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# Evaluating the Amarillo Fire Department Mayday Guidelines

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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 appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed:_____

## Abstract

The Amarillo Fire Department (AFD) hastily adopted a set of standard operating guidelines (SOGs) for Mayday events after a firefighter was endangered by a floor collapse, but had not analyzed them to determine if they met fire service laws and accepted practices.

The purpose of this research was to determine if modifications should be made during the next revision cycle to ensure the SOGs are compatible with applicable laws and standards. Evaluative research was utilized to answer the following questions:

1. What are the elements of the AFD guidelines that will affect Mayday operations?
2. What, if any, are the national and state regulations relating to Mayday operations?
3. What, if any, procedures are other organizations using to manage incidents involving a Mayday?
4. What, if any, are the standard operating procedures pertaining to Mayday events for the four fire departments sharing mutual aid agreements with the AFD?

The procedures included a literature review, a survey of Texas fire departments similar to the AFD, and a survey of departments that have mutual aid agreements with the AFD.

The results were the identification of the key components that should be addressed by Mayday procedures, state and national regulations that govern Mayday procedures, and the incompatibility of the procedures used by the fire departments that have mutual aid agreements with the AFD.

Recommendations developed included modifications to the current AFD guidelines, further research into legal implications of State statutory requirements, petitioning of NFPA Standards Committees to change their standards, and development of a cooperative committee with mutual aid department representatives to standardize procedures.

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## Mayday Guidelines

In America, over 100 firefighters a year die protecting the lives and property of others. Unfortunately, some of these men and women forfeit their lives to circumstances they could have survived if they, or others working at the scene, had reacted differently. Fire service fatality investigations reveal that, when faced with life and death situations, many firefighters do not recognize the extreme danger, do not initiate calls for assistance, fail to properly employ tools and equipment, or otherwise react inappropriately. A fire department's Mayday procedure serves as a guide to help firefighters take the correct actions in extraordinary and life-threatening environments. It is a foundation for self-survival training and a basis for action when there is little time to contemplate life and death options in disorienting smoke and mind-numbing heat. Other personnel on scene can apply the guideline to manage rescue and support activities to save the firefighter in distress. As identified in a firefighter fatality study (Tridata Corporation, 2002), "stringent adherence to standard operating procedures (SOPs)" (p. 3) is a viable prevention strategy to reduce firefighter deaths. Thus, it is critical that the Mayday procedure be well defined and as complete as possible.

The problem is that the Amarillo Fire Department (AFD) has not analyzed the Mayday Standard Operating Guidelines (SOGs) to determine if they meet fire service laws and accepted practices. The AFD hastily adopted its most significant guideline for Mayday operations, SOG No. 304.06b, "Mayday Procedures," (Appendix A) in 2002 after a near miss involving a firefighter who was endangered when a floor collapsed. The guideline was written and adopted, informally, within a week of the incident. Additionally, SOG No. 304.06a, "Lost or Trapped Fire Fighters" (Appendix B), was modified to ensure compatibility with the new guideline. After

training was conducted for all department members, the new procedures were formally placed in the AFD's *Standard Operating Guidelines Manual* (2004).

The AFD annually reviews the *Standard Operating Guidelines Manual* to identify guidelines that should be added, deleted, or revised. The purpose of this applied research is to determine if modifications to SOGs that are pertinent to Mayday operations should be made during the next revision cycle to ensure they meet applicable laws and fire service standards. Evaluative research will be utilized to answer the following questions:

1. What are the elements of the AFD guidelines that will affect Mayday operations?
2. What, if any, are the national and state regulations relating to Mayday operations?
3. What, if any, procedures are other organizations using to manage incidents involving a Mayday?
4. What, if any, are the standard operating procedures pertaining to Mayday events for the four fire departments sharing mutual aid agreements with the AFD?

## Background and Significance

### *City of Amarillo*

Amarillo, which is Spanish for *yellow*, is located in the center of the Texas Panhandle. It is relatively isolated in that, with a population of 179,000 people, it is by far the largest city in a 100-mile radius. The surrounding countryside is largely farm and ranch land carved from prairie called the Llano Estacado or *Staked Plains*. The name describes the wooden stakes that marked trails early settlers followed because of the scarcity of natural landmarks on the flat plains.

The City of Amarillo was incorporated as a railroad town, primarily as a supply depot and shipping point for buffalo hunters, in 1887 (Amarillo Fire Department [AFD], 1973). The economy of the 21st century is now built on the triumvirate of farming, cattle, and oil. However,

aggressive economic development policies have allowed the economy to become more diversified. For instance, the U.S. Marine's aircraft of the future, the tilt-rotor Osprey, is now assembled in Amarillo. Additionally, conservative fiscal policies of the municipal government have contributed to the local economy. The City of Amarillo operates with a balanced budget despite having the lowest property tax rate of any Texas city with more than 20,000 people (Amarillo Economic Development Corporation, n.d.).

*Amarillo Fire Department*

Organized firefighting in Amarillo began in 1897 with the 12 volunteers of the Amarillo Hook and Ladder Company. In 1908 the Company transferred all its property, including four horses, to the City of Amarillo (Barry, 1993). The AFD is currently comprised of 217 uniformed personnel manning 10 fire stations throughout the City's 92 square-mile area. From 2000 to 2003, the AFD responded to an average of 8560 incidents per year, of which 335 a year were structure fires (AFD, 2003). In addition to fire suppression, the AFD provides emergency response to incidents that require basic life support, hazardous materials mitigation, technical rescue, and aircraft rescue and firefighting.

Unfortunately, the AFD is familiar with the tragedy of firefighters losing their lives while fighting fire. Two firemen have been killed at structure fires (a third fell from an overpass while working at a semi-truck accident) in the 107-year history of the AFD. The first firefighter died when a brick wall fell and crushed him at a sash and door plant fire in 1936; the second died in 1982 after being burned by a rapidly developing arson fire that raced through an apartment building hallway (Barry, 1993).

The current AFD administration fully understands the dangers inherent to firefighting and has taken strong, proactive measures to reduce them. The AFD, since 1997, has maintained

minimum staffing levels that ensure four firefighters ride on each of the department's nine engine and four ladder companies every day. In 2002 the first full-time Health and Safety Officer, this author, was appointed. In 2003, the department implemented a fitness program that follows the *IAFF/IAFC Joint Wellness/Fitness Initiative* (2000) to reduce injuries and illness related to health and fitness. Beginning in 2004, every firefighter, regardless of age, will be given annual physical examinations that meet the recommendations of National Fire Protection Association (NFPA) 1582, *Standard on Medical Requirements for Fire Fighters* (2002e).

Positive encouragement to investigate near miss events and develop recommendations to prevent similar situations, which ultimately led to the current Mayday Operations SOGs, is another illustration of the safety-oriented philosophy of the department. The re-evaluation of SOGs is a yearly confirmation of that same attitude to reduce injury and harm to AFD personnel.

*Local Mutual Aid Agreements*

The AFD has reciprocal mutual aid agreements with four area fire departments. The fire departments include a career department that protects a Federal nuclear weapons facility; a municipal, combination department; and two combination departments that protect the counties that the City of Amarillo straddles. The local mutual aid arrangements are crucial to maintaining adequate protection for local citizens because of the scarcity of neighboring fire resources. Beyond these four mutual aid departments, the closest fire departments that could send significant assistance during a large-scale emergency in Amarillo are more than an hour away. As an illustration of this isolation, the next largest town in the 26 counties that comprise the Panhandle has just 18,000 people and is located 60 miles northeast of the city. Interoperability is essential for mutual aid responders, and the operating procedures, such as those for Mayday operations, of each of the mutual aid departments must be compatible.

*Mayday Standard Operating Guidelines*

It is imperative that fire departments have Mayday procedures in place. Connealy (2003) identified such a protocol as one of 27 emergency operations SOPs that firefighters must demonstrate they have mastered. The AFD Mayday procedure is now considered to be an essential SOG, but it took two near misses for the AFD to adopt it. The first occurred during a routine house fire in late 2000. The fire occurred near the department training facilities, and Fire Dispatch sent an engine company engaged in a training exercise to the emergency incident. One of the firefighters assigned to the apparatus was delayed by his involvement with the training scenario, and another firefighter took his place. Unknown to the replacement, that particular engine company was field-testing a new type of self-contained breathing apparatus (SCBA). When he donned an air pack and entered the burning structure, the firefighter did not properly engage the regulator, which resulted in his breathing smoke and toxic fumes during the firefight. The crewmembers with him noticed that he began to behave in an unusual manner, and they made an effort to remove him from the building (D. S. Eaves, personal communication, July 12, 2004). The oxygen-deprived firefighter became combative and resisted attempts to physically pull him out of danger. During this struggle, no attempt was made by anyone involved to contact the Incident Commander to either notify him a firefighter was endangered or request assistance. The firefighter was eventually transported by ambulance to the hospital, where he was treated for smoke inhalation (AFD, 2000).

Two factors contributed to this life-threatening situation not being officially investigated at the time. First, the incident occurred prior to the creation of the AFD Health and Safety Officer's position. Secondly, there was not a Mayday procedure in place at the time; therefore, no violation of procedures occurred that normally would have initiated a formal investigation.

The details of this first near miss were brought to the attention of the author while conducting an investigation into the second incident a year and a half later.

The second episode, and the one that directly led to implementation of the current Mayday guidelines, involved a residential fire in which a firefighter fell into a fire-filled basement when the floor suddenly collapsed. The firefighter, with his low-air alarm sounding and believing the entrance to the basement was walled off (AFD, 2002), did not communicate to the Incident Commander that he was in a Mayday situation. This author investigated the incident as the then recently appointed Department Health and Safety Officer. The inquiry revealed that the firefighter, who eventually self-extricated and did not suffer any injuries, did not declare his predicament, in part, because he did not have any written Mayday procedures to follow. One of the recommendations that resulted from this near miss investigation was that the AFD adopt a written Mayday protocol. Within days of the incident, a Mayday SOG was written, informally adopted until the firefighters could be trained, and then formally placed in the *AFD Standard Operating Guidelines* (2004).

This research project will help resolve the identified problem by allowing AFD administrators to make informed decisions when exploring possible revisions to the Mayday guidelines. This examination of the current protocols will directly impact the safety of personnel by making recommendations that will be incorporated into AFD survival philosophy, training, and operations at emergency incidents.

Because the results of this research will enhance the ability of firefighters to survive extreme and deadly fire situations, this applied research will support one of the five operational objectives of the U.S. Fire Administration (USFA) (2003), to "reduce the loss of life from fire of firefighters" (p. II-2).

In addition, this applied research will be used to meet two goals for students in National Fire Academy's (NFA) Executive Development Course. The first is that executive fire officers (EFO's) be able to provide leadership to their department by applying the results of applied research (National Fire Academy, 2004). The second goal is for EFO's "to use research to solve real-world problems in their work environments" (p. SM 12-4).

## Literature Review

The need for fire departments to adopt written procedures for incidents in which a firefighter is in jeopardy is well established in fire service literature. Connealy (2003) stated that all firefighters must know the procedures to provide "the check and balance required at fast-paced dynamic incidents done under very adverse conditions" (p. 78). In their landmark report on a firefighter fatality at a supermarket in Phoenix, Tobin and Kreis (2002) asserted that personnel have to adhere to standard operating procedures when in trouble. Crandall (2004) identified the need to establish even the most basic of Mayday SOG components, "a prearranged set of operational parameters for how to call a Mayday" (p. 71).

