U.S. Fire Administration/Technical Report Series

Special Report: Rapid Intervention Teams and How to Avoid Needing Them

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Homeland Security

U.S. Fire Administration Fire Investigations Program

The U.S. Fire Administration develops reports on selected major fires throughout the country. The fires usually involve multiple deaths or a large loss of property. But the primary criterion for deciding to do a report is whether it will result in significant "lessons learned." In some cases these lessons bring to light new knowledge about fire--the effect of building construction or contents, human behavior in fire, etc. In other cases, the lessons are not new but are serious enough to highlight once again, with yet another fire tragedy report. In some cases, special reports are developed to discuss events, drills, or new technologies which are of interest to the fire service.

The reports are sent to fire magazines and are distributed at National and Regional fire meetings. The International Association of Fire Chiefs assists the USFA in disseminating the findings throughout the fire service. On a continuing basis the reports are available on request from the USFA; announcements of their availability are published widely in fire journals and newsletters.

This body of work provides detailed information on the nature of the fire problem for policymakers who must decide on allocations of resources between fire and other pressing problems, and within the fire service to improve codes and code enforcement, training, public fire education, building technology, and other related areas.

The Fire Administration, which has no regulatory authority, sends an experienced fire investigator into a community after a major incident only after having conferred with the local fire authorities to insure that the assistance and presence of the USFA would be supportive and would in no way interfere with any review of the incident they are themselves conducting. The intent is not to arrive during the event or even immediately after, but rather after the dust settles, so that a complete and objective review of all the important aspects of the incident can be made. Local authorities review the USFA's report while it is in draft. The USFA investigator or team is available to local authorities should they wish to request technical assistance for their own investigation.

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Rapid Intervention Teams and How to Avoid Needing Them

Special Report

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This is Report 123 of the Major Fires Investigation Project conducted by Varley-Campbell and Associates, Inc./TriData Corporation under contract EME-97-CO-0506 to the United States Fire Administration, Federal Emergency Management Agency.

Homeland Security

Department of Homeland Security
United States Fire Administration
National Fire Data Center

U.S. Fire Administration

Mission Statement

As an entity of the Department of Homeland Security, the mission of the USFA is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support. We serve the Nation independently, in coordination with other Federal agencies, and in partnership with fire protection and emergency service communities. With a commitment to excellence, we provide public education, training, technology, and data initiatives.

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Acknowledgments

This Special Report for the U. S. Fire Administration represents ideas, insights, and information from numerous fire service representatives about firefighter rescue. Eighty-three departments contributed information on how they approach rescuing a downed firefighter. Many of these departments sent detailed policies and procedures regarding their operations, enclosing some examples of when a Rapid Intervention Team was mobilized.

Three members of the fire service served as peer reviewers for this report. We are extremely grateful for their time, insight, expertise, and willingness to engage in dialogue that provided another measure of excellence to the report. The reviewers were:

James Crawford, a full-time firefighter with the Pittsburgh Bureau of Fire, has been an invaluable resource to the authors of this report. Mr. Crawford has been involved with Rapid Intervention Training at the National level; at no cost, he provided numerous training aids and publications of his own to help in our research. His not-for-profit web site, www.rapidintervention.com, is a good resource for all. Crawford spent hours on the phone with the authors discussing approaches to firefighter rescue and was a valuable resource.

Battalion Chief Gary Ells, Tempe Fire Department provided helpful information and exchanged ideas about best practices. His experience and insight were invaluable.

Deputy Chief Michael Smith, District of Columbia Fire Department, served as a peer reviewer for this report. Chief Smith is currently assigned to the DCFD Training Academy and has been involved with the National training circuit for rapid intervention training.

We hope the information contained within this report will be shared by members of the fire service and that it can be used as a resource to help avert future fire service tragedies.

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Chapter I. Introduction and Background

Each day firefighters across the country combat fires and place themselves in harm's way. The extent of risk to firefighters is related to a number of factors, including how often they are exposed to working fires, the training and equipment they bring to the task, staffing levels, the decisionmaking skills of fire officers, discipline, building construction, and the exact nature of fire itself.

