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Leading Community Risk Reduction

Traffic Management at Emergency Scenes

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An Applied Research Project submitted to the National Fire Academy

as part of the Executive Fire Officer Program

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Appendix B Not Included. Please visit the Learning Resource Center on the Web at http://www.lrc.dhs.gov/ to learn how to obtain this report in its entirety through Interlibrary Loan.

Certification Statement

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

Signed: _____

William D. Hicks Jr. Date

Abstract

The Members of the White Hall Fire Department regularly respond to incidents that expose them to traffic flow. This research project was conducted to identify the necessary components of an effective plan for management of traffic flow at emergency scenes, and to develop an operating procedure for protecting the safety of the members of the department. This was accomplished through literature review, searches of electronic databases, and study of several guides and standards found in the National Fire Codes. The results showed that traffic management training, standard operating procedures, and appropriate warning devices and equipment were necessary to protect responders from these hazards.

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Introduction

On almost a daily basis, members of the White Hall Fire Department respond to emergency scenes which expose them to traffic flow hazards. Better planning and procedures are necessary to protect the membership from being struck during these operations. The purpose of this research was to identify the necessary components of an effective traffic incident management plan at emergency scenes, and to develop a multi-agency operating procedure for the department to implement during operations. These measures should decreases the risk of our members being injured, and additionally protect the environment and property. The research methodology for this Applied Research Project was Action. This was accomplished by integrated literature review, which resulted in the production of an operating procedure and a training curriculum.

This paper addressed the following questions:

1. What types of incidents (statistics, incident reports, etc.) are occurring during exposure to traffic flow that are injuring emergency responders nation wide?
2. What resources does each agency have that can increase the safety of the responders?
3. What research has been published on the topic?
4. What are other agencies doing to protect their personnel?
5. What are the recognized methods for traffic control at emergency scenes?
6. How can we protect our members from the hazards of operating in and around vehicular traffic?

Background and Significance

The White Hall Fire Department is an all volunteer fire district serving 15,000 citizens. This department relies on members of the community to supply manpower for

its mission to provide fire service activities. We respond to a 9 mile stretch of Interstate Highway 75, 8 miles of Federal Highway 627, and untold rural roadways and state highways in our 83 square mile district.

Although this agency does not provide technical rescue to the district, our staff respond in conjunction with the Madison County Rescue Squad to vehicle accidents, and provide traffic control for law enforcement agencies. In addition, the department also responds to hazardous materials and vehicle fire calls. The result has been consistent exposure to the hazards of operating on or near the travel path of motor vehicles. It has been one area where our membership is exposed to high risk of major injury or death, and as a result is in need of constant improvement and review of the operating procedures and safety guidelines that are in place.

In order to insure the safety of all personnel on the fire ground and to protect the victims of roadway accidents from further harm, this department must identify the components necessary for an effective traffic incident management (TIM) plan. The department has recently experienced its first traffic flow related injury. Thanks to quick action and situational awareness, the injury resulted in no apparent permanent disability. The sight of one of our members in pain and injured brought to light the need to reevaluate all the risks associated with TIM. The source of this injury, a mutual aid agency, also proved once again that the department must take a multi-agency, all hazards approach to provide protection in concert with all responding agencies.

This Applied Research Project (ARP) will identify and implement the recognized components of an effective plan for management of traffic flow. This research will also identify findings of other research that has occurred, the types of incidents that are

occurring, and the resources that other local and state agencies have that will assist in protecting our responders. This project will also review what other agencies are doing to protect their personnel, and identify recognized methods for traffic control at emergency scenes.

This research project, identifying the necessary components of an effective plan for management of traffic flow at emergency scenes, is relevant to the course work included in the curriculum of the National Fire Academy's Executive Fire Officer Program (EFOP), *Leading Community Risk Reduction* R280 course (National Fire Academy, 2006). This researcher noted the following five distinct links:

First, *Unit 1: Getting Ready* summarized the following: (1) Summarize the high risk audiences for fire and injury; (4) Describe the role of risk reduction in addressing the risk area;

Secondly, *Unit 2: Assessing Community Risk* related to the following: (1) conduct a community risk assessment that identifies and assess the critical hazards and vulnerabilities of a typical community;

Third, *Unit 3: Building Support*, in terms of (2) Identifying strategies for building organizational equity for community risk reduction; (3) Identifying community stakeholders with a vested interest in the risk reduction initiatives;

Forth, Unit 4: *Intervention Strategies*, by identifying (1) Considering acceptable Solutions; (2) Establish process objective using cost versus benefit analysis;

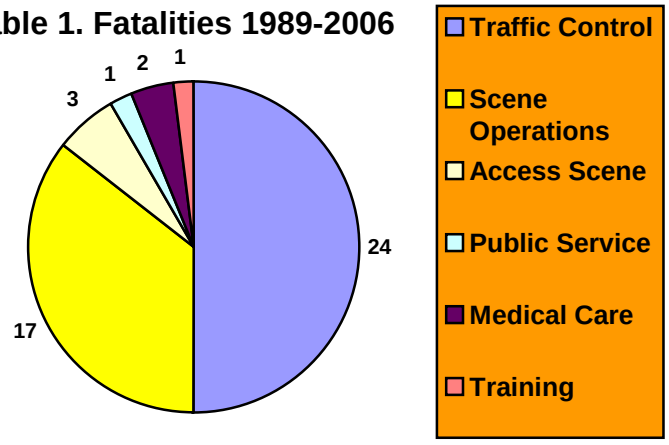
Fifth, *Unit 8; Action Plan,* by defining (1) External stake holders; (2) Establish evaluation milestones; (5) Develop a draft action plan.

This ARP relates to the following United States Fire Administration, National Fire Academy (NFA, 2005, p. II2) operational objectives: (c) To reduce the loss of life (from fire) of firefighters; (d) to promote within communities a comprehensive, multi-hazard risk reduction plan led by the fire service organization; and (e) To respond appropriately in a timely manner to emerging issues.

Literature Review

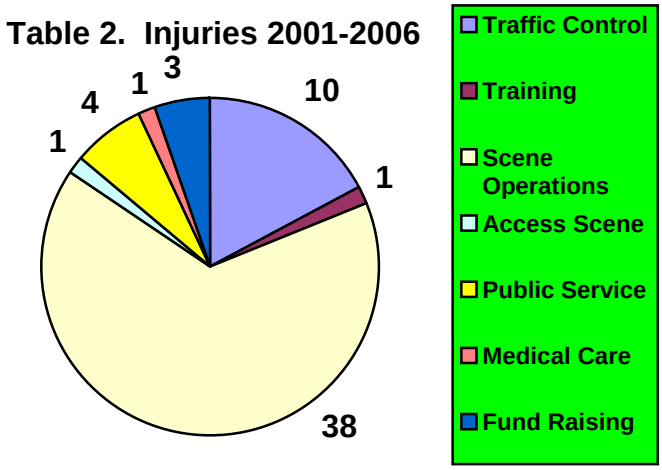
A review of available publications and resources (statistics, incident reports, ect.) was performed to identify the common factors of incidents during emergency responder exposure to traffic flow resulting in injuries, fatalities, and near-misses or close calls. First, available data provided an overview of the activity being performed when Line of Duty Fatalities have occurred. Table 1 documents the activity being performed and the number of number of deaths that occurred during each type of activity between 1989 and 2006, per 2006 NFPA (2005) and NFFF Database (2006).

Table 1. Fatalities 1989-2006



Another resource regarding information on protecting responders of all types from these hazards is the web site located at www.respondersaftey.com. Provided on this web site is an archival collection of news and emailed reports of injuries and near misses involving all first responders, but for the purpose of this research project, only

information regarding fire service personal was noted. Tables 2 represents the injuries recorded on this web site between the year 2001 and up to the date the web site was last accessed by the author on December 27th, 2006 (see Bibliography for Table-2 in references section). This is not considered a comprehensive listing, but is offered to show current trends of injuries during exposure to traffic flow.



One of the essential sources for tracking injury, illness and death among America's work force is the Center for Disease Control's (CDC) National Institute of Occupational Safety and Health (NIOSH). They support the Fire Fighter Fatality Investigation and Prevention Program, which reviews Line of Duty Deaths involving Americas Firefighters. The incidents reviewed do not represent the entire library of NIOSH investigation available, yet attempt to provide a wide range of root causes, incidental causal factors and those involving volunteer and career.

The first incident the author reviewed from NIOSH (2004) occurred on February 23, 2003, in New Jersey. A 63 year old male Volunteer was struck by a motor vehicle while directing traffic in heavy fog, and later died of complications from his injuries on

April 19, 2003. The investigation revealed that at the time of the incident, visibility was down to 20 feet, and the victim was wearing a reflective vest.