Once established, as the AFD Mayday guidelines have been, these procedures must be reviewed. This review and updating process is necessary, as the National Institute for Occupational Safety and Health (NIOSH) (1999) recommends, to prevent injury or death to fire department members. To identify possible modifications that could be proposed during the review and revision of the AFD Mayday SOGs, a literature review was conducted. The review included the AFD's *Standard Operating Guidelines Manual* (2004), state regulations, national incident management system requirements, NPFA standards, and publications from inside and outside the fire service. It is interesting to note that the literature review found multiple sources that addressed individual elements that should be included in the Mayday procedures, but the

review did not identify a single reference that provide an all-encompassing outline for Mayday procedures.

To ascertain which elements of the AFD's guidelines would be used during a Mayday event, the *Standard Operating Guidelines Manual* (2004) was examined. This examination found six SOGs that are relevant to Mayday operations. Two, "Mayday Procedures" (Appendix A) and "Lost or Trapped Fire Fighters" (Appendix B), are the backbone of the guidelines that will be employed should an Amarillo firefighter declare a life-threatening emergency. The remaining four are support documents, but they identify critical actions that should be taken by personnel working at a Mayday event.

The first of the two fundamental Mayday SOGs was developed after the AFD firefighter fell into the basement when the floor collapsed. The significant aspect of SOG 304.06b, "Mayday Procedures" (Appendix A), is that it specifically details the actions that a firefighter should take when facing a deadly situation. It first requires the firefighter to declare the emergency on the radio by announcing Mayday. This should be possible for every firefighter because it is AFD policy for all firefighters to carry portable radios when working in an Immediately Dangers to Life and Health (IDLH) environment. Currently, the AFD radios do not have emergency alert buttons that could also send out an alert tone indicating the firefighter is in trouble. Paragraph B of the SOG also gives radio priority to the firefighter declaring a Mayday by recommending the Incident Commander (I/C) "move all personnel that are ***not*** directly involved in rescue operations to a different fireground radio channel" (p. 1). Paragraph D lists the information that the firefighter should relay via the radio to Command to assist with the rescue. Even more crucial are the action steps itemized in Paragraph C, those the firefighter is to take when confronting an extremely hostile event. First and foremost, the firefighter is to

remedy the threats that could cause incapacitation, such as replacing a dislodged SCBA mask. The firefighter is then to declare, "Mayday," activate the personal alert safety system (PASS) device, and attempt self-rescue (and contact the RIT) while consciously conserving any remaining air supply. The SOG then requires on scene personnel, including Command, follow the second of the basic Mayday operations procedures found in SOG 304.06a, "Lost or Trapped Fire Fighters" (Appendix B).

In the section entitled "Lost or Injured Fire Fighters," of SOG 304.06a (Appendix B), the action steps that the firefighter should follow when in a life-threatening situation are listed again to underscore their importance. A critical point is also made, "Firefighters must recognize that being lost or disoriented is an emergency and must take immediate actions to extricate themselves from the danger before becoming incapacitated" (p. 1). This need is highlighted by the information Kreis (2003) found after a firefighter fatality:

> We asked officers and firefighters in Phoenix shortly after the Southwest Supermarket incident, "When would you call a Mayday?" Although they didn't say it directly, after boiling out all of the rhetoric, the response basically was, "on my last dying breath." That is way too late! (p. 58)

The main thrust of the Lost or Trapped Fire Fighters SOG (Appendix B) is toward actions that the I/C and others should take when working at a scene involving a firefighter in trouble. The main considerations for Command can be summarized as: (a) deploy a rapid intervention team (RIT) and assign a back-up RIT, (b) immediately upgrade incident to next greater alarm and request special units that may be required (i.e., Hazmat Team, Heavy Rescue, ambulances), (c) establish sectors to support rescue operations (i.e. Rescue Sector, Medical Sector, Level II staging), (d) establish protection zones, (e) initiate Personnel Accountability

Reports (PARs), and (f) do not allow personnel to operate outside the Incident Management System (IMS).

The Rescue Sector, the group responsible for implementing the firefighter rescue operations at the scene, is also given a list of requirements in this SOG. The Rescue Supervisor must define search areas, assign the RIT to the best location, establish protection zones around the downed/lost firefighter, and request the necessary resources to fulfill these objectives. The RIT team is charged with certain, specific tasks before and after finding the firefighter in distress. These tasks are important for the firefighters that have declared a Mayday to know because they will be better able to assist with the rescue. The firefighter can relay hazards, access paths, and landmarks in the area. Knowing that one person on the RIT is delegated the responsibility of listening for and locating sounds from the person they are trying to locate, the distressed firefighter can ensure the sound from the personal alert safety system (PASS) and low air alarms are not impeded. The firefighter can also generate noise by striking tools against furniture, doors, walls, or columns to help with echolocation. The lost or trapped firefighter can also assist with the rescue plan by helping determine what equipment may be needed to aid the extrication, such as an attic ladder when the firefighter has fallen through a floor.

The first of the four supporting standard operating guidelines for Mayday situations in the AFD's *Standard Operating Guidelines Manual* (2004) is SOG 301.10, "Safety Sector: Incident Safety Officer." This SOG stipulates that a Safety Sector/Incident Safety Officer be implemented at any incident presenting an "unusual risk" (p. 1) to firefighters. It also requires the I/C to ensure the AFD's Health and Safety Officer is responded to "incidents involving multiple alarms, trench rescue, confined space rescue, or other significantly high-risk incidents" (p. 1). The next SOG that will affect a Mayday scenario is SOG 303.06, "Rapid Intervention

Team;" however, this SOG, as it affects Mayday operations, does not add any new information. It only reemphasizes the information from the "Lost or Trapped Fire Fighters" protocol that has been previously discussed.

The third guideline from the *Standard Operating Guideline Manual* (AFD, 2004) that will be utilized for a Mayday is SOG 303.07, "Personnel Accountability System," which requires sector supervisors or team members to immediately report any absent crewmember so Command can initiate rescue operations. The Accountability Officer is to assist the Incident Commander with a PAR at any time, but specifically for:

1. A report of a missing or trapped firefighter
2. A change from offensive to defensive strategy
3. A sudden hazardous event such as a flashover, a backdraft, or collapse (p. 4)

The last SOG from the *Standard Operating Guidelines Manual* (AFD, 2004) is 303.08, "Emergency Evacuation." This guideline reiterates the actions and information previously discussed, but it also has two new and important considerations. First, it recommends that the I/C consider using the crew that was with the missing firefighter to either perform in the rescue as part of the RIT team or be used to provide intelligence regarding the location, conditions, and situation facing their fellow crewmember. Secondly, this guideline specifies that the term *Code Red* be used exclusively to prompt an immediate evacuation "when personnel are considered to be in an imminent life-hazard situation" (p. 1). This differs from when Mayday would be declared in that the firefighter is not just considered to be endangered, but is actually ensnared by the hazards. In other words, during Code Red operations personnel involved are still capable of self-extrication while those in a Mayday situation are not.

There is one proposed addition to the *Standard Operating Guidelines Manual* (AFD, 2004) that is pertinent to Mayday operations. During a RIT training class for the AFD, over 200 Amarillo officers and firefighters were presented an article by Clark (2001) and required to answer the question he asked in the title, "Mayday, Mayday, Mayday: Do firefighters know when to call it?" The results were stunning. Given five minutes to determine ejection parameters, including those that would initiate a call of Mayday as well as those that would simply involve leaving a hazard area immediately, the majority of firefighters did not list more than five or six. However, each answer that was given was compiled and categorized. Twenty Ejection Parameters (Appendix C) were classified, and these are currently being proposed as an addition to the Mayday operations guidelines.

To identify any laws and regulations regarding Mayday operations procedures, the Texas Commission on Fire Protection (TCFP) was used as the primary source of information. The TCFP is the regulatory agency responsible for fire protection in the State of Texas. Chapter 419 of the Texas Government Code (2003), defines the Commission's authority to develop and enforce standards for fire service certifications, education, training, and emergency operations to protect citizens and firefighters from fire and related hazards. There are three areas of TCFP regulations that apply to Mayday standard operating procedures: (a) Subchapter B of the Texas Government Code; (b) the *Standards Manual for Fire Protection Personnel*; and (c) the *Certification Curriculum Manual* that establishes minimum training for Texas firefighters.

Two sections of the Texas Government Code (2003) under Subchapter B, "Regulating and Assisting Fire Fighters and Fire Departments," apply to Mayday SOGs for emergency incidents. Section 419.044, "Incident Management System," requires fire departments to develop an incident management system and a written set of procedures to manage emergency

incidents. Paragraph (c) of the regulation requires the system to comply with the applicable NFPA standard, which is NFPA 1561, *Standard on Emergency Services Incident Management System* (2002b). Section 419.046, "Fire Protection Personnel Operating at Emergency Incidents," also requires standard operating procedures to protect firefighters working at such incidents. Paragraph (c) of this section suggests, but does not compel, fire departments use the minimum standards for SOPs established by the NFPA as a guideline. In this case, the applicable standard is NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program* (2002c). The NFPA standards that are applicable to this research project will be examined later in this Literature Review.

These two sections in the TCFP regulations are general in nature and do not detail the components that must be included in the SOPs developed and implemented by fire departments. They, therefore, do not specifically address Mayday SOPs. However, as Coleman (2001) recognized, "to create order out of chaos, a chief or company officer must …. know what to expect of his crew when the distress call is heard" (p. 59). By including Mayday guidelines in the standard operating procedures required by these regulations, the Incident Commander can expect standardized actions. Thus, control of crews and equipment are better achieved during one of the most stressful situations that can be faced in the fire service, an endangered firefighter calling, "Mayday, Mayday."

The second area of state regulations that apply to Mayday operations and procedures is found in the *Standards Manual for Fire Protection Personnel* (Texas Commission on Fire Protection [TCFP], 2004). In Section 435.5, "Commission Recommendations," employing entities are advised to use NFPA 1403, *Live Fire Training Evolutions* (2002d), and NFPA 1500, *Fire Department Occupational Safety and Health Program* (2002c), as guides for all firefighting

operations. It is important to note that these two standards are identified for use as guidelines and not as statutory requirements.

The *Certification Curriculum Manual* (TCFP, 2000) addresses the minimum training standards for fire suppression in the State of Texas. This manual identifies 43 subject areas that a basic firefighter must learn to become a certified Texas firefighter. Section 122, "Fire Fighter Safety and Orientation," Paragraph 122-7.00 states, "The fire fighter trainee shall describe and demonstrate techniques for action when trapped or disoriented in a fire situation or in a hostile environment" (p. 122-3). The skill sheet for this section, which must be completed to demonstrate content mastery, lists four techniques that are to be evaluated:

1. Reversing the entry path by keeping in contact with walls at all times
2. Reversing the entry path by following a hose line to the exit (feeling couplings)
3. Activate Personal Safety System (PASS), portable radio
4. Reversing the entry path with life line (rope) (p. FSSAFT#2-1)

These four skills can be utilized as a foundation in fire department SOGs to train actions that firefighters can take to self-extricate in a Mayday event. The *Certification Curriculum Manual* (TCFP, 2000) skill sheet states that the evaluator is to assess only one of the four techniques listed. The firefighter trainee does not have to reverse the entry path using a wall, or a hose line, or life line in conjunction with manually activating the PASS and using proper radio procedure to notify other personnel on scene. Separating these skills, PASS activation and radio procedure, from the others during an evaluation does not reinforce the need for simultaneous actions when personnel are faced with life and death situations. Vaught et al. (2000) support this in their study of how miners react during underground mine fires, which states, "As an emergency progresses, people who are less well-prepared tend to experience sensory overload.