Though the overall number of structure fires continues to follow a downward trend, today's building fires are burning hotter than in the past because more synthetics and polycarbonate materials are used in construction and interior furnishings. The economical, pre-fabricated, lightweight trusses that are commonly used are held together with gusset plates that fail after a brief exposure to temperatures of 800 to 1000 degrees Fahrenheit, which results in more rapid building collapse. Because of lightweight construction, today's buildings are less resistant to fire and can be a more dangerous environment in which to fight fire, unless countered by working sprinkler systems.

Due to the declining number of structure fires, firefighters on the whole have less fire- ground experience than their predecessors had a generation ago. As many of the more experienced firefighters and officers seek retirement, they are replaced by young officers with comparably less fire experience. Complicating this situation is that live fire training with Class A combustible materials (especially in acquired structures) is being replaced by temperature-controlled, fuel-fed fires in non-combustible structures. There are advantages to this type of training, but it is less realistic. Departments are relying less on live fire training for myriad reasons, including among others environmental, safety, and cost.

The personal protective gear being worn by firefighters today is excellent; some say that it is even too protective. Firefighters now can advance deeper into structures and get closer to the seat of a fire than in years past because the turnout gear protects well against heat, but this can create problems. A longer exposure to fire will rapidly deplete a firefighter's energy and air supply; and the firefighter will have a greater distance to travel to an exit in an emergency situation. Furthermore, as firefighter's progress farther into a structure, more time elapses, which means the fire is more developed, hotter, and often closer to flashover. Collapse becomes more likely because of the increased damage from the fire.

As today's firefighters' collective experience in fighting fires continues to diminish, there is great concern in the firefighter community that the inability to recognize flashover and building collapse-and to react quickly enough to avoid being caught by these two potentially fatal conditions-will continue to result in injuries and fatalities to firefighters.

While ongoing prevention efforts, realistic training, effective policy development, and firefighter discipline all can help reduce the risks of injury and death on the job, the inherent dangers of firefighting require that fire departments prepare for one of the most difficult assignments of all:

rescuing one of their own. The use of rapid intervention teams (RIT)--the subject of this report--can facilitate these rescues when an emergency occurs. Rapid intervention teams are created specifically to rescue lost and trapped firefighters; rescue of civilians is the responsibility of other crew on the fireground. There are different versions of RIT in communities throughout the country.

This report provides the ground work for developing or improving the use of RITS by fire departments. Included within the report are guidelines; suggested staffing levels and associated responsibilities; recommended training and equipment; and notes on the deployment of a RIT on the fireground.

We contacted a group of fire departments by mail, interviewed fire department personnel, talked to individuals who teach firefighter rescue Nationally, and performed an extensive literature review to discover how firefighter rescue currently is planned and implemented out. The results of this research are incorporated into this report.

Other Factors

The use of rapid intervention teams is only one way to prevent firefighter deaths. Training (including driver training), physical fitness, equipment, the incident command system, personnel accountability, and strategy and tactics all play critical roles in firefighter health and safety. Firefighter rescue teams and self-rescue techniques are last-resort measures that fall at the end of the spectrum when other steps to ensure safety and health have been overtaken by the unpredictability of conditions on the fireground or by previously undisclosed medical conditions.

Proper scene size-up upon arrival and accurate assessment of collapse indicators during suppression are two actions that factor heavily into both strategic and tactical decisions. Poor risk assessment or bad tactical decisions can have serious implications for operational safety and whether a RIT ultimately has to be activated.

The lack of an effective accountability system, freelancing, failure to understand and predict fire travel, lack of an available rescue team, and the lack of training in self-survival or forcible-exit techniques in emergency situations – all have been shown to contribute to the deaths of firefighters. Considering that rescues sometimes must be attempted, this report includes information on some recent rescue experiences using RITS.

Data on Firefighters Injuries and Deaths

Although the number of "working" fire incidents to which the fire service responds has decreased over the last ten years, the number of firefighter injuries and deaths has not fallen in equal measure. This means that while the actual number of deaths is certainly lower than it was a decade ago, the injury *rate* is actually higher now than before. The causes of these injuries and deaths are varied, but the reality is that firefighters still become lost or entrapped on the fireground, leading to injuries and deaths.