The next incident published by NIOSH (2003) occurred in Minnesota on July 1, 2002. The 28 year old victim, serving as Captain, was gathering scene information, when a passenger car traveling northbound was rear ended by a pick up truck. The passenger car then skidded sideways into the scene and struck 5 victims. The weather was clear and dry, the topography of the area was not a factor, and the vehicles involved were all traveling below the posted speed limit.

On June 8, 2002, an off-duty Firefighter was killed and a second off-duty Firefighter was injured when they were struck by a Tractor-trailer while working at the scene of a motor vehicle incident in Florida, reported NIOSH (2004). Both Firefighters, along with several other bystanders, had stopped to aid a motorist who was trapped in an overturned motor vehicle which was in the highway divider. A heavy rain was failing, and stopped traffic caused a tractor-trailer to swerve into the median, striking all 6 of the persons attempting to give aid. In addition to the Fire Fighter, a Physician was also killed, and the surviving fire fighter received a broken leg. The tractor-trailer was noted to have defective windshield wipers, and no traffic control of any type had been established.

In Mississippi, on March 20, 2002, a 19 year old volunteer was struck by a passenger car, and thrown into the roadway, where he was struck and killed by a pickup truck. The investigation by NIOSH (2003) revealed the Firefighter had responded in his Personal Owned Vehicle (POV) (which was not equipped with warning devices) to a non-injury incident, and while on scene, a second incident occurred. The victim walked

to this second scene to asses the situation. An approaching vehicle was changing lanes to give the incident room when the driver lost control, traveled along the shoulder, and struck the victim, throwing him into the travel portion of the lane where he was struck a second time.

A volunteer Fire fighter was struck and killed by a tractor-trailer on September 27, 1999 in South Carolina. This Incident was also investigated by NIOSH (2000). The victim was providing traffic control for a mutual aid department operating at an accident scene. The victim placed an apparatus up stream from the incident in an area of high visibility to provide warning for oncoming traffic. After approximately forty minutes, a tractor-trailer was observed to apply its brakes and come to a complete stop. The driver of the vehicle got out, inspected his truck, and then returned to the cab and traveled away from the scene. About 2 minutes later, another driver stopped to alert the members on scene that there was a Firefighter down in front of an apparatus. The front of the fire apparatus, and the victim had both been struck. The victim was wearing a yellow rain suit, but had no reflective garment. A slow/stop handheld sign was found next to the victim, broken into three pieces.

Other organizations are also tracking the types of incidents and their associated causes. In March of 1999, a national summit was held to discuss the problems associated with secondary incidents, or those that occur while responders are attending to the original emergency. Sponsored by the Cumberland Valley Volunteer Firemen's Association (CVVFA) this meeting gave direction toward the authoring of a white paper, funded by a grant from the USFA titled, "Protecting Emergency Responders on the Highways" (CVVFA 1999). This paper addresses several factors in secondary incidents.

One recurring theme is a lack of awareness of the public in regards to the hazards of approaching an emergency scene, and of first responder's roles in the control of that traffic's interaction in and around the original emergency. Also noted by this focus group was a lack of understanding, consistency, or even agreement on the minimum training for first responders operating near moving traffic.

Moore (2005) addressed these risk factors in Part-II of his firehouse.com Vehicle Rescue Safety series. He noted that of recent Line of Duty Deaths (LODD) involving being struck by a motor vehicle, all included the common factor that effective traffic control had not been implemented. The author goes onto say, "Traffic accidents cause traffic problems…Traffic problems cause traffic accidents…Working in or near moving traffic is a high risk activity".

Sullivan (2001) states that the trend for "struck by" incidents is on the up swing, with no sign of dropping off. He adds to the list of causal factors: the speed at which traffic is moving, lane obstructions, temporary detours, drivers distracted by the original event, and even lack of traffic control. Sullivan goes on to point out hazard awareness of the causal factors as the first step in protecting responders, and quotes Chicago Fire Commissioner James Joyce in telling his personnel to "operate as if someone is trying to run you over", as a good example of getting the word out in a manner easily remembered.

The next area of discussion is to identify who the major players are during roadway incidents and identify the resources each agency would have that can increase the safety of the responders on scene. In an article titled "Traffic Incident Management", Helman (2004), Manager for Traffic Incident Management, US Department of Transportation, identifies the 8 major players in traffic incident management.

Helman explains that public safety agencies, such as law enforcement, fire and rescue, and emergency medical services (EMS) are generally called "first responders." Other agencies such as transportation (operations and maintenance), towing and recovery, and hazardous materials contractors generally are enlisted for specific services but act in support roles to the public safety responders, and are called "secondary responders."

The first entity discussed by Helman, law enforcement agencies, provide 24-hour emergency response and operate under a paramilitary command structure. At most traffic incidents, law enforcement officers act alone and are trained to make unilateral command decisions and may be jurisdictional, county, state or federally empowered. They have the authority to enforce laws and to act to correct those who would pose a threat by incorrect or illegal actions. Some law enforcement agencies operate special departments within their organizations which provide response vehicles just for traffic control purposes.

Fire and rescue services provide 24-hour emergency response and operate on-scene under a well-defined command structure. Unlike police, who operate individually for most duties, fire departments function under a highly organized team structure under the close supervision of a commanding officer. The resources found in fire departments include apparatus for lane blocking and shielding, traffic cones, and warning lights.

Emergency medical services (EMS) have evolved as primary caregivers to individuals needing medical care in emergencies. As with police and fire, emergency medical personnel have a defined set of priorities. They focus on providing patient care, rescuing crash victims, and ensuring the safety of their personnel. In many communities, fire and rescue companies provide emergency medical services. In other areas, other

public agencies or private companies provide those services to local jurisdictions under contract.

Helm goes on to identify the secondary responder group. First, transportation agencies are typically called to the incident scene by first responders, usually law enforcement. Transportation personnel assist in traffic control, cleanup of debris, repair of damage to the highway infrastructure, and motorist aid. Transportation agencies also operate Transportation Management Centers (TMCs) that are the prime source of traffic information for the media. They also have access to large amounts of portable traffic control apparatus, such as variable messaging signs, as well as fixed messaging signs, mobile barrier trucks, and control over fixed traffic control devices. Some transportation departments support highway incident response vehicle solely for traffic control.

Towing and recovery service providers are private sector partners responsible for the safe and efficient recovery and removal of wrecked or disabled vehicles, and debris from the incident scene. They operate under a towing contract or rotational call agreement usually maintained by a law enforcement agency. Hazardous materials contractors are hired by emergency or transportation authorities to clean up and dispose of toxic or hazardous materials. Most common (and small quantity) engine fluid spills (such as oil, diesel fuel, gasoline, and antifreeze) can be contained and cleaned up by the fire department, with waste being handed off to towing companies for proper disposal.

Helm concludes by identifying other agencies and private sector service providers who can play important roles in traffic incident management off-scene. Public safety communications personnel receive reports of incidents and provide the location and severity to the appropriate dispatch center, such as police, fire, or EMS. Using traffic

feeds, detectors, aerial surveillance, and other traffic reporting media, they can collect incident data and provide reports to television, radio stations, pager systems, and the internet to warn the public of traffic impact and detours. This advanced notice can help to keep the driver alert to changing conditions and make the situation safer for all involved.

Sullivan (2006) stresses that once all the players have been identified, multi-agency planning is a must. All the players must be included and need to take a coordinated approach. "If you have never held a table top drill, now is the time" says Sullivan. The author goes on to stress how important it is that this is a preplanned coordinated effort so all involved have time to air concerns, questions, and get their ideas addressed.

The next goal of this research project was to identify what research had been published on this significant topic. As mentioned before, the Cumberland Valley Volunteer Firemen's Association (CVVFA 1999) helped to support a white paper on this subject. They organized their findings into five major headings during a follow up review held October 30^{t}-31, 1999 at the National Fire Academy (NFA) in Emmitsburg, MD, which culminated into a written publication.

The focus group addressed the fact that first responders are called to assist the public in a multitude of capacities which expose them to vehicle traffic. They provided traffic control that is both directly related to the situation, and also respond just to assist in a traffic control for other agencies, both public and private. Next, the need for unified command was addressed to keep order and avoid further chaos.

The third area expanded on the need for effective laws that would protect the responders, and provide enforceable and significant penalties for violations. Just like

laws and standards protect the public from dangerous products, laws would provide extra incentive for the public to operate with caution around responders.

The next area of concern in the CVVFA white paper was for the physical and mental health of the responder. They face uncertainty in every new situation, and know they may be injured or killed at any time. The report calls for minimum evaluation criteria to be enforced as to their physical and mental condition in order to better prepare them for the dangers they may face. The discussion also addressed public education, in that the public needs to be aware of the dangers of emergency scenes on roadways, and how they can play their part in making the environment safer for all who work in it and pass through it. Public education programs must be developed, and the information disseminated to the driving public.