This causes them to focus on small parts of the problem rather than trying to comprehend the entire situation" (p. 220).

Nationally, there are no laws or regulations that govern municipal fire departments across the nation. However, in February, 2003, President Bush issued Homeland Security Presidential Directive (HSPD)-5 that directed the Secretary of Homeland Security to develop a National Incident Management System (NIMS) (U.S. Department of Homeland Security [USDHS], 2004). NIMS is mandatory for all Federal departments and agencies, but not state or local organizations such as the AFD. However, HSPD-5 does mandate Federal agencies, beginning in FY 2005, to make state and local organizations adopt NIMS as a condition of grants and contracts for preparedness assistance from Federal sources. Since the AFD and the City of Amarillo have applied for several Federal grants that could be awarded in FY 2005, it is important that the department follow the NIMS requirements.

Chapter III of *National Incident Management System* (USDHS, 2004) addresses the need for preparedness by those agencies that can be expected to respond to emergencies together. It lists one of the major objectives of agency preparedness as ensuring "mission integration and interoperability in response to emergent crises across functional and jurisdictional lines" (p. 33). To achieve this interoperability, NIMS requires the preparedness organizations to "establish the standards, guidelines, and protocols necessary" (p. 35). The AFD has mutual aid agreements with four local fire departments and must integrate standard operating procedures, including Mayday SOGs, with these departments to comply with NIMS.

Review of state and national regulations pertaining to Mayday operations identified one NFPA standard that is a mandatory minimum standard for local fire departments, NFPA 1561, *Emergency Services Incident Management System* (National Fire Protection Association

[NFPA], 2002b). Paragraph 4.2.6 of NFPA 1561 requires that emergency service organizations (ESO) prepare plans that address "both routine and unusual incidents and shall provide standardized procedures … that can be applied to the needs of situations of differing types, sizes and complexities" (p. 1561-6). In Annex A, "Explanatory Material," of NFPA 1561, Paragraph 4.2.6 is expanded upon. It lists 17 items that an incident commander should consider when a firefighter is in a life-threatening situation (Appendix D).

NFPA 1561 (2002) also addresses another area related to Mayday operations, standard terminology. Paragraph 4.3.11 requires the ESO "to have an SOP that uses the radio term *emergency traffic* as a designation to clear radio traffic," (p. 1561-6) and Paragraph 4.3.12 states, "Emergency traffic will be declared by an incident commander (IC), TLMC, or member who is in trouble or subjected to an emergency condition" (p. 1561-6). The explanatory material for these paragraphs gives examples of possible wording that can be used to clarify the reason a member is announcing "emergency traffic." The standard gives as examples, "fire fighter missing,' 'fire fighter down,' 'officer needs assistance,' 'evacuate the building/area,' 'wind shift from north to south,' 'change from offensive to defensive operations,' or 'fire fighter trapped on the first floor" (p. 1561-13).

The literature review also identified two NFPA standards that the TCFP does not mandate, but does recommend, Texas fire departments to use as guidelines for fire protection operations. The first was NFPA 1403, *Standard on Live Fire Training Evolutions* (2002d). Examination of this document found that the only section pertinent to Mayday operations in gas-fired training center buildings, which is the type operated by the AFD, was Paragraph 5.1.1. It requires that the student shall meet the Fire Fighter I performance requirements for Fire Fighter I in NFPA 1001, *Standard for Fire Fighter Professional Qualifications* (2002a). The only section

that is directly applicable to Mayday operational skills for Firefighter I in NFPA 1001 is found in Paragraph 5.3.1, which is concerned with self-contained breathing apparatus (SCBA) use during fireground operations. The firefighter is required to ensure that emergency procedures are followed should there be a failure of the SCBA. Once again, this standard does not specifically state what components the emergency procedures should include; the requisite skill simply requires "The ability to… initiate and complete emergency procedures in the event of SCBA failure or air depletion" (p. 1001-6). There are two inferences to Mayday situations in NFPA 1001 that Clark (2001) noted regarding in the standard, the Firefighter I's knowledge of emergency radio procedures in Paragraph 3.2.3. and understanding what factors create a hazard in Paragraph 3.3.4. However, the skill and knowledge requirements listed for these are not focused specifically toward Mayday circumstances.

The TCFP also recommends fire department use NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program* (2002c). Paragraphs 8.1.10.1 - 8.1.11.1, like NFPA 1561, requires the use of *emergency traffic* to clear radio traffic and *all clear, resume radio traffic* to announce that the hazard no longer exists. However, Paragraph A.8.1.11 of the "Explanatory Material" goes further and explicitly precludes *Mayday* from being used by firefighters in distress by stating in boldface print, "The term *mayday* should not be used for fireground communications in that it could cause confusion with the term used for aeronautical and nautical emergencies" (p. 1500-40). This restriction seems to be in opposition of Williams and Stambaugh's (2003) finding, which is "the term 'mayday' is becoming universally accepted by fire departments as an indication that an interior firefighter or crew needs assistance" (p. 38).

NFPA 1500 (2002) also has requirements for personnel working at an incident involving the rescue of a firefighter(s). Paragraph 8.5.5.1 emphasizes the need for firefighters to continue

as assigned and not abandon their tasks to perform a rescue, which could endanger other personnel working at the incident. Paragraph 8.5.6.1 requires that crews/companies operating at the scene remain together during a firefighter rescue operation.

A review of fire service and non-fire service publications was done to help determine what other fire departments and agencies deem desirable for inclusion in Mayday procedures. The literature review identified six categories that should be addressed in a good set of Mayday procedures, each of which be discussed individually. These categories are: (a) Terminology, (b) Firefighter Emergencies, (c) Firefighter Actions, (d) Crew Actions, (e) Incident Commander Actions, and (f) Administrative Considerations.

*Terminology*

The initial focus was to determine what terminology is being used throughout the fire service to describe the situation in which a firefighter(s) is confronting an extreme and imminently life-threatening situation. This literature review found that the almost universally accepted term in fire service literature for such endangerment is *Mayday*. Dodson (2004) explains *Mayday* "indicates that an individual or team is in extreme danger" (p. 739). He more specifically defines the term's use when he encourages firefighters to study procedures for declaring Mayday if they are lost or trapped. For his applied research project to assess Command responsibilities in these types of events, Ray (2003) defined *Mayday* as "The emergency condition where a firefighter may be lost, trapped, missing, or disoriented to a level assistance will be needed" (p. 20). Miles and Tobin (2004) recommend operating procedures have two terms to distinguish the severity of the emergency. They state, "A Mayday transmission is used only in situations that are life threatening to firefighters. The Urgent message is used for other types of fireground emergencies" (p. 22). When establishing

benchmarks for self-survival hands-on training after Tarver died in Phoenix, Tobin and Kreis (2002) used "Initiate 'Mayday' when crewmembers are in trouble" (p. 97). Kreis (2003) again uses the term *Mayday*, in an often-quoted article on rapid intervention, to encourage an immediate declaration of an emergency. He stated, "waiting until you can't get out of trouble before you call a Mayday will cause serious problems that cannot be overcome" (p. 58). Morris (2003) encourages personnel to call Mayday as soon as they believe they are endangered. Comstock and Maxwell (2004) consider not immediately calling a Mayday one of the 10 deadly sins committed on the fireground.

Not only do accessed sources use *Mayday* to define the urgent situation of a firefighter in distress, many use it with the implicit understanding that the reader will know what is being discussed. Mora (2003) entitled his article explaining a study of 23 firefighter fatalities in which disorientation was a causal factor "No more maydays." The same month, Nasta (2003) began his article on what firefighters should do in an emergency with "Mayday! Mayday! Mayday!" (p. 20). Clark (2001) uses *mayday ejection parameters* as a term to standardize what situations a firefighter could use to recognize an extreme hazard and then react quickly and appropriately. Dewan and O'Donnell (2002) wrote that a New York City Fire Commissioner, trying to explain the deadly circumstances at a fire to newspaper reporters, said the firefighter who had died had not alerted anyone by radioing a Mayday.

Although the overwhelming majority of sources reviewed during the literature review utilized *Mayday* exclusively to describe a firefighter's life and death emergency, it was not unanimously so. Most notable was the NFPA standards that were previously discussed, and which are totally devoid of the term *Mayday* other than to recommend fire departments not include it in their procedures. NFPA 1561 (2002b) has an annex that is not part of the NFPA

requirements, but is included as an information source for fire departments. Section C.2 of Annex C, "Managing Responder Safety," has guidelines reflecting Phoenix Fire Department standard operating procedures applicable to firefighter emergencies. This material follows the NFPA requirement of using *emergency traffic*; it does not use *Mayday* at all.

Publications from NIOSH varied on the usage of *Mayday*. The NIOSH (1999) Alert on structural collapse did not use *Mayday*, but instead recommends "a standard operating procedure for the delivery and acknowledgement of 'emergency traffic' at the incident scene" (p. 7). In a fatality report (National Institute for Occupational Safety and Health [NIOSH], 2004a) written after a firefighter had not called for assistance, NIOSH recommended that personnel should "train on … life-saving activities when lost, trapped or disoriented. Basic activities such as emergency radio traffic … can save an individual or team" (p. 1). However, another report on a fatality in a high-rise in Texas (NIOSH, 2002) made a very similar recommendation but included the term *Mayday*, "train fire fighters on initiating emergency traffic (Mayday-Mayday) when they become lost, disoriented, or trapped" (p. 1).

*Firefighter Emergencies*

A review of the literature linked danger recognition and early reaction as key factors in surviving a perilous event. Recognizing a hazard early is also crucial to being able to take proper action. Vaught et al. (2000) explains that the first signs of impending danger are often unclear. In addition, people in highly dangerous situations do not pull together the necessary information and, as a result, are unable to take effective action. Furthermore, Kowalski and Vaught (2001) found that people under time pressure will attempt to gather more information in a deteriorating situation instead of reacting quickly and decisively to correct it.

Unfortunately, firefighters are subject to these human behaviors, sometimes to the point they lose their lives. Writing about the tragic fire on Storm King Mountain, Maclean (1999) states, "the twelve firefighters did not at first hike at maximum speed…. everyone failed to recognize early enough the danger of the situation" (p. 242). Investigators confirmed that the slow pace was a factor in the deaths. Varone (2003) identified 24 firefighter fatalities in a 24 year period where delaying or failing to declare a Mayday was a contributing factor. Similarly, Ray (2003), studying NIOSH firefighter fatality reports, discovered 13 of 30 incidents where no Mayday was called. Clark, Auch, and Angulo (2002) believe "firefighters might have survived had they recognized early enough that they needed help or that something was out of the norm and they had called a Mayday" (p. 85).

Risk perception is another critical behavior that affects the decision process while trying to survive a catastrophic event. Lopez-Vazquez and Marvan (2003) identified a distorted perception of reality (*invulnerability illusion*) and the tendency to overestimate personal control of a situation (*illusory optimism*) as factors that influence a person's perception of the environment. Cannon-Bowers and Salas (1998) consider *recognition-primed decision-making* (RPD), the theory that people will interpret a situation by relating it to similar experiences they have had, as another factor in risk perception. The near-miss experiences of three firefighters in Seattle illustrate that both a distorted perception of reality and RPD are causal factors in fire service tragedies. Each firefighter suffered impairment of judgment and motor skills after running out of air and breathing carbon monoxide. Clark (2003) quotes one of the victims, 'I knew I was in trouble. I thought about using my radio, but I thought, I found my way in; I can find my way out" (p. 85).