An examination of fire incident data reveals the circumstances that have been involved in fireground fatalities and injuries. This information, collected and analyzed each year by the U. S. Fire Administration and by the National Fire Protection Association, is important in terms of clarifying safety measures that may have been overlooked, or how tactics might be improved so that the number of situations where firefighters encounter life-threatening conditions can be minimized.

The USFA report, *Firefighter Fatalities Retrospective Study,*[1] analyzed incident data on firefighter fatalities between 1990 and 2000. According to this report, the leading nature of fatal injuries to firefighters is heart attack (about 44 percent). Trauma, including internal and head injuries, is the second leading type of fatal injury (27 percent). Twenty percent of fatalities are the result of asphyxia and burns. Firefighters under the age of 35 are more likely to be killed on duty by traumatic injuries and burns than from medical causes such as heart attack or stroke. Figure 1 and 2 provide more detailed information about both the nature and cause of fatal firefighter injuries.

While the majority of the firefighters who died (57 percent) were members of volunteer or combination departments, career personnel were killed at a rate disproportionate to their numbers in the fire service. Full-time career personnel accounted for 33 percent of firefighter fatalities but comprised only about 26 percent of the American fire service. Thus, both career and volunteer departments should consider this report's recommendations to address fireground-related deaths, especially with regard to firefighter rescue teams.

Since 1977, the number of firefighters who lost their lives while on the job has trended downward by 38 percent. One of the reasons, as noted before, is that the overall number of fires has declined significantly. However, **the rate of deaths per 100,000 incidents has actually increased**. In other words, there are fewer fatalities overall, but the likelihood that an incident will result in a fatality is up (higher per incident rate).

Most fatal firefighter injuries have occurred while fire personnel were extinguishing a fire or otherwise neutralizing an incident (30 percent). Another 12 percent of deaths happened during suppression support activities (e.g. forcible entry, ventilation, salvage and overhaul, and raising ground ladders). Fire departments should note that in those fires, which cost firefighters' lives, the leading cause of the fire was arson by a wide margin. Thirty-seven percent of the fires where there were fatal injuries to fire personnel were incendiary or suspicious. The second leading cause (16 percent) was electrical distribution (See Figure 3).

The National Fire Protection Association (NFPA) conducted a ten-year review[2] (1991-2000) of firefighter deaths caused by structural collapses. Of these, 42 were operating either inside the structure or on it. They died of asphyxiation, burns, and crushing injuries (internal trauma). Career firefighters accounted for 25 of the deceased, while 17 were from volunteer fire departments. Floor collapses ranked as the number one collapse situation, while roof collapses ranked a close second.

Fourteen of the 56 collapse-related fatalities occurred during operations outside the structure, when the firefighters were hit by debris from a collapse. Crushing injuries killed 11, and 3 perished from internal trauma.

RIT and Two-in/Two-out

There is some confusion as well as debate within the fire service as to whether there is a difference-conceptually or functionally-between the OSHA respiratory standards title commonly known as "two-out" and rapid intervention teams. Some fire departments consider the two to be synonymous,

[1] Firefighter Fatalities Retrospective Study, U.S. Fire Administration, FEMA, April 2002/FA-220.

[2] NFPA Journal, July/August 2001, "2000 *U. S. Firefighter Fatalities*".