The U.S. DOT Partnered with Texas A&M's Texas Transportation Institute to publish a study titled Incident Management Performance Measures. Balk et al, (2002) worked to identify measurement standards that are being used to identify the effectiveness of traffic incident management. The specific objectives of the study were to provide a better understanding of how agencies measure their performance in organized traffic incident management, and to identify the difference, if any, in the definitions of relevant measures of performance in incident management (such as detection time, response time, clearance time, etc.). The study used a survey instrument to asses the data collection and effectiveness assessment criteria of several cities across the United States.

Through performance measurement, transportation agencies and emergency response providers can set goals and objectives defining how well their incident detection

and response capabilities should be in their communities. This document then set out guidelines for analysis of the effectiveness of traffic incident response and planning.

NIOSH/CDC published Hazard ID-12 (2001), "Traffic Hazards to Firefighters While Working Along Roadways", in June 2001 as part of its Workplace Safety and Health Hazards Identification series. NIOSH first identified that the average motorist is accustomed to clear, unobstructed roadways, and may fail to recognize traffic control devices, closed lanes, or even responders themselves. Focusing on two events resulting in firefighter fatalities which occurred in 1999, they identified risk factors associated with these two events and the operations of motor vehicles while passing near or through incident sites. These factors included: weather conditions, time of day, scene lighting (both warning devices and operating area illumination), traffic speed, traffic volume, and topography of the area.

The USFA teamed up with the Society of Automotive Engineers to produce "A Study Of Emergency Vehicle Warning Lighting Inferences About Emergency Vehicle Warning Lighting Systems From Crash Data" (July 2005). This Study utilized databases covering fatal and nonfatal crashes, from Missouri and Florida. This data was obtained from the U.S. Fatality Analysis Reporting System (FARS), which covers all fatal crashes, and a second specialized database for all fatal firefighter traffic crashes

This research analyzed the causal factors retrieved from crash data recorders and reports in order to better understand the effect of warning lamps that are used on emergency vehicles in order to reduce traffic risks by increasing the conspicuity of those vehicles. The study concluded that the lights are effective in making vehicles conspicuous. The study concluded that stronger lamps may be more effective in getting

drivers to notice emergency vehicles, and thereby avoid many potential crashes. However, there may also be some negative effects of warning lamps—including visual effects such as glare and masking; and cognitive effects such as distraction, confusion, and disorientation.

The study found that detection distances for pedestrians and emergency responders operating on the roadway at night wearing typical clothing are very short, shorter than typical required stopping distances. In contrast, detection distances for pedestrians and emergency responders operating on the roadway at night with retro reflective markings were very good.

The study identified the needed for further research in two areas. First, in order to overcome the limits of existing crash databases, it may be valuable to directly observe the behavior of other vehicles around an emergency vehicle engaged in emergency operation, either while in transit or while parked at an emergency site. Second, the possibility that warning lamps at night reduce the visibility of emergency personnel as pedestrians should be directly studied with human-performance field work.

Solomon, (2002) provided an insightful overview of the findings of several research projects assessing causal factors of struck by incidents. According to Solomon, the two important points from these studies were first, as you increase the number of flashing light signals you decrease the ability of civilian drivers to quickly respond to the emergency message. Second, an emergency flashing light is more quickly detected when there are NOT other flashing lights present in the field of view. Solomon then states that there is a limit to the number of flashing lights mounted on an emergency vehicle and exceeding that number will make the vehicle less safe.

Therefore, Solomon's first recommendation was that during emergency vehicle transit to reduce the number, brightness, and arrays of multi-color, revolving, strobe, and reflecting lights. This significantly reduces prolonged visual contact and decreases confusion. The second recommendation is applied when the emergency vehicle is parked along the road shoulder or at the curb, and clear of all active traffic lanes. Use either filament bulbs in one or two amber flashers blinking in tandem, or revolving beacons. The amber lights should be mounted on the upper level of the vehicle on each corner.

To support the reduced light package and further elevate the safety potential, Solomon, (2002) advises agencies to utilize high visibility paint colors and appropriate applications of fluorescent retro-reflective tape material. These painted patterns, called chevrons, are applied to the rear of the apparatus, and should resemble an inverted "V", with the point to the top. MUTCD 6F.57 (2003) also recognizes this approach, and requires the stripes to slant at a 45 degree angle.

When marking an apparatus with reflective tape, Solomon points out it should be applied along the top, sides, and bottom areas of the vehicle body to presents a vehicle silhouette to on coming traffic. "Paint and tape do not flash, blink, or impart any motion," says Solomon, "and are considered passive warnings that command less prolonged gaze while effectively providing strong visual Information".

This project will now review what other agencies are doing to protect their personnel during roadway operations. From a state wide approach, Cochran (2001) reports the Pennsylvania Turnpike Commission, Pennsylvania State Police, Pennsylvania Department of Transportation (PennDOT), and the Pennsylvania State Fire Commission,

joined forces to start a state wide initiative focusing on Unified Incident Command during operations on the state's roadways.

According to the PennDOT (2007) website, Unified Incident Command is a team effort that allows all the agencies with responsibilities for an incident to establish a common set of goals and objectives to which all agencies can subscribe. The Unified Incident Command System is not so much about who is in charge as it is about who is in charge of what. Unified Incident Command enables multiple agencies, who are responding to an incident, to coordinate the effort of that response through one incident system.

The focus of Unified Incident Command is on combining the knowledge, abilities, and resources of all emergency response agencies and making full use of all available technology. The primary objectives of Unified Incident Command are to arrive on the scene as quickly as possible, conduct a thorough and accurate assessment of the incident (which may vary quite dramatically in nature), secure the scene of the incident, protect the workers at the scene, and ensure that the backlog resulting from the incident is managed in a safe fashion. "Highway incidents require a multidisciplinary approach" says the PennDOT website, "Unified Incident Command provides for that approach."

The Miami-Dade (2006) Traffic Incident Management (TIM) team has a mission to develop recommendations that will provide a safe, efficient, and appropriate multi-agency response to and removal of traffic incidents in Miami-Dade County through timely and accurate detection and verification. To fulfill its mission, the Miami-Dade TIM team has in place a planned and coordinated program process that brings together a number of public and private sector partners. These TIM team members address issues

that arise as a result of the diverse institutional functions and individual agency goals. The multi-agency Miami-Dade TIM team meets every other month to provide, discuss, and improve operational services related to traffic incident management.

NFPA 502, 2001 edition, Standard for Road, Tunnel, Bridges, and Other Limited Access Highways states that a "designated authority shall complete and implement a fire protection program which included written preplanned procedures and standard operating procedures". NFPA 1620, Standard on Recommended Practice for Pre-incident Planning, gives guidance to help departments provided for plans to address the hazards of each scene, including TIM areas, and to build coalitions for the protection of all responders.

Along with multi agency preplanning, public education is another tactic useful in preventing injuries during TIM operations. Phoenix Fire Department's web site contains their "Move to the Right for Siren and Red Lights" (Phoenix 2006) public education program which lists the "do's" and "don'ts" when civilians are interacting with fire department vehicles and personnel. One of the Do's directly addresses the purpose of this research project, informing the public to "Be careful when driving by or around a motor vehicle accident or any situation where emergency vehicles are parked and the firefighters are working". Also, one of the Dont's listed also address TIM areas by warning the public "Don't disregard the presence of the emergency vehicle by continuing to drive".

The Kentucky Department of Transportation (KY DOT) (2006) has also recently launched a campaign to educate drivers about the requirement for yielding the lane to emergency vehicle who are both moving and stopped. "Move Over" Law television

commercials, flyers, posters, roadway signs and mailers have been used to educate the public on safe procedures when operating motor vehicles around responders**.**

Next, this author explored the recognized methods for traffic control at emergency scenes. First and foremost, The U.S. Department of Transportation's Federal Highway Administration has authored the Manual on Uniform Traffic Control Devices (MUTCD) (2003). This document sets standards for the size, color, spacing, and manufacturing material of traffic control devices in the United States. Of particular interest, and most relevant to the White Hall Fire Departments operations, is Part 6I of the MUTCD, which covers temporary traffic control through Traffic Incident Management areas.

Under the MUTCD Part 6I, a traffic incident is an emergency involving any road user, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic. A traffic incident management area is an area of a highway where temporary traffic controls (TTC) are imposed by responders in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.

On-scene responders should be trained in safe practices, states the MUTCD, for accomplishing their tasks in and near traffic. Responders should always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning.

Under Chapter 6I, responders arriving at a traffic incident should, within 15 minutes of arrival on-scene, estimate the magnitude of the traffic incident, the expected

time duration of the traffic incident, and the expected vehicle queue length, and then should set up the appropriate temporary traffic controls for these estimates. Under the MUTCD (2003) responders have 30 minutes to establish TIM beyond temporary means of cones, flares and portable signs. The cooperation of the news media in publicizing the existence of, and reasons for, traffic incident management areas and the presence of responders can be of great assistance in keeping road users and the general public well informed.