Organizations that must place their personnel in harm's way have developed strategies to reduce the risk. The *US Army Survival Manual* (U.S. Department of the Army, 1992) explains the concept of *survival planning* to soldiers. Simply, survival planning is being prepared by understanding that a life and death situation could occur and then taking steps beforehand to better the odds of surviving. The manual then lists several different high-risk scenarios and provides methods of overcoming each. Clark (2001) points out that U.S. Navy pilots are required to know explicit ejection parameters for their type of aircraft before they get into the air to ensure there is no ambiguity in the decision to punch out. The *Mine Rescue Manual* (Saskatchewan Mine Emergency Response Program, n.d.) stresses that recognizing early warnings and responding immediately are the difference between life and death. Eight indicators that mandate immediate emergency response for miners are identified in the manual.

Firefighters too must have hazardous conditions defined before they are faced with making such judgments in a dark, deadly atmosphere. Clark (2003) asserts fire departments must have specific benchmarks that ensure personnel will call for help as soon as they recognize trouble. To increase the breathing air time remaining during an emergency, Bucher (n.d.) emphasizes the firefighter must "recognize the danger early on, and act as if your life depended on it" (p. 1). Standardizing the definition of Mayday situations can reduce the chances of an individual's risk perception or decision-making skills contributing to their death.

Following the examples set by the Army, Navy, and Canadian mining authorities, many fire service experts are identifying criteria that should automatically trigger the declaration of Mayday and the resulting rescue operations. The Anne Arundel County Fire Department has six Mayday parameters: "Fall, Collapse, Activated (low air or PASS device), Caught, Lost, Trapped" (Clark, 2004, p. 1). Dodson (2004) identifies several conditions including lost,

trapped, injured, and alludes to collapse. He emphasizes that a crew lost in an IDLH environment is in a true emergency. McCormack (2002) addresses SCBA emergencies such as entanglement, equipment failure, and depleted air supply. He also discusses disorientation emergencies and their possible causes, including losing reference points, falling because of a partial collapse (i.e, a floor), collapsing structural elements, and rapidly deteriorating conditions. Miles and Tobin (2004) suggest a Mayday transmission for situations involving imminent or already completed collapse, an unconscious or grievously injured firefighter, a trapped or lost firefighter, or a missing crewmember. Kreis (2003) points out that being lost, running out of air, or being trapped are Mayday episodes.

Other authors address Mayday circumstances that were pertinent to the subject they were discussing. Mora (2003) studied firefighter disorientation in buildings with enclosing designs. The NIOSH (2000) fatality report on the Worcester tragedy spoke of firefighters throughout the United States succumbing to smoke or being trapped by fire after first becoming disoriented. NIOSH's (1999) Alert was concerned specifically with Mayday emergencies involving structural collapse emergencies.

The most detailed list of Mayday parameters reviewed was developed by Clark et al. (2002) to help address a problem they identified in the fire service, "we have not clearly defined lost, missing or trapped" (p. 1). This problem was clearly evident at the AFD incident in which the firefighter fell into the basement but did not call for assistance. Clark, et al. drafted a set of Mayday parameters for a single family dwelling that was based on the survey results of responses of 339 firefighters. The innovative aspect of their approach was the inclusion of timeframes in deciding what is a Mayday situation. Parameters developed as a result of the survey were:

1. Entrapment with a low air alarm activating
2. Falling through a roof
3. Entrapment and unable to extricate within 60 seconds
4. Caught in a flashover
5. Falling through a floor
6. No reference point in zero visibility and unknown direction to exit
7. Primary exit blocked by fire or collapse and unable to reach secondary exit in 30 seconds
8. Low air alarm activating and unable to reach exit in 30 seconds
9. Unable to locate exit in 60 seconds. (p. 3-4)

Clark et al. (2002) stress that these parameters are only for a single-family residence without a basement. They suggest that different parameters should be developed for structures of various types and occupancies.

*Firefighter Actions*

Once firefighters have recognized they are in danger and have declared, "Mayday, Mayday," they must be able to execute actions and provide information that will help save them from injury or death. As Nasta (2003) states, "it is surprising how many firefighters do not know what to do when they find themselves lost in a structure" (p. 20). In contrast to this statement, the literature review did not find extensive differences in the recommendations for what actions the firefighters should do once they are endangered. Dodson (2004) provides several action steps that should be taken after calling for assistance: (a) stay calm, (b) activate the PASS, (c) make noise and use visual signals to alert the RIT, (d) assess the surroundings, and (e) attempt self-extrication. McCormack's (2002) steps are similar: (a) orient (air supply, reference points,

etc.), (b) activate PASS, (c) make noise to contact RIT, (d) solve the problem, and (e) attempt communication with crewmembers. Nasta (2003) keeps the action steps very simple – remain calm, activate the PASS, and orient yourself. He points out that the first step, remaining calm, is to conserve air. Firefighters must keep their facemask on and utilize emergency breathing techniques. Bucher (n.d.) offers a supporting view, "The key factor here is to increase the time, breathing air time, to escape" (p. 1).

Two of these authors have the same viewpoint regarding the choice the firefighter must take to either stay in one place or move in order to attempt self-rescue. They recommend the firefighter should keep moving, but for different reasons. Dodson (2004) says this will prevent panic by focusing on the escape. Nasta (2003) is more direct when he maintains that the firefighter should "Take matters into your own hands. Don't wait to die. Find your own way out if you are physically able" (p. 22). Boudreault (2003) claims Nasta's statement helped him escape a floor collapse into a basement where he struggled through a hostile fire environment to a window. RIT members were able to pull him out just as his air supply was exhausted.

PASS activation was an almost universal action step in the literature on Maydays. However, as widespread as this knowledge is, it must continually be reinforced through standard operating guidelines. Comstock and Maxwell (2004) reported that over a 10-year period only 9% of firefighters killed on the fireground while wearing a PASS device had activated them. Not activating a PASS is numbered as sixth on their list of deadly sins firefighters commit on the fireground. Kreis (2003) commented that Brett Tarver did not activate his PASS even after being told to do so by the Incident Commander.

Communication is also a significant factor for the endangered firefighter. Not only must Mayday be announced, but vital information must be also conveyed to help effect a successful

rescue. Miles and Tobin (2004) assert the radio transmission should include the crewmember's name, unit, assignment, and location as well as the problem causing the Mayday. Crandall (2004) suggests the mnemonic acronym, "E.S.C.A.P.E." (p. 71). A more common acronym, L.U.N.A.R., was given by McCormack (2002) and Clark (2004), but they vary on what the *R.* represents. Table 1 presents the information these acronyms remind an endangered firefighter to transmit.

Table 1

Mnemonic Acronyms for Mayday Transmissions

| Crandall [a] | McCormack [b] | Clark [c] |
|---|---|---|
| **E**ngine/truck assignment | **L**ast known location | **L**ocation |
| **S**ituation | **U**nit number/ID | **U**nit number |
| **C**onditions | **N**ame | **N**ame |
| **A**ir supply | **A**ssignment | **A**ssignment |
| **P**osition | **R**adio equipped | **R**esources needed |
| **E**scape plan | | |

[a]From "Learning to E.S.C.A.P.E" by S. Crandall, 2004, *Fire Engineering, 157*, pp. 71-76.

[b]From *FireNotes: Firefighter Survival* by J. McCormack, 2002, Indianapolis, IN: Fire Department Training Network, Inc.

[c]From "Calling a Mayday: the Drill" by B.A. Clark, 2004, *FireHouse.com*, Retrieved August 28, 2004, from http://ems.firehous.com/content/article/article.jsp?sectionID=10&id=32431

In addition to the information already mentioned, Williams and Stambaugh (2003) include the number of firefighters that need assistance as part of the Mayday transmission. Nasta

(2003) found that the PASS device interfered with the transmission and suggests that the firefighter may have to silence it when communicating by radio. Dodson (2004) stresses that if the team or member should escape on their own they need to report they are no longer endangered.

*Crew Actions*

While the firefighters that have declared a Mayday are taking the necessary actions to save themselves, other personnel must have the discipline to continue their assignment until otherwise directed by the Incident Commander. Klaene and Sanders (2000) relate that it is the natural instinct of crews to abandon their assignments to help their fellow crewmembers. A NIOSH (2004b) fatality investigation found that the incident became chaotic when other crews attempted to help with the rescue of the firefighter trapped by a chimney collapse. The I/C gained control and ordered crews to shore the collapse area, which was done simultaneously with the rescue. The Cincinnati Fire Department (2003) reported that an engine crew that continued the fire attack aided the rescue effort by keeping the fire in check. At the Southwest Supermarket Fire, Kreis (2003) said that crews continued the firefight and held the fire out of the rear of the building until the downed firefighter was recovered. As Dodson (2004) points out, firefighters not assigned to the rescue sector or in the immediate area to execute the rescue should trust those that are.

Another problem that those operating on the scene involving a firefighter emergency need to overcome is overwhelming the radio communications. Miles and Tobin (2004) insist that fire departments must have procedures that allow the person in trouble to have radio priority. They suggest crews suspend all radio transmissions and use face-to-face communications as much as possible to minimize the radio congestion. NIOSH investigations frequently find

communications are a contributing factor to the fatality. Ray's (2003) examination found NIOSH cited communications as a contributing factor in 16 of the 30 investigations he studied. As an example, at the Worcester fire NIOSH (2000) reported that radio communication was often ineffective due to number of firefighters using their radios. Williams and Stambaugh (2003) state, "Other units on the fire ground, unless they have an emergency, should not complicate the rescue effort with radio traffic or suggestions" (p. 39).

*Incident Commander Actions*

The Incident Commander must also have a set of guidelines to direct rescue operations. McNamee (2003) asserts that if the I/C does not effectively manage the situation, it "rapidly deteriorates into an emotionally driven freelance fiasco" (p. 13). The I/C also must make critical decisions under the time constraint imposed by the imperiled firefighter's air supply, the "small window of survivability" (p. 5) described by Morris (2003). In a review of eight incidents involving firefighter deaths, Jakubowski and Morton (2001) identified the lack of effective plans to rescue the firefighters in jeopardy as contributing factors in their deaths.

Determining who is actually involved in the emergency is a priority for the Incident Commander. Dodson (2004) discusses the I/C initiating personnel accountability reports (PAR). The process involves contacting each sector or crew on the fireground and having them report their status. Missing crews or crewmembers can then be identified and resources directed to their aid. Klaene and Sanders (2000), Crandall (2004), and Sendelbach (2004) refer to the need for PARs to be conducted when a firefighter announces, "Mayday, Mayday."

Controlling the radio communications is also of extreme importance at a scene with an ongoing firefighter emergency. That firefighters at such an incident must stay off their radios was discussed previously. Another procedure that can help establish control of the radio traffic

involves changing personnel to other radio frequencies. Crandall (2004) presents two options the I/C has other than keeping all personnel and operations on the same channel. The first is to designate a different channel for the firefighter in danger and those working directly in the rescue sector. The second option is for the firefighter and rescue sector to stay on the primary channel while all other operations are moved to another one. NIOSH (2000) recommends the second choice when they state, "switch radio operations to a new frequency…. This would open the main channel for communication in case of an emergency or lost firefighter" (p. 11).