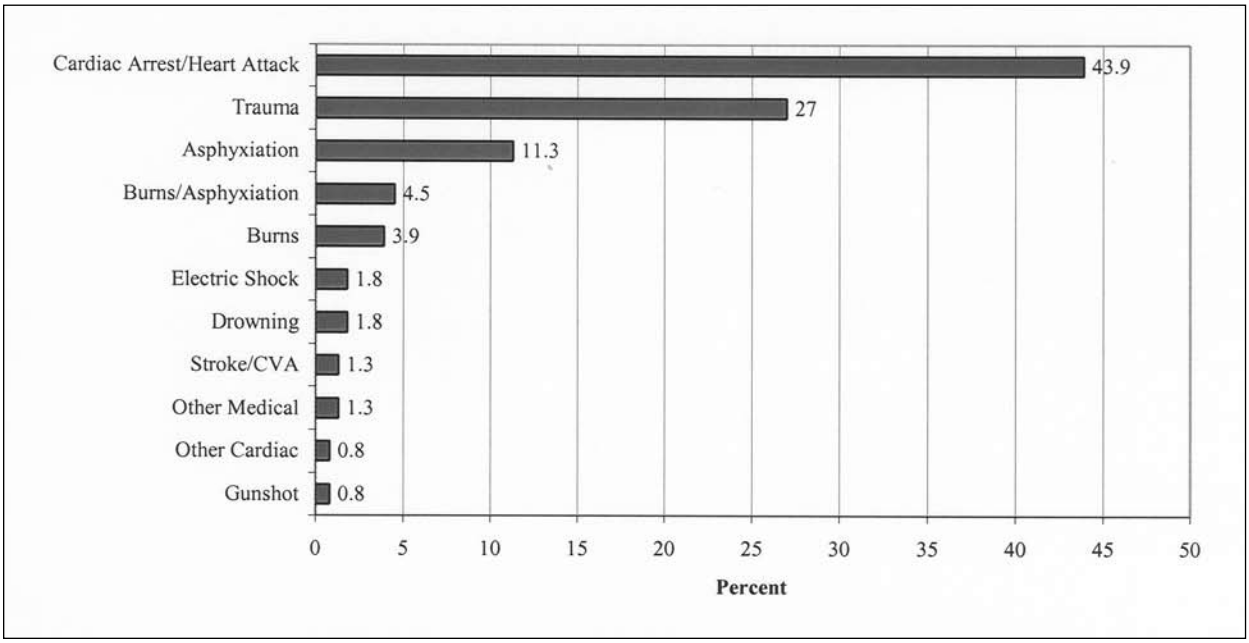

Figure 1. Nature of Fatal Injury (1990-2000)

Source: pre-1990 data and USFA *Analysis Report on Firefighter Fatalities*. U.S. Fire Administration, FEMA, April 2002/FA-220