If flaggers are used to provide traffic control for an incident management situation, the flaggers should use appropriate traffic control devices, either flags or paddles, that are readily available or that can be brought to the traffic incident scene on short notice. Flags must be a minimum of 24 by 24 inches, and made of retro-reflective red material, attached to a 36 inch pole or handle. Paddles are to be 18 by 18 inch square and retro-reflective marked with stop on one side, and slow on the other.

The MUTCD states that when flares are used to initiate TTC at traffic incidents, more permanent traffic control devices should replace them as soon as practical. Once it is no longer needed, both the flare and its supporting device should then be removed from the roadway to prevent damage to traffic or a trip hazard to personnel. All traffic control devices that will be used to set up the TTC at a traffic incident should be available so that they can be readily deployed for intermediate traffic incidents.

Under the MUTCD, traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

A. Major—expected duration of more than 2 hours;

B. Intermediate—expected duration of 30 minutes to 2 hours; and

C. Minor—expected duration under 30 minutes.

Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding two hours. If the traffic incident is anticipated to last more than 24 hours, applicable procedures and devices set forth in other Chapters of Part 6 of the MUTCD should be used.

For lane closures in major incidents, vehicles are usually channeled through lane shifts or detoured around the traffic incident and back to the original roadway. This is accomplished by the use of cones, barriers, variable messaging signs, apparatus placement, and other appropriate traffic control devices. Large trucks are a significant concern in such a detour, especially when detouring them from a controlled-access roadway onto local or arterial streets. The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by interagency planning that includes representatives of highway and public safety agencies.

The MUTCD explains that intermediate traffic incidents typically affect travel lanes for a time period of 30 minutes to 2 hours, and usually require traffic control on the scene to divert road users past the blockage. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the end of a queue. Attention should be paid to the end of the traffic queue such that warning is given

to road users until they completely clear the TTC zone.

Minor traffic incidents are typically disabled vehicles and minor crashes that result in lane closures of less than 30 minutes. Diversion of traffic into other lanes is often not needed or is needed only briefly. It is not generally possible or practical to set up a lane closure with traffic control devices for a minor traffic incident. Traffic control is the responsibility of on-scene responders. When a minor traffic incident blocks a travel lane, it should be removed from that lane to the shoulder as quickly as possible.

The MUTCD also addresses the use of emergency vehicle lighting (such as high-intensity rotating, flashing, oscillating, or strobe lights) as being essential, especially in the initial stages of a traffic incident, for the safety of emergency responders and persons involved in the traffic incident, as well as road users approaching the traffic incident. Emergency vehicle lighting, however, provides warning only and provides no effective traffic control, as it usually gives no clear indication of the direction you desire them to travel. It is often confusing to road users, especially at night. Road users approaching the traffic incident from the opposite direction on a divided facility are often distracted by apparatus warning lights and slow their vehicles to look at the traffic incident, posing a hazard to themselves and others traveling in their direction.

The use of apparatus lighting can be reduced if good traffic control has been established at a traffic incident scene. This is especially true for major traffic incidents that might involve a number of emergency vehicles. If good traffic control is established through placement of advanced warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency vehicle lighting.

Public safety agencies should examine their policies concerning the use of emergency warning lights, the MUTCD explains, especially after a traffic incident scene is secured, with the intent of reducing the use of this lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing forward facing emergency-vehicle lighting, especially on divided roadways, to reduce distractions to on-coming road users. Vehicle headlights not needed for illumination, or to provide notice to other road users of the incident response vehicle being in an unexpected location, should be turned off at night.

NFPA 1500 (2002) requires DOT approved warning devices such as traffic cones, retro-reflective signs stating "Emergency Scene", and illuminated devices such as flares be used to warn oncoming traffic and to funnel traffic away from the scene and in the direction desired. The First devices should be placed to begin to warn oncoming traffic an appropriate distance (between 8-12 feet multiplied by the posted speed limit) from the beginning of the TIM area, depending on topography, weather, or any other consideration.

The final area researched by this author was methods to protect our members from the hazards of operating in and around vehicular traffic. NIOSH Hazard ID-12 (NIOSH, 2001) provided recommendations for preventing injuries and deaths. First, departments must develop, implement, and enforce SOPs regarding roadway incidents, as well as how department members shall operate while off duty, should they stop to assist. According to the National Fire Protection Association (NFPA), a standard operating procedure is "an organizational directive that establishes a standard course of action" (USFA 1999).

In other words, SOPs are written guidelines that explain what is expected and

required of fire service personnel in performing their jobs. SOPs should not be confused with pre-incident plans or pre-plans, which describe strategies for emergency response at a specific facility. SOPs are not intended to duplicate technical information or provide step-by-step instructions for doing the job. Well-designed standard operating procedures help fill both needs. For individual workers, SOPs clarify job requirements and expectations in a format that can be readily applied on the job. The result is improved safety, performance, and morale.

The USFA (1999) has produced "Developing Effective Standard operating Procedures for Fire and EMS Departments". This manual is intended to serve as a planning guide and reference document for fire service organizations in developing, implementing, and maintaining SOPs. It describes general concepts, related legal authorities, specific steps, and resource requirements for managing the SOP process. Rodriguez (2006) has authored and made available a model SOP for operating near moving traffic, which is available online at www.respondersafety.com, which can be updated to meet any department's needs.

As with all incidents, IMS must be implemented in order to insure accountability and control. Sullivan (2001) also points out the importance of accountability, should the unimaginable happen, and multiple vehicles find their way into the scene and roll or overturn. Next, unified command must start with preplanning among responder disciplines, and jurisdictions involved must share in the effort. Helman (2004) states that IMS provides the framework for a safe, effective and efficient response to roadway incidents. In order for it to be successful, it must be a unified command, with preplanned roles and responsibilities.

Like a hazmat incident, a safety officer should be automatically assigned to insure all necessary concerns are addressed. NFPA 1500 (2002) requires a risk management approach, and places responsibility for the safety of members on the department. The safety officer should be an experienced member, familiar with the hazards of operating on or near roadways. They should also be familiar with the preplanned response of the other agencies and guard against their possible impacts on safety.

NIOSH also recommends departments ensure that firefighters are provided proper training, and are equipped with appropriate protective garments. A class III, yellow-green or high visibility orange garment meeting ANSI/ISEA 107 (1999) or the brand new ANSI/ISEA 207 Public Safety High Visibility Vest Standard, should be worn at all times by all responders. These vests are for roadway situations where traffic may move at greater than 50 miles per hour. MUTCD (2003), section 6E.02, also states that workers shall wear bright, highly visible clothing when working near moving traffic. The safety officer should check each member to insure they wear this vital piece of equipment says Sullivan (2006). Moore (2003) recommends that the wearing of complete PPE should continue throughout the incident unless other factors make this more of a hazard, such as weather conditions, and personnel should not rely on the reflective marking on turnout gear for all their retro-reflective needs, states.

The MUTCD (2003) also addresses training for those who perform temporary traffic control. 6E.01 lists seven minimum qualifications. Listed in no particular order are a sense of responsibility for the safety of the scene, training in temporary control practices and the proper use of the equipment, and average intelligence. Also noted is good physical and alert mental condition, eyesight, mobility and hearing. The standard

also recommends the person be courteous but, firm, and maintain a neat appearance.

NIOSH (2001) also made several recommendations toward the firefighters' responsibilities when arriving on scene. First and foremost, control the oncoming traffic before starting operations such as suppression or extrication, and insure the apparatus is positioned to protect the scene, taking advantage of topography and weather. Several of the NIOSH incident reports reviewed earlier shared the common factor of no traffic control in place as a contributing factor in fatalities and injuries among first responders.

Sullivan (2001) directs that apparatus should be placed at a 45 degree angle, with the wheels turned as far as possible in the same direction to guide the apparatus away from the scene should it be struck from down stream. This will help to protect responders while operating at the scene. Moore (2006) recommends that the same occur upstream when operating on undivided roadways to protect responders from vehicles crossing lanes and entering the working area. Sullivan (2001) also states that unneeded apparatus should be removed from the scene or parked clear of the roadway and staged, and responders should take full advantage of and use traffic control devices that maximize their visibility to motorists.

Procedures

The information gathered in this Applied Research Project was located through key word searches of several databases, web sites, internet resources, and through collections of periodicals. This work was conducted during July, 2006 at the National Fire Academy Learning Resource center, Emmitsburg, MD, with additional research being conducted at the College of Justice and Safety Library housed on Eastern Kentucky University's campus in Richmond, KY. Electronic search engines were used to scan the EBSCOHost

and LEXISNEXIS research databases. Several fire service websites were also keyword searched. This included www.firehouse.com, http://fe.pennnet.com/ (Fire Engineering Magazine), and www.respondersafety.com. General internet searches were conducted using two search engines, www.google.com and www.dogpile.com. This integrated literature review was done to answer the following research questions, and formulate a final action plan.

