___. Sometimes ___. Never ___.

7. When driving an emergency vehicle in response to an alarm, do you proceed through intersections only after you have accounted for traffic from all lanes in all directions?
   Always ___. Most times___. Sometimes ___. Never___.

8. Some fire departments have adopted a "quiet response" policy which directs second due apparatus to respond without lights and sirens unless and until dispatch is receiving confirmation of an actual working fire or life hazard or pending the size up report of the initial arriving officer. How does your shift or company handle automatic fire alarms that are <u>not confirmed</u> fires or life hazards? Check only one response:
   ___A) We always respond all apparatus with lights and sirens, unless or until directed otherwise by the Officer in Charge.
   ___B) We respond the second due engine "quiet" pending initial size up or unless it's a confirmed fire.

APPENDIX 5 – OHIO FIRE EXECUTIVES INTERVIEW SURVEY

Ohio Fire Executives Quiet Response Policy Survey

The following questions were discussed in telephone interviews with 10 professional fire executive officers, all alumni of the Ohio Fire Executive (OFE) Program. A mass email request was sent to all OFE alumni seeking feedback and experiences with the adoption of quiet response policies for automated fire alarms.

Name of contact:_____

Agency:_____

How long has your agency utilized a quiet response policy? _____

What led your organization to adopt such a policy? Particularly, was there in incident involving an apparatus collision while responding?

Did your organization experience any internal resistance in implementing a quiet response policy?

Are you aware of any occasions in which your quiet response policy led to a delayed response in a truly critical emergency which resulted in an untoward outcome?

Do you believe that the adoption of a quiet response policy has reduces your agency's exposure to the risks of collisions, injuries, and death?

APPENDIX 6 – PROPOSED AFD AUTOMATIC ALARM RESPONSE SOG

AURORA FIRE DEPARTMENT
STANDARD OPERATING GUIDELINE

DRIVER SAFETY PROGRAM

(page 14, paragraph 9)

"EMERGENCY RESPONSE" is authorized only in conjunction with emergency incidents. Unnecessary emergency response shall be avoided. In order to avoid any unnecessary response, the following rules shall apply:

1. Calls for a fire department response where a caller has observed smoke or fire in a structure, or other life threatening condition, and subsequently called 911 or otherwise manually initiated a fire alarm, will warrant an emergency response from all responding apparatus.

2. Upon initial size up, the first arriving fire officer will advise additional units to respond "nonemergency" (no lights or sirens) whenever appropriate.

3. Automated structural fire alarms which have been transmitted by electronic fire alarm systems and which are not received in conjunction with eyewitness reports of fire, smoke, or other life threatening conditions, will warrant an emergency response from the engine company in the response district of the alarm, and a non-emergency or quiet response from the second due engine company. If at any time following the alarm, additional information becomes available indicating an actual structure fire or other life threatening situation, the second due engine company shall "step up" their response. The officer-in-charge shall retain the authority to upgrade the second due engine company quiet response in any case where he or she judges it to be appropriate.