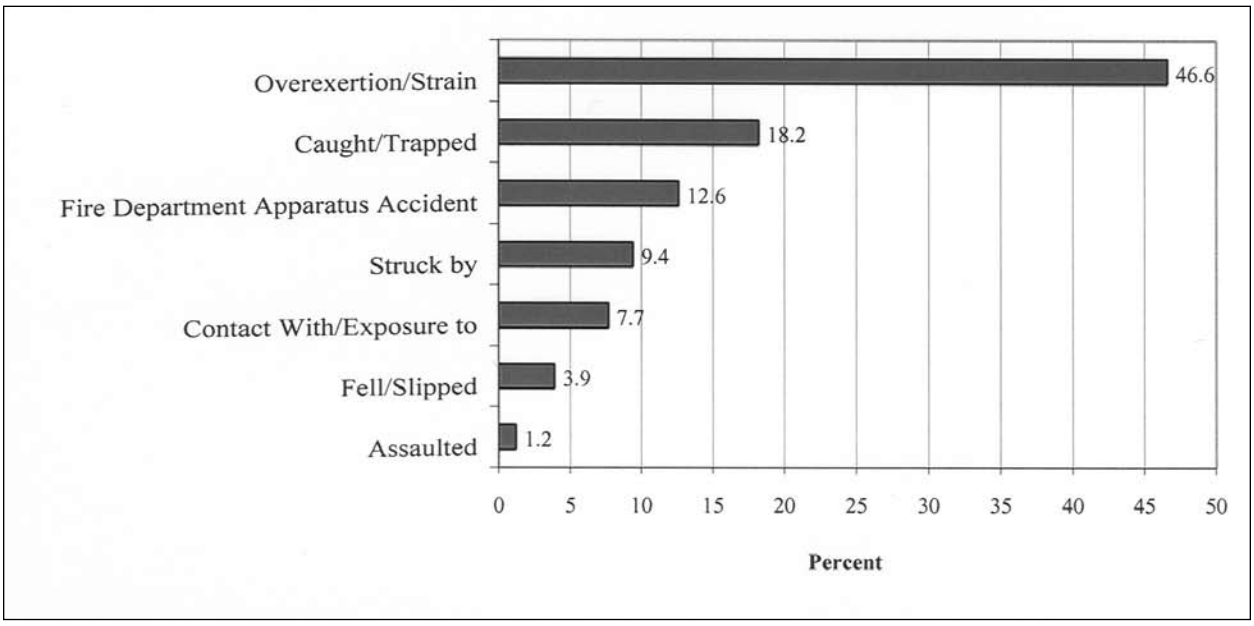

Figure 2. Immediate Cause of Fatal Injury (1990-2000)

Source: pre-1990 data and USFA *Analysis Report on Firefighter Fatalities*, U. S. Fire Administration, FEMA, April 2002/FA-220.

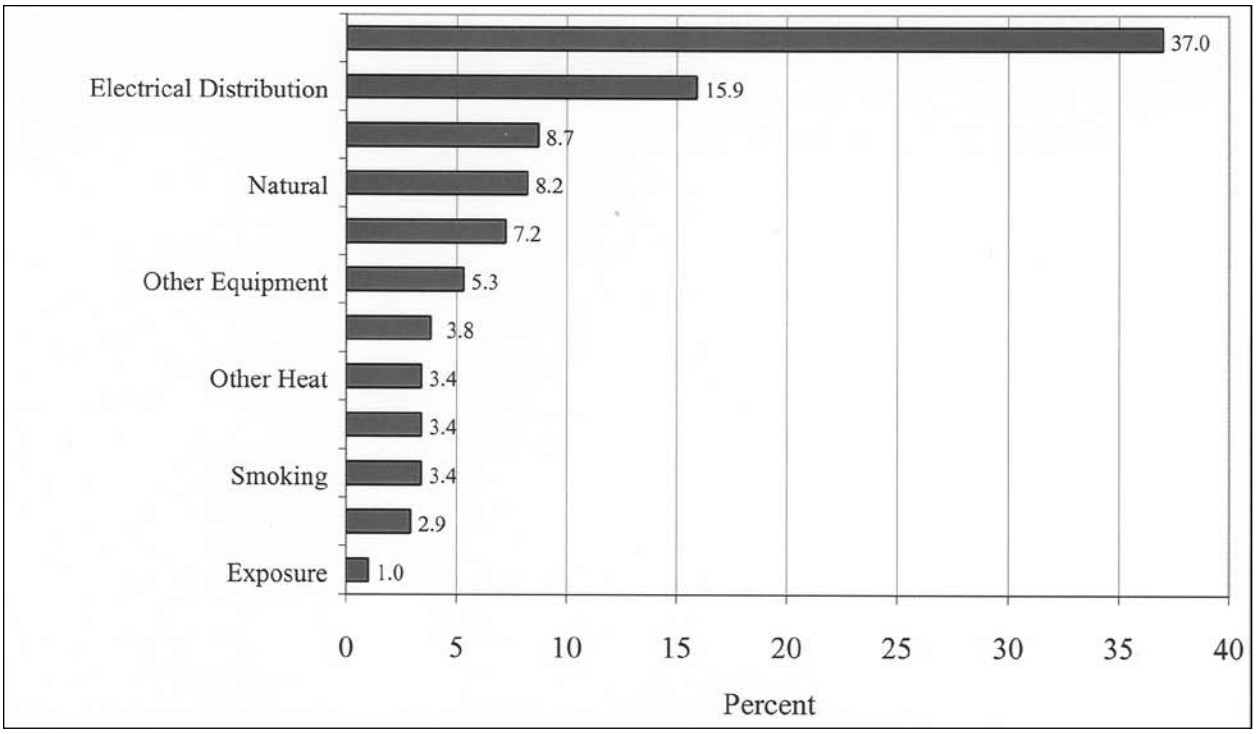

Figure 3. Cause of Fire Involving Firefighter Fatalities on the Fireground (1990-2000)

Source: pre-1990 data and USFA *Analysis Report on Firefighter Fatalities*, U. S. Fire Administration, FEMA, April 2002/FA-220.

i.e. the terms can be used interchangeably. Other departments view RITS as a higher order two-in/two-out team that is differentiated by specializing training and equipment and the firefighting credentials of RIT members.