Research Question 1;What types of incidents (statistics, incident reports, ect.) are occurring during exposure to traffic flow that are injuring emergency responders nation wide? For this question, the author utilized a data base search of the National Fallen Fire Fighter Foundation to identify Line of Duty Deaths (LODD) Involving responders who were "Struck By" vehicles. The search was performed by choosing a year to search and entering the key word struck by, which is the category of event for this type of incident. 48 LODD incidents were noted to fit the criteria. A limitations noted was a lack of narrative explaining the actual struck by incident in 1993 and prior records. NFPA retrospective studies were used to expand the information back to 1989.

The website www.respondersafety.com news article archive was utilized to gather data to show trends in injuries and near misses. This site contained multiple accounts of incidents that occurred during TIM. General internet searches also produced more accounts using the key word phrases "firefighter", and then adding "struck by car", "hit by car", "injured performing traffic control", etc. Limitations were unpublished accounts, or stories that were no longer viewable online.

The NIOSH Fire Fighter Fatality web site was also used to gather information on LODD deaths involving TIM. 5 of the available incidents were chosen for their wide

range of causal factors. Limitations included the fact that NIOSH does not investigate each LODD, hence more appropriate learning points may have occurred, but were not available.

A general internet search was performed to identify other resources to answer this question, and one research paper and two published articles were utilized. Limitations included lack of articles being electronically available, and lack of access to periodicals which contained sought information.

Research Question 2; What resources does each agency have that can increase the safety of the responders? This question was answered utilizing the previously mentioned search engines and fire service web sites. One TIM guide, produced by the Federal government, and one article was used to provide the requisite information. Limitations included the author only being able to locate a few documents addressing this issue, lack of articles being electronically available, and lack of access to periodicals which contained relevant information.

Research Question 3; What research has been published on the topic? This was again accomplished by searching periodicals, internet searches, and fire service websites. Key word/phrase searches of the internet and periodical databases included “traffic control”, “traffic incident management”, “combined with statistics”, “data collection”, “study”, “research”, ect. One research paper, two multi-agency research project, three articles and one NIOSH Hazard assessment document was utilized. Limitations again centered on the availability or lack of articles being electronically available, and lack of access to periodicals which contained sought information.

Research Question 4; What are other agencies doing to protect their personnel? The intent of this question was to identify the programs and projects in place around the country to protect responders during TIM. Key word search included “traffic control”, and “traffic incident management”, along with “program”, “plan”, “procedure”, and “multi-agency”. One state wide initiative, one regional TIM program, two public education programs, one NFA Publication, and three NFPA standards were used to show what other agencies are doing to protect responders. Limitations here included a large amount of findings, which involved discarding all but the most relevant information for inclusion.

Research Question 5; What are the recognized methods for traffic control at emergency scenes? This topic is almost solely answered by analysis of the Manual on Uniformed Traffic Control Devices, Part 6I published by the Federal Highway Administration. In addition, one NFPA document was utilized. Internet resources, fire service websites, and periodicals were key word/phrase searched. Limitations were a lack of additional resources to answer this question, although the MUTCD is the blueprint for traffic control in the United States.

Research Question 6; How can we protect our members from the hazards of operating in and around vehicular traffic? The final area of interest was answered by one NIOSH document, one NFPA document, and two published and one unpublished article. The unpublished article has yet to be printed, but is authored by a Prolific author on the subject at hand, and was provided to this researcher as a further resource, as it contained some updated information. Internet, website, and periodical databases were key word searched, with phrases such as “traffic control” and “traffic incident management”,

coupled with “procedures”, “operating procedures”, “plans” and etc. Limitations included lack of articles being electronically available, and lack of access to periodicals which contained sought information.

Results

The results of this research are now presented. The integrative review revealed that fatalities are most frequently occurring during TIM while performing traffic control related activities, with 24 LODD from 1989-2006. Next in the fatalities category, scene operations such as fire suppression, extrication and other activities associated with the direct cause of the incident, 17 LODD were recorded. Three LODD occurred while trying to reach the scene, two occurred during medical care, and one each were noted for public service and training activities.

The most common activity where injuries were occurring during TIM was scene operations, as this author located 38 documented cases between 2001 and 2006. Traffic control ranks second, with 10 injuries. The next highest statistic was four injuries during public service. Three documented cases of firefighters being injured while performing fundraising, and one each for accessing the scene and providing medical care.

Causal factors identified in the NIOSH incidents reviewed included failure to take into effect the topography, weather conditions, speed of traffic and road conditions. Another factor noted was a failure to implementation traffic control and failure to shield responders with apparatus prior to beginning operations. Other conditions revealed were a lack of utilization of traffic control devices, especially retro-reflective vests, and a lack of hazard recognition. In fact, the CVVFA research showed a lack of consensus in the community over the levels and contents of proper traffic control training. Also

mentioned are causal factors on the citizens side included altered states of mind, failure to recognize altered lanes, lane obstructions, and lack of understanding of the role of first responders in TIM.

This researcher also sought to identify the different agencies involved in TIM. These were divided into two groups: first responders, meaning law enforcement, Fire and Rescue Departments, and EMS organizations, and secondary responders, such as towing, DOT, hazardous materials contractors, and public safety communications personnel. Identified as a useful tool was the immense power of the media in spreading news of lane changes, blockage, and detours. Noted from several sources was the need for multi-agency planning to outline responsibilities.

This author then reviewed research projects on the topic of this ARP. The first item addressed is the fact that first responders are placed into danger each and every time they perform TIM. A consensus on the need of unified command for a safe and efficient response was emphasized. The need for laws with real consequences to encourage the public to operate with due caution when around fire responders and TIM areas was repeatedly discussed in identified documents. Concern were also raised in the reviewed publications for the health and mental well being of first responders, who know full well the risks associated with their jobs, and a need for impact analysis of this stressor. Public education was identified as an effective tool in several of the documents retrieved for this project.

Of importance to supervisor and management level personnel was a research project reviewed which outlined methods for analysis of the effectiveness of TIM

programs. The tools in this document allow managers to set goals and objectives, review effectiveness of their agencies efforts, and identify areas which need improvement.

Several of the researched documents pointed out that the average motorist is accustomed to clear roadways, and may not even recognize when first responders have implemented traffic control. Several other sources presented in this research also focused on effect of warning lights, and their ability to both warn, and confuse the public. These studies all agreed that too many warning lights on a scene cause only confusion and actually distract driver attention from the roadway. One study confirmed the effectiveness of passive, retro-reflective garment in making responders more visible. Also recommended is the use passive warning markings, such as retro-reflective tape and brightly colored paint, for apparatus marking, as it does not move and hence takes less time for the human brain to analyze and recognize.

This project also revealed actions being taken to protect first responders on state, regional and local levels. Pennsylvania has a statewide initiative, which encourages multi-agency planning and unified command for TIM incidents. The Miami-Dade TIM team provides regional, multi-agency support for TIM incidents in that region. Meeting monthly, the organization provides clear lines of communications and preplanning for these types of incidents.

Also brought to light is the usefulness of operating procedures for protecting responders. Sources of guidance were incorporated into the research to help in the development of procedures for safe handling of TIM incidents. These included three NFPA guides, which require SOP's and Preplanning for these types of incidents and a SOP development guidebook from the NFA.

Public education programs, as mentioned in other sections of this research project, are also viewed by several authors as important to the overall approach to TIM safety. The statewide approach by Kentucky is reviewed, and is now being enforced, another important facet also previously discussed. The second one reviewed is from the Phoenix Fire Department. Both use several different types of media to get guidance to drivers on how to operate safely when around emergency vehicles and responders.

The next area explored identified the MUTCD as the bible for traffic control situations. It outlines clear goals and objectives, gives guidance on methods, and sets regulation on equipment size, shape and color. In particular, Part 6I, applies directly to first responders. It outlines the levels of response and the criteria for each. Breaking incident levels down by traffic impact, it provides guidance on needs assessment and gives solutions where probable. It also gives recommendations on the use of vehicle warning lights as traffic control, as being essential in the initial phases, but should be phased out as traffic control devices are implemented. NFPA 1500 also recognizes the same standards as the MUTCD for traffic control devices color, shape, size and placement.

The final information sought identified protection methods for first responders. SOPs and operating guidelines must be developed in advance, and should address both on duty and off duty response. Unified command must also be in place in order to insure accountability and resource protection. Several authors recommend that, like a hazmat incident, a safety officer be assigned for each TIM situation, to insure all SOPs are followed, and traffic control devices are used appropriately. Preplanning must be performed to insure resource availability and to minimize on scene confusion.

Also noted in several sources is the fact that responders must don retro-reflective garments, in addition to turnout gear, at all times. First responders should first implement traffic control before engaging in any operations, and take full advantage of available traffic control devices. This needs to include using apparatus as shielding, covering both sides of the incident if not on a divided roadway, and providing multiple layers if possible to deflect vehicle away for the operating area.