Another consideration for the I/C is the amount of resources available to create an effective rescue sector in addition to ongoing operations. According to a study conducted in Phoenix, Kreis (2003) determined it will take 12 firefighters to remove the downed firefighter from a commercial structure. Additionally, he found that 1 in 5 rescuers will themselves become endangered, and back-up teams must be established to "rescue the rescuers" (p. 64). McNamee (2003) points out that the required manpower will be great, and the I/C is responsible for providing enough resources. It is the Command officer's decision to provide those resources by redirecting on scene crews, calling for greater alarms, or summoning aid from outside departments. Shaw (2004) comments that "when a Mayday is transmitted…. is not the place to learn how many resources it takes" (p. 26).

With the establishment of the rapid intervention team (RIT) concept in recent years, much attention has been focused on the subject in contemporary fire service literature. Much of the information reviewed for this research came from sources that had RIT as their primary topic. However, the details of RIT tactics are beyond the scope of this research project and, except as part of the Incident Commander's and Rescue Sector's responsibility, will not be included in this literature review. Like PASS activation, RIT deployment by the I/C was a common component

of the rescue operation. McNamee (2003), Sendelbach (2004), Kreis (2003), and the Cincinnati Fire Department (2003) all state that the RIT must be deployed upon hearing that a firefighter is in trouble. Unfortunately, this seems difficult for fire department to actually accomplish in the reality of the emergency scene. Of the 14 contributing factors NIOSH listed in the reports Ray (2004) examined, the most cited factor was "RIT Ready"(p. 18), which was cited in 21 of the 30 investigations he reviewed.

The I/C must establish a command structure that will allow for the rescue to be successful. Kreis (2003) discusses having a Rescue Sector established to direct the rescue attempt. He recommends that a command level officer, with a field aide, should supervise the Rescue Sector. According to Morris (2003), another major sector that should be implemented during the rescue operation is the Safety Section. He points out the difficulty of a single Safety Officer monitoring the entire scene, developing a safety plan, and focusing on the ongoing rescue operation. He proposes that the solution is multiple safety officers working within a Safety Sector for such complex incidents. Sendelbach (2004) offers a similar philosophy. He proposes the *Safety Engine Concept* in which a team of at least two (preferably four) "supports/promotes 'firefighter self-rescue' as it's primary duty, and firefighter rescue as it's secondary role" (p. 13).

Two supporting NIOSH recommendations for an I/C managing a Mayday were found during the literature review. The first was from a NIOSH (2000) fatality report, which recommended that high-intensity lights be placed at egress points of the building to aid the firefighter inside with self-extrication. The second was also a recommendation in a NIOSH (2001) fatality report. The fire department is to "ensure that, whenever a building is on fire and is occupied, all exits are forced and blocked open" (p. 2).

*Administrative Considerations*

The literature review identified two administrative issues that should be considered for inclusion in Mayday SOGs. The first was the consideration of how the firefighter rescue operation can be emotionally and mentally taxing on the firefighters involved. Dodson (2004) recognizes this *critical incident stress* (CIS) and identifies two causes related to a Mayday incident: (a) death or serious injury to a coworker, and (b) a rescue attempt that results in death. He asserts that it should be mandatory for all personnel involved in these types of incidents to participate in formal critical incident stress management (CISM).

A second administrative issue that may be included in a fire department's procedures concerns liability. Kistner (2004) states, "when you examine the headlines in recent years, the fire service and individual firefighters are being held more accountable for their actions" (p. 136). He recommends that fire departments operating procedures can help avoid liability complaints if they include: (a) rigorous investigation into firefighter deaths, injuries, and near misses, (b) mandatory reporting of such incidents, and (c) mandatory post-incident critiques.

*Literature Review Summary*

The literature review provided an overview of the current AFD Mayday guidelines that served as a basis for developing a research plan to identify relevant information from outside sources. The literary research for this project developed a perspective of the regulatory requirements imposed upon fire departments. This influenced the research project by illustrating the interrelationship of local jurisdictional procedures, state regulations, and national standards. The review also helped identify the six major categories that served as an outline for the surveys that were conducted.

The literature review emphasized the extreme complexity and multiple challenges of a Mayday incident. This, in turn, reinforced the criticality of firefighters understanding their roles

and responsibilities, as well as those of other personnel involved. As Shaw (2004) states, "When a Mayday occurs, everyone needs to be on the same page" (p. 26). The existing literature provided a means of accomplishing this goal by identifying elements that form a framework for a comprehensive set of Mayday operating guidelines.

## Procedures

The procedures employed to prepare this applied research paper consist of research questions, a literature review, and two surveys using a questionnaire-type format. Initially, four questions were developed to: (a) determine which current AFD standard operating guidelines would actually be utilized when an Amarillo firefighter called, "Mayday, Mayday," (b) focus on the legal requirements of Mayday SOGs, and (c) determine what other fire departments consider a standard for such protocols. The evaluative research method was utilized to allow comparison of current AFD Mayday SOGs with regulatory requirements and fire service standards.

A literature review was conducted to provide information to answer research question 1 and question 2 and, in conjunction with the surveys, questions 3 and 4. The review included the AFD's *Standard Operating Guidelines Manual* (2004) to assess which guidelines would be relevant during Mayday operations. It also included state regulations, national incident management system requirements, and NPFA standards that could pertain to Mayday operations. Finally, publications from inside and outside the fire service that had information applicable to Mayday operations were reviewed.

An 11-question questionnaire (Appendix E) was developed to assess demographic characteristics and standard operating procedures used during Mayday situations by other fire departments comparable to the AFD. The first section of the questionnaire developed demographic information for the respondent's department. The second section requested

information specifically regarding the department's SOGs pertaining to Maydays. A cover letter (Appendix F – similarly sized population, Appendix G – mutual aid departments) was attached to explain the nature of the survey. The chief and address of each fire department were identified using the Texas Commission on Fire Protection's website, which lists each fire department registered in the state. The survey was mailed to each of the identified departments on September 29, 2004, with a request that it be returned in the enclosed, self-addressed, stamped envelope. The attached cover letter requested a response by October 15, 2004, as well as a copy of the department's Mayday SOPs, if applicable. Survey participants were offered both anonymity in the research paper and the recommendations from the research as incentives to complete and return the questionnaire.

The survey population consisted of two different groups of fire departments. The first set included each of the 25 fire departments in Texas that protect populations similar in size to Amarillo's. These cities were determined by accessing the United States Census Bureau's website on September 10, 2004. A *similar population* was defined as one within +/- 100,000 of Amarillo's 179,000. The intent of surveying this population was to assist with answering research question 3. To help answer question 4, the survey was sent to a second set of fire departments, those that have existing mutual aid agreements with the AFD.

Of the 25 questionnaires sent to fire departments serving similarly sized populations to Amarillo's, 19 were completed and returned, which was a response rate of 76 percent. Each of the four fire departments that have mutual aid agreements with the AFD completed their surveys for a 100 percent response rate. To achieve this, however, telephones calls were placed to two of these departments after the requested deadline to encourage that the survey be returned.

The surveys had some limitations that are pertinent. One limitation was the confinement of the survey to Texas fire departments covering a restricted population range and those immediately local to Amarillo. Every fire department in the country, regardless of location and size, is subject to having a firefighter in life-threatening distress, and innovative procedures to control Mayday operations by departments not included in the survey may have been missed. A second limitation was the closed question format of the questionnaire. As an example, a respondent could answer "yes" to the question that his department SOGs has specific situations that mandate calling Mayday, but he could not list them. A final limitation is that the accuracy of the respondent's answers could not be validated for every questionnaire.

*Definition of Terms*

Illusory optimism: A tendency in an individual's risk perception to have a positive evaluation of personal control over an environment (Lopez-Vasquez and Marvan, 2003).

Invulnerability illusion: A cognitive characteristic of risk perception that gives a person a distortional perspective of reality (Lopez-Vasquez and Marvan, 2003).

Recognition-primed decision making: A theory that suggests people interpret their current environment by comparing it to similar, previously experienced situations (Cannon-Bowers and Salas, 1998).

Standard operating guidelines (SOG)/Standard operating procedures (SOP): An organization's written set of directives that provides guidance for personnel to employ in decision-making and establishing courses of action (Ray, 2003). For this research, the two terms are used interchangeably.

# Results

## *Research Questions*

*Research Question 1*. What are the elements of the AFD guidelines that will affect Mayday operations?

There are six AFD guidelines that will be used should a Mayday event occur during an emergency response in Amarillo:

1. AFD SOG 304.06b, “Mayday Procedures” (Appendix A)
2. AFD SOG 304.06a, “Lost or Trapped Fire Fighters” (Appendix B)
3. AFD SOG 301.10, “Safety Sector: Incident Safety Officer”
4. AFD SOG 303.06, “Rapid Intervention Team”
5. AFD SOG 303.07, “Personnel Accountability System”
6. AFD SOG 303.08, “Emergency Evacuation”

In addition to these six guidelines, an SOG (Appendix C) that has been proposed for addition to the AFD’s *Standard Operating Guideline Manual* during the next revision is related to Mayday operations. This guideline, should it be approved for inclusion, will be entitled SOG 304.06c, “Ejection Parameters.” The first two guidelines are the most essential to personnel working at a firefighter emergency. The other four will support the ongoing operations.

The identified elements of SOG 304.06b, “Mayday Procedures” (Appendix A), are: (a) *Mayday* is the term used to indicate a firefighter(s) emergency and need for assistance, (b) the I/C will assign a separate radio channel for crews not directly involved in the rescue, (c) six pieces of information that must be conveyed by the endangered firefighter, and (d) four action steps the firefighter is to take to survive.

The components of SOG 304.06a, “Lost or Trapped Fire Fighters” (Appendix B), that are factors in a Mayday emergency are: (a) six action steps for the Incident Commander, (b) four responsibilities of the Rescue Sector, and (c) RIT search and extrication considerations.

The elements of the four supporting AFD guidelines and the proposed “Ejection Parameters” SOG (Appendix C) that will affect firefighter rescues are: (a) a Safety Sector will be established, (b) PAR criteria, (c) the missing member’s crew will be utilized as an intelligence resource, (d) *Code Red* is used to signify an immediate evacuation, and (e) 20 ejection parameters to call Mayday or immediately leave the hazard area.

*Research Question 2*. What, if any, are the national and state regulations relating to Mayday operations?

The Texas Commission of Fire Protection (TCFP) is the regulatory agency for the State of Texas, and three areas of TCFP regulations govern Mayday procedures.

Sections 419.044 and 419.046 of the Texas Government Code (2003), are the first of the regulatory areas. Section 419.044, “Incident Management System,” requires the fire department to have an incident management system (IMS) that complies with NFPA 1561 (2002b). The applicable paragraphs of NFPA 1561 concerned are (a) Paragraph 4.2.6, which requires incident management procedures that address extraordinary circumstances, (b) Paragraph A.4.2.6 (Appendix D), which explains Paragraph 4.2.6 and identifies I/C considerations for firefighter rescue operations, and (c) Paragraph 4.3.11, which requires *emergency traffic* to be used when personnel are facing emergency conditions.

The other Texas Government Code (2003) section that concerns Mayday procedures is Section 419.046, “Fire Protection Personnel Operating at Emergency Incidents,” and it recommends, but does not mandate, fire departments follow NFPA 1500 (2002c). NFPA 1500

requires the term *emergency traffic* for clearing radio traffic, and *all clear, resume radio traffic* when the danger has passed (Paragraphs 8.1.10.1-8.1.11.1). Paragraph A8.1.11 precludes *Mayday* from being used in the fire service. Paragraphs 8.5.5.1 and 8.5.6.1 of NFPA 1500 require crews to continue their assignments and remain together during firefighter rescue operations.