The purpose of this ARP is to develop a Traffic Incident Management Procedure for the White Hall Fire District. This will involve identifying the stakeholders, holding initial meetings to build communication channels, and to present draft procedures to mutual aid agencies for their input as well. A standard operating procedure for the White Hall Fire Department is the first step in protecting our members, and other responders in our area. It will include initial procedures, levels of response, types of devices to be used and placement distances. A model SOP (Rodriguez 2005) exists on www.respondersafety.com. This was used as a theoretical framework to produce an operating procedure, which was included as appendix A of this ARP. Also apparent, is the need to provide responders with TIM training. A draft training course is included in this ARP as Appendix B. It was based on original work of this author and resources authored by Sullivan (2006), Jones et al. (2006), and Rodriquez (2005).

Discussion

The sources gathered in the completion of this ARP focused on several common themes, which are all too common in the fire service today. Of the most importance, we must work with our fellow first responder agencies to coordinate those activities at scenes to which we already know whom will respond. Helman (2000), Sullivan (2006),

CVVFA (1999), PennDOT (2007), and Metro-Dade (2007) all identify the multi-agency preplanning process as being essential, and is recommended by NFPA 502 (2001) and NFPA 1620 (1998). All the players must be identified, and we must utilize multi-agency planning in order to protect all responders and those involved in the incident.

It is very clear from the data collected that we must address how our responders are being hurt and killed during TIM operations. NFPA (2005), CVVFA (1999) and NIOSH (2001) acknowledge that personnel must understand that the public may not recognize our TIM activities are in place until it is too late. We must begin a new scene size-up for TIM, taking into account topography, weather, roadway and available traffic control devices. NIOSH (2003), NIOSH (2002), NIOSH (2004), and NIOSH (2000), show that our first responders are either not receiving proper training in the hazards of roadway operations, are not being issued proper PPE, or are failing to do both. Training must cover these topics, as well as those found in the MUTCD.

USFA (2005) and Solomon (2002) all note the need to better understand the effects of aggressive warning media, like light bars, and its ability to confuse and distract drivers. Once TTC is in place, warning lights need to be cut back. We also must increase our passive traffic controls like cones, safety shapes painted and retro-reflective outlines on our apparatus. First responders must rethink the theory of more lights is better, especially while on the scene on roadway incidents. Further research is also need to identify the interaction between citizens and emergency vehicle, SAE (2005) in order to assess the full impact of aggressive versus passive warning systems.

Standard operating guidelines and procedures must be implemented to provide for the safe and effective response to TIM incidents. Sullivan (2006), MUTCD (2003),

NFPA 1500 (2002), NIOSH (2001) and Moore (2005) all expanded on the importance of having procedures reviewed and outlined to insure that activities move in a positive direction in terms of TTC implementation, and safety. Accountability, according to PennDOT (2007), NIOSH (2001), Helman (2004), Sullivan (2001), is essential for several reasons. First, it allows for resource management to insure an efficient response. Second, should an incident occur where vehicle enters you work zone, and overturns, a quick personnel accountability report will allow you to direct your activities toward just those in the vehicle, or toward locating unaccounted for responders.

Public education programs must be increased to educate the public in our activities and they way they need to interact when inside and approaching TIM areas, and KY DOT (2006), and Phoenix (2006) have taken this to hand. Agencies need to track the effectiveness of our TIM efforts according to Balk et al (2002). The more effective our processes are, the less stress put on the driving public, making them safer drivers and more willing to cooperate during future TIM events. Additionally, we must be aware of the stress we put on our responders, in terms of time exposed to hazards. We must track the physical and mental impact on our responder CVVFA (1999), and find ways to relieve the emotional burden placed on them by being in high risk situations.

Recommendations

The White Hall Fire Department must develop a traffic incident management procedure. This plan should involve all first and secondary responders who foreseeable respond into the White Hall Fire District. Each agency will have to be contacted and provided with a draft outline of a TIM procedure, given a time frame for comments (Appendix C), and a group meeting scheduled to bring all of the stakeholders together.

An initial draft procedure was included in this ARP as Appendix A, which utilized the Rodriquez (2005) model SOP, and articles authored by Sullivan (2006) and Moore (2003) and resources for its development.

In order to be successful, further direct contact will need to be made with some of the sources identified in this ARP to gather information on the goals and objectives set by each of their team members, and to gather information on any initial roadblocks that were overcome. This will be additionally to gather copies of documents, policies and procedures developed by each agency for dissemination.

Once in place, training will have to be offered to all responders involved. Outlines of training programs will have to be gathered that are agency type specific. The trainers will also need to be agency specific, such as law enforcement teaching law enforcement, in order to overcome inherent job description obstacles. A draft training Program is included as Appendix B, and was developed using the information gathered in this Applied Research Project, and also on resources authored by Sullivan (2006), Jones et al. (2006), and Rodriquez (2006).

Further research will need to review the impact of the action plan, through assessment of near miss incidents, injuries, and review of the member's interpretations of the effectiveness of the procedure and the training program. In addition, more expansive contact could be made to other first responder disciplines to include their collected data, training programs, and procedures.

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Appendix A
Draft Traffic Incident Management Procedure

I. Scope

All responders with public safety responsibilities within the White Hall Fire District, who are required to perform in operations which expose them to traffic flow.

II. Procedures

This procedure identifies parking practices for First Responder apparatus and vehicles that will provide maximum protection and safety for personnel operating in or near moving vehicle traffic. It also identifies several approaches for individual practices to keep Responders safe while exposed to the hazardous environment created by moving traffic.

III. Policy

It shall be the policy of the White Hall Fire Department to position apparatus and other emergency vehicles at a vehicle-related incident on any street, road, highway or expressway in a manner that best protects the incident scene and the work area. Such positioning shall afford protection to fire department personnel, law enforcement officers, emergency medical services, rescue squads, tow service operators and the motoring public from the hazards of working in or near moving traffic.

IV. General

All personnel should understand and appreciate the high risk that personnel are exposed to when operating in or near moving vehicle traffic. Responders should always operate within a protected environment at any vehicle-related roadway incident.

Always consider moving vehicles as a threat to your safety. At every vehicle-related emergency scene, personnel are exposed to passing motorists of varying driving abilities. At any time, a motorist may be driving without a legal driver's license. Approaching vehicles may be driven at speeds from a creeping pace to well beyond the posted speed limit. Some of these vehicle operators may be vision impaired, under the influence of alcohol and/or drugs, or have a medical condition that affects their judgment or abilities. In addition, motorists may be completely oblivious to your presence due to distractions caused by cell phone use, loud music, conversation, inclement weather, and terrain or building obstructions. Approaching motorists will often be looking at the scene and not the roadway in front of them. Assume that all approaching traffic is out to get you until proven otherwise.

Nighttime incidents requiring personnel to work in or near moving near traffic are particularly hazardous. Visibility is reduced and driver reaction time to hazards in the roadway is slowed.

V. Definitions

The following terms shall be used during incident operations, post-incident analysis, and training activities related to working in or near moving traffic.

1. **Advance Warning-** notification procedures that advise approaching motorists to transition from normal driving status to that required by the temporary emergency traffic control measures ahead of them.

2. **Block-** positioning a fire department apparatus on an angle to the lanes of traffic creating a physical barrier between upstream traffic and the work area. Includes 'block to the right' or' block to the left'.
3. **Buffer Zone-** the distance or space between personnel and vehicles in the protected work zone and nearby moving traffic.
4. **Downstream-** the direction that traffic is moving as it travels away from the incident scene.
5. **Flagger-** any Responder assigned to monitor approaching traffic and activate an emergency signal if the actions of a motorist do not conform to established traffic control measures in place at the highway scene
6. **Shadow-** the protected work area at a vehicle-related roadway incident that is shielded by the block from apparatus and other emergency vehicles.
7. **Taper-** the action of merging several lanes of moving traffic into fewer moving lanes.
8. **Temporary Work Zone-** the physical area of a roadway within which Responders perform their Duties.
9. **Transition Zone-** the lanes of a roadway within which approaching motorists change their speed and position to comply with the traffic control measures established at an incident scene.
10. **Upstream-** the direction that traffic is traveling from as the vehicles approach the incident scene.

VI. Safety Benchmarks

All Responders are at great risk of injury or death while operating in or near moving traffic. There are several specific tactical procedures that should be taken to protect all crewmembers and emergency service personnel at the incident scene including;

1. Never trust approaching traffic
2. Avoid turning your back to approaching traffic
3. Establish an initial "block" with the first arriving emergency vehicle or fire apparatus
4. Always wear ANSI 107 or ANSI 207 high visibility retro-reflective vests during operations and all agency issued Protective Equipment.
5. Turn off all sources of vision impairment to approaching motorists at nighttime incidents including vehicle headlights and spotlights
6. Use fire apparatus and police vehicles to initially redirect the flow of moving traffic
7. Establish advance warning and adequate transition area traffic control measures upstream of incident to reduce travel speeds of approaching motorists
8. Use traffic cones and/or cones illuminated by flares where appropriate for sustained highway incident traffic control and direction

11. Assign a Responder to the "Flagger" function to monitor approaching traffic and activate an emergency signal if the actions of a motorist do not conform to established traffic control measures in place at the highway scene. The Key Phrase to be transmitted for a vehicle threatening responders is "DANGER" repeated 3 times over the radio frequency assigned for the incident

VII. Apparatus and Emergency Vehicle Benchmarks

Listed below are benchmarks for safe parking of apparatus and emergency vehicles when operating in or near moving traffic.

1. Always position first-arriving apparatus to protect the scene, patients, and emergency personnel.
    a. Initial apparatus placement should provide a work area protected from traffic approaching in at least one direction.
    b. Angle apparatus on the roadway with a "block to the left" or a "block to the right" to create a physical barrier between the crash scene and approaching traffic.
    c. Allow apparatus placement to slow approaching motorists and redirect them around the scene.
    d. Use fire apparatus to block at least one additional traffic lane more than that already obstructed by the crashed vehicle(s).
    e. When practical, position apparatus in such a manner to protect the vehicles operator position from being exposed to approaching traffic.
2. Positioning of large apparatus must create a safe parking area for EMS units and other vehicles. Operating personnel, equipment and patients should be kept within the "shadow" created by the blocking apparatus at all times.
3. When blocking with apparatus to protect the emergency scene, establish a sufficient size work zone that includes all damaged vehicles, roadway debris, the patient triage and treatment area, the extrication work area, personnel and tool staging area and the ambulance loading zone.
4. Ambulance should be positioned within the protected work area with their rear patient loading door area angled away from the nearest lanes of moving traffic
5. Command shall stage unneeded emergency vehicles off the roadway or return these units to service whenever possible.
6. At all intersections, or where the incident may be near the middle lane of the roadway, two or more sides of the incident will need to be protected.
    a. Police vehicles must be strategically positioned to expand the initial safe work zone for traffic approaching from opposing directions. The goal is to effectively block all exposed sides of the work zone. The blocking of the work zone must be prioritized, from the most critical or highest traffic volume flow to the least critical traffic direction.

b. For first arriving engine or truck companies where a charged hose line may be needed, block so that the pump panel is "down stream", on the opposite side of on-coming traffic. This will protect the pump operator.

c. At intersection incidents, consider requesting additional Law Enforcement response. Coordinate with those providing traffic control as to exactly what your traffic control needs are. Ensure that vehicles are parked in a position and location that provides additional protection of the scene.

7. Traffic cones shall be deployed from the rear of the blocking apparatus upstream a minimum of 150 foot at 10 foot intervals, with the first "Emergency Scene Ahead" sign placed according to the formula 10 times the posted speed limit (answer in feet), and the second "Emergency Scene Ahead" placed 50 feet upstream from the cones

8. Personnel shall place cones and flares and retrieve cones and flares while facing oncoming traffic.

9. Traffic cones shall be deployed at 10 foot intervals down stream of the blocking apparatus approximately 40 feet to allow adequate protection to responders.

10. Additional traffic cones shall be retrieved from PD units to extend the advance warning area for approaching motorists.

VIII. Incident Command Benchmarks

The initial-arriving company officer and/or the Incident Commander must complete critical benchmarks to assure that a safe and protected work environment for emergency scene personnel is established and maintained including;

1. Assure that the first-arriving apparatus establishes an initial block to create an initial safe work area

2. Assign a parking location for all ambulances as well as later-arriving apparatus.

   a. Lanes of traffic shall be identified numerically as "Lane 1", "Lane 2", etc., beginning from the right to the left when right and left are considered from the approaching motorist's point of view. Typically, vehicles travel a lower speed in the lower number lanes.

   b. Directions "Right" and "Left" shall be as identified as from the approaching motorist's point of view left or right.

   c. Instruct each arriving responder vehicle to "block to the right" or "block to the left" as it is parked at the scene to protect the operating area from the closest lane of moving traffic.

3. Assure that all ambulances on-scene are placed within the protected work area (shadow) of the larger apparatus.

4. Assure that all patients loading into Ambulances is done from within a protected work zone.

5. The initial company officer and/or Incident Commander must operate as the Scene Safety Officer until this assignment is delegated.

6. Command shall assure that Opticom strobe systems are turned OFF and that other emergency lighting remains ON.
7. At residential medical emergencies, Command shall direct ambulances to park at the nearest curb to the residence for safe patient loading whenever possible.

IX. Emergency Crew Personnel Benchmarks

Listed below are benchmarks for safe actions of individual personnel when operating in or near moving vehicle traffic.

1. Always maintain an acute awareness of the high risk of working in or near moving traffic. They are out to get you!
2. Never trust moving traffic.
3. Always look before you move!
4. Always keep an eye on the moving traffic!
5. Avoid turning your back to moving traffic or any vehicle.
6. Personnel arriving in crew apparatus should exit and enter from the protected 'shadow' side, away from moving traffic.
7. Officers, apparatus operators, crew members in apparatus with individual jump seat configurations and all ambulance personnel must exit and enter their units with extreme caution remaining alert to moving traffic at all times.
8. Protective clothing, ANSI 107 or 207 safety vest, and helmet must be donned prior to exiting the emergency vehicle.
    a. During normal daylight lighting conditions, don helmet and ANSI 107 or 207 safety vest and full agency provided PPE when operating in or near moving traffic.
    b. All staff personnel and assigned student trainee personnel arriving on an apparatus or emergency vehicle must don full protective clothing and ANSI 107 or 207 vest prior to exiting their vehicle.
9. Always look before opening doors and stepping out of apparatus or emergency vehicle into any moving traffic areas. When walking around fire apparatus or emergency vehicle, be alert to your proximity to moving traffic.
    a. Stop at the corner of the unit, check for traffic, and then proceed along the unit remaining as close to the emergency vehicle as possible.
    b. Maintain a 'reduced profile' when moving through any area where a minimum 'buffer zone' condition exists.
10. Police Department personnel may place traffic cones or flares at the scene to direct traffic. This action builds upon initial FD cone deployment and can be expanded, if needed, as later arriving law enforcement arrive. Always place and retrieve cones while facing on-coming traffic.

11. Placing flares, where safe to do so, adjacent to and in combination with traffic cones for nighttime operations greatly enhances scene safety. Where safe and appropriate to do so, place warning flares to slow and direct approaching traffic.

X. High-Volume, Limited Access

Highway Operations

High-volume limited access highways include the Interstate multi-lane roadways, State and County divided roadways within the WHFD response area. Law Enforcement and Department of Transportation (DOT) have a desire to keep the traffic moving on these high-volume thoroughfares. When, in the judgment of FD Command, it becomes essential for the safety of operating personnel and the patients involved, any or all lanes, shoulders, and entry/exit ramps of these limited access highways can be completely shut down. This, however, should rarely occur and should be for as short a period of time as practical.

Unique Safe Parking procedures for all roadway incidents;

1. First-arriving engine company apparatus shall establish an initial block of the lane(s) occupied by the damaged vehicle plus one additional traffic lane.
2. A Second Engine or Tanker apparatus shall automatically respond to all vehicle-related incidents, or incidents that require exposure to traffic flow.
3. The primary assignment of this second company apparatus and crew shall be to;
    a. Establish an upstream block occupying a minimum of two lanes plus the paved shoulder of the highway or blockage of three driving lanes of traffic upstream of the initial block provided by the first-due apparatus.
    b. The position of this apparatus shall take into consideration all factors that limit sight distance of the approaching traffic including ambient lighting conditions, weather-related conditions, road conditions, design curves, bridges, hills and over- or underpasses.
    c. Traffic cones and/or cones illuminated by flares should be placed upstream of the second apparatus by the crew at the direction of the company officer.
    d. Traffic cones shall be deployed from the rear of the blocking apparatus upstream a minimum of 150 foot at 10 foot intervals with the first “Emergency Scene Ahead” sign placed according to the formula 10 times the posted speed limit (answer in feet), and the second “Emergency Scene Ahead” placed 50 feet upstream from the cones.
    e. Personnel shall place cones and flares and retrieve cones while facing the traffic.
    f. Assign a Flagger person to monitor the response of approaching motorists as they are directed to transition to a slower speed and taper into merged lanes of traffic.

g. Notify Command on the incident operating channel of any approaching traffic that is not responding to the speed changes, transition, tapering and merging directions.

h. Flagger shall activate a pre-determined audible warning or transmit the "DANGER" key word to operating personnel of a non-compliant motorist approaching.

i. Driver operator of apparatus shall sound a series of long blasts on the apparatus air horn or transmit the "DANGER" key word to audibly warn all operating personnel of the concern for the actions of an approaching motorist.

4. Law Enforcement vehicles will be used to provide additional blocking of additional traffic lanes if Available. Ambulances shall always be positioned within the safe work zone.