The next area of TCFP regulations that apply to Mayday guidelines is the TCFP's *Standards Manual for Fire Protection Personnel* (2004), which advises, but does not mandate, fire departments use NFPA 1403 (2002d) and NFPA 1500 (2002c) as guidelines. NFPA 1403 requires that firefighters working in a gas-fired training facility meet the qualifications of NFPA 1001 (2002a), Paragraph 5.3.1. This paragraph requires the firefighter to be able to follow emergency procedures should there be an SCBA failure. The applicable portions of NFPA 1500 were discussed previously in this section.

The last area of TCFP regulations that are applicable to Mayday procedures is TCFP's *Certification Curriculum Manual* (2000). Section 122, Paragraph 122.7 requires trainees to be able to demonstrate four techniques to use if trapped or disoriented. Three of the techniques are reversing the entry path by: (a) keeping in contact with walls, (b) following a hoseline to the exit, and (c) following a life line to the exit. The fourth technique is PASS activation and using a portable radio to summon assistance.

Only one national regulation that was relevant to Mayday operations was identified. The National Incident Management System (NIMS) (USDHS, 2004), which was mandated by Homeland Security Presidential Directive-5, requires state and local organizations to adopt NIMS before being eligible for Federal funds. Chapter III requires interoperability of standard operating procedures between mutual aid departments. The AFD has such agreements with four

departments, and operating procedures must be compatible in order to receive grant monies that have been solicited.

*Research Question 3*. What, if any, procedures are other organizations using to manage incidents involving a Mayday?

Categories for key components that could be included in operating procedures for Mayday events were developed to help identify the procedures that organizations in the fire service are using.

The first of these key components was the terminology that is being used to describe or announce a firefighter emergency. Overwhelmingly the term *Mayday* is the accepted practice in the fire service. The single, consistent exception is the NFPA standards, which recommend *emergency traffic* be used as a declaration that a firefighter is endangered and needs assistance. NFPA 1500 (2002b) specifically states that *Mayday* should not be used. Of the 17 fire departments surveyed that have Mayday SOGS, four do not use *Mayday*. Three of these departments use *Code Red*; the other uses *Emergency-Emergency-Emergency*.

The next element of the procedures was the definition of Mayday situations for firefighters. Bucher (n.d.) and Clark (2003) exemplify the growing philosophy in the fire service that firefighters must be strongly encouraged to declare a Mayday as soon as they recognize a danger. By defining these dangers, firefighters will have the support and knowledge to announce their situation in time to survive. Eight broad circumstances were identified: (a) tapped or entangled, (b) lost/disoriented/missing, (c) serious injury, (d) collapse, (e) depleted air supply, (f) hazardous fire conditions (rapid fire growth, backdraft, flashover), (g) falling (through roof or floor), and (h) equipment failure.

Another possibility that can be explored for SOGs is establishing detailed parameters for each type of structure that could be encountered.

Of the 23 fire departments that returned surveys, 11 report they have identified Mayday situations in their SOGs. Six other respondents do not include such circumstances; the remaining six report not having Mayday procedures.

The third of the key elements for the guidelines was the firefighter's action steps after having announced, "Mayday, Mayday." The identified steps include: (a) remain calm/conserve air supply, (b) assess the situation, (c) activate PASS, (d) attempt self-extrication, and (e) signal the RIT. There is also a communications aspect for the endangered firefighter. The acronyms E.S.C.A.P.E. (Crandall, 2004) and L.U.N.A.R. (Clark, 2004) (see Table 1) are recommended mnemonics for personnel to remember what information they should transmit. Additional information to relay to the I/C can include the number of crewmembers needing assistance and an announcement that the firefighter has successfully self-extricated.

Twelve of the survey respondents that have Mayday SOGs include action steps for the firefighter in trouble; the five others with guidelines did not have them.

The next component that should be considered for inclusion in the Mayday protocols is requirements for crews operating at the scene. The first is that crews must stay with their current assignment until otherwise directed by the I/C. The second is that personnel at the scene should avoid radio communications except for critical, life or death information.

Thirteen of the survey respondents that have Mayday SOGs include on scene firefighter actions in their SOGs; the four others with guidelines in place do not have them.

The fifth element that Mayday guidelines should include is the Incident Commander's actions. The SOGs should address that the I/C has to determine the people actually endangered

by initiating a personnel accountability report. Also, they should reflect that the RIT be deployed, and a command structure is developed, including a Rescue Sector and Safety Sector, to maximize the control of resources. Another inclusion for the SOGs is the I/C's responsibility to request additional resources to support the rescue operation. To gain control of the radio communications, the I/C should move all crews not directly involved in the rescue to another radio frequency. Finally, to directly assist the firefighter trying to self-extricate, the I/C can have the openings of the building forced and high-intensity lights placed at egress points.

Of the 17 respondents to the survey that have Mayday procedures in place, 15 include I/C actions in them. This was the most common of the six key elements that were asked about in the survey.

Administrative issues were the last component of the Mayday procedures used to assess Mayday protocols. Both of the considerations found were unexpected results of the research done for this project. The first is that the SOGs should consider the emotional stress placed on firefighters attempting to rescue one of their crewmembers by inclusion of a critical incident stress management requirement after the Mayday event.

The second issue was suggested by one of the survey respondents and supported in the literature reviewed. The Mayday SOGs should include an investigative requirement that includes mandatory reporting of injuries and close calls and mandatory critiques/reviews of these incidents.

*Research Question 4.* What, if any, are the standard operating procedures pertaining to Mayday events for the four fire departments sharing mutual aid agreements with the AFD?

Two of the four departments reported not having any type of Mayday guidelines. The two departments that report having guidelines for a firefighter in distress use different

terminology for their firefighters to declare the emergency; one uses *Mayday* while the other uses *Code Red.* One department defines situations that would trigger calling a Mayday while the other does not. One lists the actions the firefighter in danger should take; the other does not. Each of the two departments reports that their procedures identify actions that both crews on the scene and the Incident Commander should take to help make the rescue successful.

*Surveys*

For the surveys conducted, the same questionnaire was sent to two different groups of fire departments. The first set was fire departments that protect cities equivalently sized in population to Amarillo. The second set surveyed was the departments that could operate within an incident management system with the AFD due to mutual aid agreements.

*Results for Survey of Similarly Sized Populations*. The first three questions of the survey were used to develop the demographic characteristics of the surveyed departments. The overwhelming majority, 18 of 19 respondents, indicated theirs was a career department. The single exception was a combination department. The entire sample group each had more than 101 uniformed firefighters in their department, with eight having between 101 and 150 and six having between 151 and 200, 42 percent and 32 percent respectively. The number of structure fires per year that each department reported spanned the entire range of options listed, from less than 50 to more than 1001. The plurality of the surveyed departments, nine (47 percent), responded to between 101 and 300 fires each year. Twelve of the 15 departments that reported they had Mayday SOPs returned copies of them with the questionnaire, which allowed validation of data provided and direct comparison with AFD SOGs.

The next seven questions of the survey were used to develop information regarding Mayday standard operating procedures for the sample departments. Table 2 shows the number

of departments that reported they have Mayday SOPs, and, if so, which major components are included in them.

Table 2

Survey Results for Similar Population Fire Departments

| SOG Components | Yes | % | No | % | N/A | % |
|---|---|---|---|---|---|---|
| All firefighters carry radios | 11 | 58% | 8 | 42% | | |
| Mayday SOPs | 15 | 79% | 4 | 21% | | |
| SOPs use the term *Mayday*[a] | 12 | 63% | 3 | 16% | 4 | 21% |
| SOPs define Mayday situations | 10 | 53% | 5 | 26% | 4 | 21% |
| SOPs list firefighter actions | 11 | 58% | 4 | 21% | 4 | 21% |
| SOPs list on scene firefighter actions | 11 | 58% | 4 | 21% | 4 | 21% |
| SOPs state Command actions | 13 | 68% | 2 | 11% | 4 | 21% |

[a]Of the three departments that do not use "Mayday," two use "Code Red" and one uses "Emergency, Emergency, Emergency" for a firefighter to declare a life-threatening emergency.

The last question on the questionnaire was open-ended to allow respondents to include components of their Mayday SOGs that were not in the survey. Although several people made general statements, such as "ensure Dispatch understands their role during a Mayday," only one person presented an additional element that his department includes in their SOPs. This was an investigative component consisting of mandatory Command Staff notification, close call reporting, and review board investigation.

*Results for Survey of Mutual Aid Departments*. The type of department for the four mutual aid departments was a contrast to those that serve similar populations to Amarillo. The

single municipal and two county fire departments operate as a combination of paid and volunteer. The exception in this survey population was the department protecting a federal facility as a career department. However, all four departments reported similar numbers of personnel; the range was between 36 and 78 firefighters. The municipal and county departments did have much more experience with structural firefighting than did the federal firefighters. Where the weapons facility respondent reported having only "4 or 5" structure fires each year, the others saw between 34 and 100 per year. Table 3 details the data provided for the questions pertaining to Mayday SOPs and significant components for each of these four departments.

Table 3

Survey Results for Mutual Aid Fire Departments

| SOG Components | Yes | No | N/A |
|---|---|---|---|
| All firefighters carry radios | 4 | | |
| Mayday SOPs | 2 | 2 | |
| SOPs use the term *Mayday*[a] | 1 | 1 | 2 |
| SOPs define Mayday situations | 1 | 1 | 2 |
| SOPs list firefighter actions | 1 | | 3 |
| SOPs list on scene firefighter actions | 2 | | 2 |
| SOPs state Command actions | 2 | | 2 |

[a]One department uses "Code Red" for a firefighter to declare a life-threatening emergency.

One of the departments did return a copy of their Mayday procedures. None of the respondents in this survey group listed additional elements to those listed in Table 3. Three of

them did emphasize, in the words of one respondent, the need for the mutual aid departments "to share as much information as possible… to combine our guidelines."

## Discussion

The research for this project was benefited by the attention focused on the rapid intervention concept in recent years. As the concept has developed and matured, it has highlighted the problems associated with the core reason that the RIT is deployed, a firefighter is in a desperate situation and needs assistance. As Kreis (2003) found, firefighters will wait too long to declare their emergency, sometimes costing them their lives. The reasons for the delay is not simply the fire service culture that Kreis mentions, there are basic human behaviors that must be overcome, such as invulnerability illusion and illusory optimism, (Lopez-Vazquez & Marvan, 2003) and recognition-primed decision making (Cannon-Bowers & Salas, 1998). This difficulty is addressed in the current AFD "Lost or Trapped Fire Fighters" (Appendix B) SOG in a statement that directs firefighters to take action immediately when they are lost or disoriented.

It is not simply the delayed Mayday that is a problem. The firefighter's reactions in the hostile environment may not be appropriate (Maclean, 1999), the actions of on scene crews may hinder the rescue operation (NIOSH, 2004b), or the I/C may not provide the command and control necessary to save the person in danger (Ray, 2004). The initial step in developing solutions to these problems is a comprehensive standard operating guideline. These SOGs can then serve as a basic foundation for training and response operations that may ultimately save a member's life.

The Amarillo Fire Department's guidelines for Mayday operations seem to be a good example of procedures. First, they meet the state regulations issued by the Texas Commission on Fire Protection (TCFP) and all but one point of the NFPA standards that the state regulations

reference. The exception is that the AFD guidelines use *Mayday* instead of *emergency traffic*, the term that NFPA 1561 (2002c) requires. This is a concern because the Texas Government Code (2003), Section 419.044 compels fire departments in Texas to comply with NFPA 1561 (2002). However, of the 23 departments that returned surveys, all of which are in Texas, none comply with the standard's requirement to use *emergency traffic*. Of these departments, 13 use *Mayday*, 3 use *Code Red*, and 1 uses *Emergency, Emergency, Emergency* as an indication that a firefighter is in need of assistance. The other six departments said they do not have Mayday procedures.

Secondly, the six AFD guidelines include most of the components the research identified as being key elements of such procedures. The one important element that is not currently in the SOGs is a list of situations that would serve as benchmarks for the firefighter to declare a Mayday. The proposed SOG, "Ejection Parameters," (Appendix C) will alleviate this deficiency. Each action step for the endangered firefighter that was identified by the research is already included in the current guidelines. The information that the firefighter should transmit in the AFD guideline contains very similar information to Crandall's (2004) "E.S.C.A.P.E." acronym (p. 71), which is perhaps a better form to allow for recall during an emergency.

The two considerations that the research found for crews working on the scene are already accounted for in the current AFD guidelines. Most of the I/C's responsibilities that the research identified are also included in the guidelines. There were 5 of 17 responsibilities in NFPA 1561 (2002b), Paragraph A.4.2.6 (Appendix D) that are not already addressed: (a) withdraw crews from affected area, (b) ensure dispatch is monitoring all channels, (c) provide additional ventilation, (d) open doors for access and egress, and (e) set lighting at points of entry.

Only two of these, opening doors (NIOSH, 2000) and placing lights at entry points (NIOSH, 2001) had supporting information from other sources accessed in the literature research.

A major deficiency found by the surveys for this research project is the lack of standardized Mayday guidelines between the AFD and the four fire departments that have signed mutual aid agreements. This total lack of interoperable procedures was an unexpected finding. Generally, the five departments cooperate well and are willing to share information. This is a serious deficiency because of the extreme life risk involved and, when "everyone needs to be on the same page" (Shaw, 2004, p. 26), clearly the AFD and the mutual aid departments are not. This inadequacy is a concern also because of the NIMS (USDHS, 2004) requirements for interoperability between mutual aid departments.

Another very important finding is that one of the mutual aid departments uses *Code Red* as the signal for a firefighter in extreme danger. The problem is that *Code Red* for the AFD is an evacuation signal for all personnel to exit the building immediately. Should Code Red be announced at an incident the AFD has responded to with this department, AFD personnel will begin evacuating while the mutual aid department's firefighter is actually calling for assistance inside.

Several implications for the Amarillo Fire Department stem from the findings of this research project. Concerning the most important, life safety, the AFD has a good set of guidelines on which to base training and rescue operations for a firefighter in danger, but modifications that incorporate missing key components identified by the research could make them a strong set of guidelines. The results also indicate that the AFD, as well as other Texas fire departments, may inadvertently be violating a statutory requirement of the Texas Commission on Fire Protection. Finally, the AFD has not developed interoperable operating

procedures for Mayday events with the other mutual aid departments. As the National Incident Management System becomes the law of the land, these shortcomings in establishing standard operating procedures will have important ramifications if they are not corrected.

## Recommendations

There are four recommendations based on the research done for this project. First, the Amarillo Fire Department administrators responsible for revisions to the *Standard Operating Guidelines Manual* (2004) should consider modifications to the guidelines that are applicable to Mayday events. These modifications would include incorporating the missing elements identified by this research as well as the acceptance of the proposed Ejection Parameters guideline. These modifications will allow an improved foundation for conducting training exercises and firefighter rescue operations in the future.

Secondly, the Amarillo Fire Department should fully research the legal implications of the Texas Commission's regulatory requirement that Texas fire departments must follow NFPA 1561, *Standard on Emergency Services Incident Management System* (2002b). This will ensure that the department maintains compliance with the statutory requirements of the State.

Another recommendation is that the Amarillo Fire Department should petition the NFPA 1500 and NFPA 1561 Committees during the next revision of the standards to remove the sanction against using *Mayday* to indicate a firefighter in danger. This recommendation will ensure the department becomes more closely aligned with the standards established by the NFPA, and the NFPA standards become more closely aligned with fire service advancements.

Finally, the Amarillo Fire Department should work to establish a cooperative committee with representatives from each of the local mutual aid departments to develop and implement standardized operating procedures. This recommendation will improve the ability of each

department, including the Amarillo Fire Department, to interact with the others during mutual response incidents. It will also develop the interoperability of the departments as required by the National Incident Management System.

The nature of the Mayday emergency creates chaos, stress, and emotional upheaval when calm and order are most needed. Fire departments must have the procedures on which to base firefighter emergency training and rescue operations before the event occurs. For those readers that seek to be proactive and have such procedures before they are needed, here are some general recommendations. First, the complexity of an incident with a firefighter calling, "Mayday, Mayday," is enormous and requires everyone on the fireground to play their role to effect a successful rescue. The standard operating procedures must include basic guidelines that define those roles for everyone, from the firefighter in need to the Incident Commander managing the effort. Secondly, do not assume that the agencies that are assisting you through mutual aid-type agreements will be able to safely and effectively work with you, especially when the stakes are the lives of your members. Take steps to develop a process that will coordinate procedures and responses before a tragedy shows you the problem.

Lastly, instill in each member of the department a mentality that it is possible they could be the imperiled crewmember calling for assistance, and it is their responsibility to know what dangers constitute a Mayday response and what actions they should take. As the Amarillo Fire Department has twice found out by the deaths of Firefighters Williams and Caldwell, no one is immune from the inherent dangers of firefighting.

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# Appendix A

## Amarillo Fire Department Mayday Procedures Guideline

| AMARILLO FIRE DEPARTMENT<br>STANDARD OPERATING GUIDELINE | MAYDAY PROCEDURES |
|---|---|
| **304.06b** | **04/04** **PAGE 1 OF 1** |

**PURPOSE:**

The purpose of this procedure is to identify the actions that should be taken in the event a firefighter is endangered beyond normal firefighting operations.

**GENERAL INFORMATION:**

A. The term ***"Mayday"*** will be used only when personnel are in immediate life-threatening situations. The AFD will use "Emergency Traffic" to report other emergencies.

B. A firefighter reporting "Mayday" will have priority over all other radio traffic. All firefighters operating on scene will use radios for immediately critical information only. Command should move all personnel that are not directly involved in rescue operations to a different fireground radio channel to keep the victim's radio channel clear.

C. In the event of a "*Mayday*" emergency, the following action should be taken by the firefighter(s) that is endangered:

1. Rectify any immediately life-threatening situations.
2. Notify Command using "Mayday, Mayday"
3. Activate the P.A.S.S. Device
4. Take actions to self-evacuate and/or merge with RIT
5. Take actions to conserve air supply.

D. The firefighter reporting "*Mayday*" will contact the Incident Commander if a portable radio is available. Critical information to relate should include:

1. Unit and Name
2. Location - rescue crew access routes (i.e., following hose line, stairwell, etc.)
3. Cause of entrapment (i.e., structure collapse, wire entanglement, lost, etc)
4. Injuries
5. Remaining air supply
6. Other conditions/needs

E. During "Mayday" Operations, Command and on scene firefighters will follow the provisions outlined in SOP304.06a, *"Lost or Trapped Firefighters."*

F. During "Mayday" Operations, Sector Officers and firefighters will continue with assignments as given by Command. They will *not* redirect their activities without the knowledge and consent of the Incident Commander.

Appendix B

Amarillo Fire Department Lost or Trapped Fire Fighters Guideline

| AMARILLO FIRE DEPARTMENT<br>STANDARD OPERATING GUIDELINE | LOST OR TRAPPED<br>FIRE FIGHTERS |
|---|---|
| **304.06a** | **04/04** **PAGE 1 OF 3** |

**PURPOSE:**
This guideline identifies operational approaches for search and rescue for lost, trapped, or injured firefighters. An immediate and well-organized search and rescue response will be implemented to rescue endangered firefighters.

**GENERAL PROVISIONS:**

1. A Rapid Intervention Team (RIT) will be established based on the AFD 2-in/2-out Guideline for Structural Firefighting (SOG 403.14) and Rapid Intervention Team (SOG 303.06).
2. Upon recognition that a firefighter(s) is missing, lost, trapped, or injured, Command will immediately upgrade the incident to the next greater alarm.
3. Depending on the needs of the incident, Command should consider activation of medical units and special response teams, i.e. heavy rescue, the Hazardous Materials Team.
4. Lost or trapped firefighters will utilize "Mayday, Mayday" to announce an emergency. Sector Officers will use "Mayday" if they have personnel that are missing or have been involved in a building collapse.

**LOST OR INJURED FIRE FIGHTER(S):**

The following guidelines pertain to firefighters that are lost or are injured in a hazardous environment and are unable to self-rescue.

1. Firefighters must recognize that being lost or disoriented is an emergency and must take immediate actions to extricate themselves from the danger before becoming incapacitated:

    a. Inform Command of the emergency situation using "Mayday, Mayday."
    b. Explain situation to Command (i.e. lost or trapped, name, crew, remaining air supply, others that may be endangered)
    c. Relate information to Command that will assist in determining location (i.e. floor number, sounds of nearby activity, entry point, assignment)
    d. Activate the alarm on the P.A.S.S
    e. Make efforts to contact RIT by making noise and using flashlight as signals
    f. Conserve air supply and continue to attempt self-rescue

Appendix B (cont'd)

Amarillo Fire Department Lost or Trapped Fire Fighters Guideline

| AMARILLO FIRE DEPARTMENT<br>STANDARD OPERATING GUIDELINE | LOST OR TRAPPED<br>FIRE FIGHTERS |
|---|---|
| **304.06a** | **04/04** **PAGE 2 OF 3** |

2. Command Responsibilities:
    a. Deploy a RIT to begin rescue operations (see SOG 303.06)
    b. Initiate next greater alarm and establish Level II staging.
    c. Adjust the incident management plan to a high priority rescue: implementing appropriate sectors, establishing protection zones, implementing medical/triage, etc.
    d. Establish a new RIT to back up crews involved in the rescue operation. Two firefighters for each rescuer should be on standby outside the entry point(s).
    e. Coordinate with the Accountability Officer and initiate PARs to determine which firefighter(s) is missing.
    f. Move personnel that are ***not*** directly involved in rescue operations to a different fireground radio channel. This will allow the person involved in the Mayday event to have radio priority and keep that channel clear of excess traffic.
    g. Ensure Sector Officers and personnel continue to operate within the Incident Action Plan and not attempt rescue operations without direction.
    h. When the rescue operations are complete, Command will declare the emergency situation over and a return to normal operations.

**RESCUE OPERATIONS:**

1. Command should consider establishing a Rescue Sector to coordinated rescue activities. Such activities include:

    a. Develop and assign search areas/grids based on information regarding location and situation of missing/lost firefighter
    b. Deployment of RIT to best access point
    c. Establish protection zones around endangered firefighter(s)
    d. Request resources required to perform rescue
    e. Ensure back up crews are in place

2. Sector officers and firefighters will continue with assignments as given by Command. They are ***not*** to redirect their activities without the knowledge and consent of the Incident Commander.