5. Staging of additional companies off the highway may be required. Ambulances may be brought onto the highway scene one or two at a time. An adequate size multi-patient loading area must be established.

6. Command should establish a liaison with Law Enforcement as soon as possible to jointly coordinate a safe work zone and to determine how to most efficiently resolve the incident and establish normal traffic flows.

7. The termination of the incident must be managed with the same aggressiveness as initial actions. Crews, apparatus, and equipment must be removed from the highway promptly, to reduce exposure to moving traffic and minimize traffic congestion.

XI. Agency Supervisor Safe Parking "Cue Card"

1. It is recommended that the following safe parking cue cards be attached to a clipboard or other location for easy access by responders to determine necessary safety bench marks are in place.

2. A Model Traffic Management setup diagram is provided for further reference.

Agency Supervisor's Safe Parking "Cue Card"

"Block" with first-arriving apparatus to protect the scene, patients, and emergency personnel.

- □ Block at least one additional lane
- □ Block so pump panel is "down stream"
- □ Block most critical or highest traffic volume direction first
- □ Consider requesting additional PD assistance

Crews wear proper PPE w/Helmet

- □ ANSI 107 or 207 vests at all times
- □ Full agency issued PPE at all times

Establish more than adequate advance warning

- □ Traffic cones at 10' intervals
- □ Deploy minimum 5 cones upstream
- □ Cones only "Suggest" they don't Block!
- □ Expand initial safe work zone

Direct placement of ambulances

- □ Assure ambulances park within shadow of larger apparatus as directed
- □ Lane 1 is furthest right lane, next is Lane 2, then Lane 3, etc. from approaching motorist's point of view
- □ Direct ambulance to "block to the right" or "block to the left" to protect loading doors
    - Place ambulance patient loading area facing away from closest lane of moving traffic
- □ All patient loading into Med Units is done from within a protected work zone

You are the Scene Safety Officer

- □ Consider assigning FF as upstream "Spotter" as necessary for approaching traffic

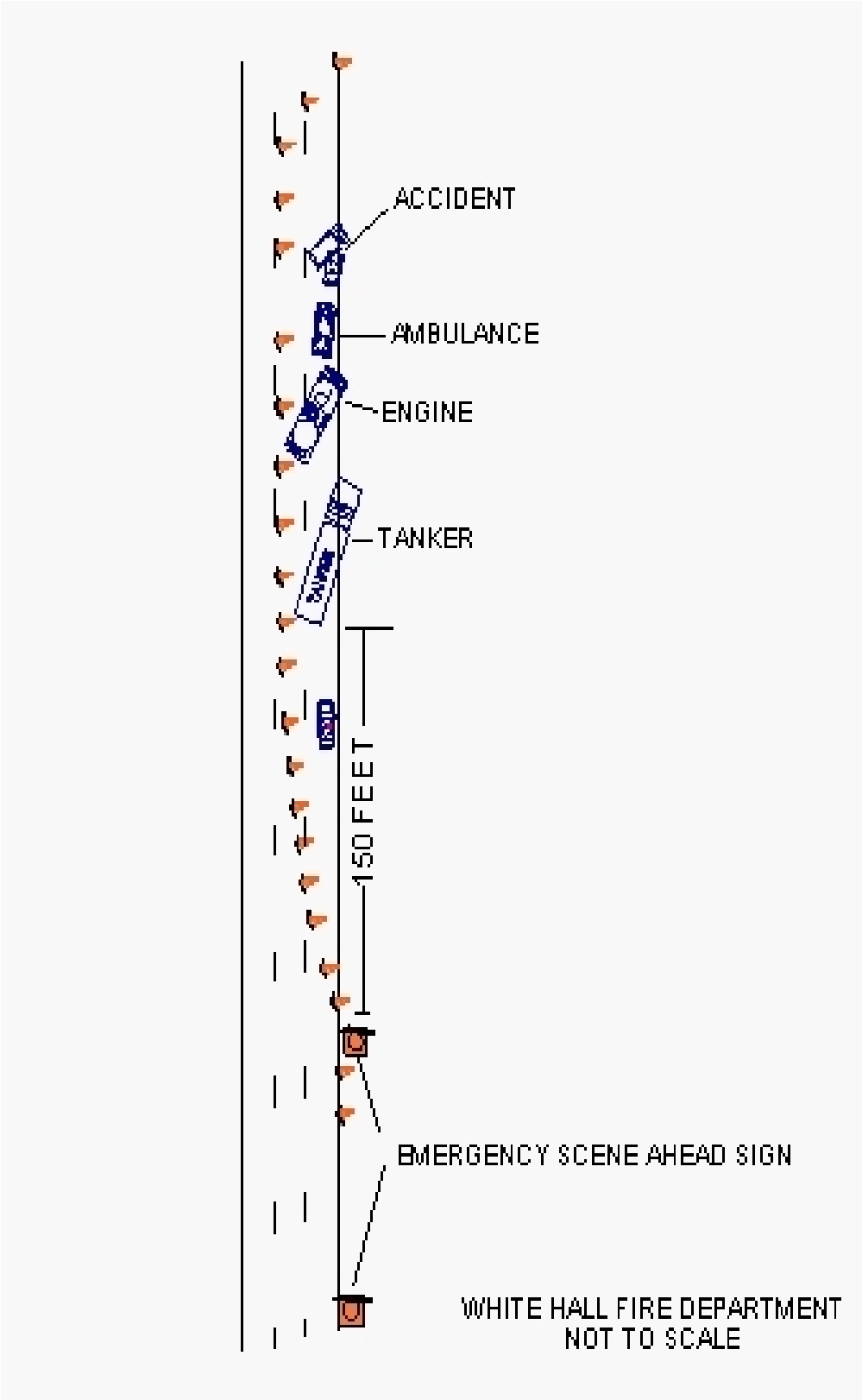
Night or Reduced Light Conditions

- □ Turn OFF vehicle headlights
- □ Turn OFF Opticom
- □ Provide overall scene lighting
- □ All personnel in agency PPE
- □ Illuminate cones with flares
- □ Consider additional responder vehicles for additional upstream "Block"
- □ Once TTC Established, step down aggressive warning lamps

Limited access, high-volume highway incidents

- □ Establish initial block: minimum two lanes
- □ Ladder truck establishes upstream block
    - two lanes plus paved shoulder or
    - three driving lanes
- □ Place cones and/or cones illuminated by flares upstream of last blocking apparatus
    - last cone approximately 150 feet "upstream" of apparatus
- □ Establish Flagger position
    - monitor approaching traffic
    - sound emergency signal as necessary
- □ Driver operator of apparatus
    - sound a series of long blasts on apparatus air horn as necessary
    - Transmit Key Phrase RUNAWAY as necessary.
- □ Use law enforcement vehicles for additional blocking
- □ Stage additional companies off highway
- □ Establish liaison with Police Department
- □ Terminate incident aggressively

Model Diagram for Traffic Incident Management



Appendix B
Draft TIM Training Presentation

Please note

The power point presentation is included on this ARP's disk. The instructor's manual for this draft class is viewed by printing the notes view of the presentation. There was no way to save the PPT file into word.

Appendix C
Implementation Strategy and Schedule

IMPLEMENTATION ***STRATEGY***	**Goal: REDUCED INJURIES TO FIRST RESPONDERS DURING TRAFFIC INCIDENT MANAGEMNT** ***Program Manager: W. Hicks***	**Accreditation Criterion: Risk Management**
Objective: By July 1, 2007 implement a multi-agency Traffic Incident Management procedure for the White Hall Fire District.	**Accreditation Category:**	Estimated Startup Cost: $ 200.00 Estimated Annual Cost: $ 0.00

Task No.	Task	Responsibility	Planning		Schedule by Month/Year									
			Days	Cost	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*
1	Develop Draft Procedure	W. Hicks	5	$0.00	→									
2	Develop Draft Training	W. Hicks	5	$0.00	→									
3	Identify Stakeholders	W. Hicks	1	$0.00	→									
4	Initial Meetings with S.H. to Provide Draft Documents/Course	W. Hicks/J. Cox	1	$0.00	→									
5	S.H. Update Draft Documents	Stake Holders	30	$0.00		→								
6	Meeting to Produce Final Documents/Course	W. Hicks	1	$100.00			3-15							
7	Train the Trainers	W. Hicks	15	$100.00			→							
8	Begin Training	Agency Training Officers	60	$0.00				→	→					
9	Evaluation Milestones	W. Hicks			X		X	X		X	**X**			
10														
		Totals:	***120***	**$ 200.00**										

Start Date: January 15 2007	**Fire Chief Approval:**	***Policy Approval: (If Required)***
Estimated Completion Date: July 1, 2007	*James Cox Jr.*	_____
By: *William D. Hicks Jr.*	***DATE: January 1 2007***	***DATE:***
DATE: January 1 2007		