3. The RIT should consider the following when searching for missing/lost firefighters:

    a. Developing information of firefighter's possible location: speak with crewmembers, follow hoseline, identify landmarks
    b. Implementing a search and rescue plan.
    c. Identify immediate hazards that could endanger RIT members
    d. Assign one member of RIT crew to listen for and locate sounds generated by firefighter, SCBA, P.A.S.S, or portable radio.

Appendix B (cont'd)

Amarillo Fire Department Lost or Trapped Fire Fighters Guideline

| AMARILLO FIRE DEPARTMENT<br>STANDARD OPERATING GUIDELINE | LOST OR TRAPPED<br>FIRE FIGHTERS |
|---|---|
| 304.06a | 04/04 PAGE 3 OF 3 |

e. Use portable radio feedback to locate firefighter(s)
f. Identify fans, lights, or other equipment that may have been used by missing firefighters.

4. The RIT should consider the following when the missing firefighter(s) have been located:

a. The RIT team/s should be equipped with RIT Bags and a TIC.
b. Assessment of immediate hazards in the area
c. Victim status: level of consciousness, ability to assist with rescue, breathing, air supply, injuries, entrapment, etc
d. Identify and remove life-threatening conditions. If the victim is not breathing, immediate extrication from the hazardous area is imperative; replacing the air supply will not increase chances of survival.
e. Request resource requirements: extrication equipment, manpower, extra air cylinders, area protection, ventilation, lighting, etc
f. Identify egress and escape routes

**BUILDING COLLAPSE:**

The following guidelines pertain to building collapse that involves firefighters working in, on, or near a structure that has collapsed:

1. Command and the Sector Officers will immediately initiate an evacuation of the collapse area, rescuing firefighters as necessary.
2. Command will initiate a PAR for all firefighters operating in the sector or area.
3. If it is determined that firefighters are missing, Command will follow the procedures listed above for Lost or Injured Firefighter(s) and Rescue Operations.
4. Command will activate necessary special rescue teams.
5. Rescue crews must be cautious not to cause an additional collapse while searching or removing trapped firefighters from the collapse area.

Appendix C

Proposed Amarillo Fire Department Guideline: Ejection Parameters

| **AMARILLO FIRE DEPARTMENT STANDARD OPERATING GUIDELINE** | **EJECTION PARAMETERS** |
|---|---|
| **304.06c** | **04/04** **PAGE 1 OF 1** |

It is critical that a firefighter that faces a possible life-threatening emergency immediately take action to avoid the situation and/or call for assistance early – before they become incapacitated. The following **"Ejection Parameters"** should be used by AFD firefighters as a basis to make a decision to leave the situation, call "Mayday," or both:

1. If you (or your partner) are injured, eject.
2. If you are trapped, eject.
3. If you become lost/disoriented, eject.
4. If your SCBA malfunctions, eject.
5. If your air supply is low, eject.
6. If you have used ½ of your air supply getting to your current position, eject.
7. If your PPE is compromised, eject.
8. If you have lost communications, eject.
9. If backdraft/flashover conditions exist, eject.
10. If fire threatens your escape route, eject.
11. If indicators of building collapse exist, eject.
12. If water supply is lost, eject.
13. If electrical hazards are encountered, eject.
14. If the fire attack is ineffective, eject.
15. If you are exhausted, eject.
16. If you encounter intentionally set hazards (traps, explosives, etc,) eject.
17. If you encounter a human threat (guns, baseball bats, etc,) eject.
18. If you encounter unexpected hazardous materials, eject.
19. If Fire/Pressurized Smoke is coming from vent opening, eject (from roof.)
20. If Command orders immediate evacuation, eject.

Appendix D

Incident Command Considerations During Fire Fighter Rescue Operations

**This information is from Paragraph A.4.2.6 in Annex A of NFPA 1561, *Standard on Emergency Services Incident Management System* (2002).**

A.4.2.6 During firefighter rescue operations, the incident commander should consider implementing the following:

1. Requesting additional resources
2. Including a medical component
3. Utilizing staging for resources
4. Committing the RIC team from standby mode to deployment
5. Changing from a strategic plan to a high priority rescue operation
6. Initiating a PAR (personnel accountability report)
7. Withdrawing companies from affected area
8. Assigning a rescue officer
9. Assigning a safety officer
10. Assigning a backup RIC
11. Assigning of Advanced Life Support (ALS) or Basic Life Support (BLS) company
12. Requesting additional command level officers
13. Requesting specialized equipment
14. Ensuring that dispatch is monitoring all radio channels
15. Opening appropriate doors to facilitate egress and access
16. Requesting additional vertical/horizontal ventilation
17. Providing lighting at doorways, especially at points of entry (p. 1561-12)

Appendix E

Response Survey: “Mayday” Operations SOGs

Department Name: [Anytown] Fire Department

Contact Person: _____
(*Your name will be for contact purposes and will not be used in the research paper.*)

Phone Number:_____ E-mail:_____

*Please check the appropriate category that applies to your department.*

DEPARTMENT INFORMATION:

1. Which of the follow most accurately describes your fire department?

_____ Career
_____ Volunteer
_____ Combination
_____ Other

2. How many personnel (paid and/or volunteer) engage in fire fighting activities for your department?

_____ < 30
_____ 31-50
_____ 51- 100
_____ 101-150
_____ 151-200
_____ 201-250
_____ 251-300
_____ > 301

3. How many structural fire calls does your department respond to annually?

_____ < 50
_____ 51-100
_____ 101-200
_____ 201-300
_____ 301-400
_____ 401-500
_____ 501- 750
_____ 751-1000
_____ > 1001

Appendix E (cont'd)

Response Survey: "Mayday" Operations SOGs

4. Does your department require all personnel carry a portable radio when operating in Immediately Dangerous to Life and Health (IDLH) environments?

   _____ Yes
   _____ No

MAYDAY PROCEDURES INFORMATION:

5. Does your department have Standard Operating Procedures (SOPs) or Standard Operating Guidelines (SOGs) for Mayday situations on the fireground?

   _____ Yes
   _____ No

6. Do the Mayday SOPs/SOGs identify "Mayday" as the term firefighters should use to announce they are facing a life-threatening situation?

   _____ Yes
   _____ No If "no," what term is used?_____
   _____ Not Applicable (check if department does not have Mayday SOPs)

7. Do the Mayday SOPs/SOGs address the specific situations in which the firefighter should call for Mayday? Examples may include: lost or disoriented; trapped; or an SCBA malfunction.

   _____ Yes
   _____ No
   _____ Not Applicable (check if department does not have Mayday SOPs)

8. Do the Mayday SOPs/SOGs identify specific actions the firefighter should take in a life-threatening event? Examples could include: conserving air supply; notifying Command; or activating the P.A.S.S. device.

   _____ Yes
   _____ No
   _____ Not Applicable (check if department does not have Mayday SOPs)

Appendix E (cont'd)

Response Survey: "Mayday" Operations SOGs

9. Do the "Mayday Operations" SOPs/SOGs include what actions other firefighters on scene should take when a firefighter announces "Mayday?" Examples may be: maintain current assignment; listen for sounds generated by firefighter in trouble; or relaying fire conditions in their assigned area.

   _____ Yes
   _____ No
   _____ Not Applicable (check if department does not have Mayday SOPs)

10. Do the "Mayday Operations" SOPs/SOGs identify specific actions that the Incident Commander should take upon hearing a firefighter(s) declare a Mayday emergency? Examples could include: deploying a Rapid Intervention Team; calling for the next greater alarm; or automatically establishing a Medical Sector.

    _____ Yes
    _____ No
    _____ Not Applicable (check if department does not have Mayday SOPs)

11. Are there other components of your fire department's Mayday Operations SOPs/SOGs that you feel should be considered for inclusion during the revision cycle of the *Amarillo Fire Department Standard Operating Guidelines*?

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

Would you like to receive, by email, a copy of any revised AFD Mayday Operations Guidelines suggested by the survey or research paper? _____ Yes _____No

**Please remember to include a copy of your department's Mayday SOPs/SOGs when returning this survey.**

Thank you.

Appendix F

Cover Letter for Response Survey: Mayday Operations SOGs

(Similar Sized Populations)

Dear Chief,

I am analyzing my fire department's standard operating guidelines (SOG's) that apply to Mayday Operations, and I am asking for your assistance. I am currently enrolled as a student in the National Fire Academy's Executive Fire Officer Program, and one requirement of the curriculum is a research paper. For my research topic I have chosen to evaluate the Amarillo Fire Department's (AFD) Mayday procedures. One aspect of the project is to determine if other fire departments have Mayday procedures, and, if so, what components are included in them.

As a Texas fire department protecting a population similar in size to Amarillo, I have identified the [name of Fire Department] as one that should be included in the survey I am conducting. Your participation in the survey will involve: (1) completing the enclosed questionnaire and returning it in the stamped, self-addressed envelope by October 15, 2004, and (2) if possible, including a copy of your department's standard operating procedures that pertain to Mayday operations. I anticipate it should take 10-15 minutes to complete the 11-question survey and provide a copy of your Mayday SOGs.

For the survey, the term "Mayday" refers to situations in which a firefighter(s) has encountered circumstances that could imminently result in injury or death. "Mayday Operations" include the actions that the firefighter in distress, as well as others on scene, should take to save the firefighter from further harm.

Complete confidentiality will be maintained for the information that you provide. I will only use the name of the person that completed the form as a contact if it is necessary to clarify a survey answer. The person will not be identified in the research paper in any way. If your department is included in the research paper, it will only be identified by a letter designation.

The results of the research will be available upon request.

Your help will contribute to the safety of firefighters in Amarillo and elsewhere. I appreciate the time and effort you take to provide the information for this project.

Sincerely,

Marc Lusk
District Chief - Health and Safety
Amarillo Fire Department

Appendix G

Cover Letter for Response Survey: Mayday Operations SOGs

(Mutual Aid Departments)

Dear Chief,

I am analyzing my fire department's standard operating guidelines (SOG's) that apply to Mayday Operations, and I am asking for your assistance. I am currently enrolled as a student in the National Fire Academy's Executive Fire Officer Program, and one requirement of the curriculum is a research paper. For my research topic I have chosen to evaluate the Amarillo Fire Department's (AFD) Mayday procedures. One aspect of the project is to determine if the AFD Mayday procedures are compatible with those that have Mutual Aid Agreements with Amarillo.

As a fire department that has a Mutual Aid Agreement with the AFD, the [name of Fire Department] should be included in the survey I am conducting. Your participation in the survey will involve: (1) completing the enclosed questionnaire and returning it in the stamped, self-addressed envelope by October 15, 2004, and (2) if possible, including a copy of your department's standard operating procedures that pertain to Mayday operations. I anticipate it should take 10-15 minutes to complete the 11-question survey and provide a copy of your Mayday SOGs.

For the survey, the term "Mayday" refers to situations in which a firefighter(s) has encountered circumstances that could imminently result in injury or death. "Mayday Operations" include the actions that the firefighter in distress, as well as others on scene, should take to save the firefighter from further harm.

Complete confidentiality will be maintained for the information that you provide. I will only use the name of the person that completed the form as a contact if it is necessary to clarify a survey answer. The person will not be identified in the research paper in any way. If your department is included in the research paper, it will only be identified by a letter designation.

The results of the research will be available upon request.

Your help will contribute to the safety of firefighters in Amarillo and elsewhere. I appreciate the time and effort you take to provide the information for this project.

Sincerely,

Marc Lusk
District Chief - Health and Safety
Amarillo Fire Department