In this report, the two-in/two-out requirements pertain to initial arrival and deployment of first due operations. Once a scene progresses beyond the incipient stage (which often happens even before the fire department arrives, especially in incendiary fires) and escalates to a working fire or additional alarm or both, then the need to deploy a formal RIT unit becomes a factor. Firefighter safety is the issue with both RIT and two-in/two-out. Each has its own requirements and distinct (though related) approaches to providing safety based on an escalating level of need. Both are implemented and often staffed differently, but are established with the common goal of affecting firefighter rescue.

"Two-In/Two-Out"

The "two-in/two out" rule developed by OSHA was originally written in a larger context to protect all types of workers from illness and injuries associated with hazardous environments that require respirators. The procedure describes the types of respirators required, fit tests required for each employee, medical evaluations required, continuing respirator effectiveness, and maintenance and care of respirators, as well as training and information required for respirator use.

Section (g) (4) of the OSHA standard (29CFR1910.134) that governs two-in/two-out specifically pertains to firefighters. It outlines the procedures for interior structural firefighting and establishes that the employer shall ensure the following:

- At least two employees enter the immediately dangerous to life and death (IDLH) atmosphere and remain in visual or voice contact with one another at all times;
- At least two employees are located outside the IDLH atmosphere; and
- All employees engage in interior structural firefighting use self-contained breathing apparatus (SCBA).

The standard also states in Paragraph 1 (g) that

> one of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

Paragraph 2(g) further states that "nothing in this section is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled."

Due to the potential for mechanical failure or reception failure, radio communication is not considered an acceptable form of communication between the two or more interior firefighters for "remaining in visual or voice contact." This is in part due to OSHA's opinion that in certain circumstances the individual(s) needing rescue may be physically unable to operate an electronic device to summon help. Radios can and should be used for communications on the fireground, including communications between the interior firefighter team(s) and exterior firefighters. They cannot, however, be the sole tool to account for one's partner in the interior of a structure.

The two-in/two-out requirement is not invoked until firefighters begin to perform interior firefighting, which is an attempt to control or extinguish a fire in an advanced stage of burning inside a building. OSHA defines interior firefighting as "the physical activity of fire suppression, rescue, or both inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage." OSHA defines an incipient stage fire as a

> fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers. Class I standpipe or small hose systems without the need for protective clothing or breathing apparatus.

Any fire beyond the incipient stage is considered by OSHA to be an atmosphere that is immediately dangerous to life and health (IDLH). OSHA considers an atmosphere to be IDLH when it could cause irreversible adverse health effects or could impair an employee's ability to escape. OSHA states: "Once firefighters begin the interior attack on an interior structural fire, the atmosphere is assumed to be IDLH and paragraph 29 CFR 1910.134(g)(4) applies." That is, a two-out standby team is required. The 1990 recommended IDLH values found in the NIOSH Pocket Guide to Chemical Hazards might be used to support OSHA enforcement action.

All firefighters engaged in interior firefighting must wear SCBA. SCBA must be NIOSH-certified, positive pressure, and contain a minimum of 30 minutes air supply. Standby personnel (two-out or a

full RIT) must be appropriately equipped to attempt a firefighter rescue and minimize the danger to themselves during rescue efforts. These personnel must have pressure-demand or other positive-pressure SCBA; they should also have spare SCBA cylinders, rescue tools, forcible entry tools, wirecutters, search/guide ropes, hydraulically powered tools, radios, and handlights. Appropriate training and standard operating procedures (SOP's) need to be in place before rescue efforts are undertaken.

Under the two-in/two-out rule, at least two firefighters must always be stationed outside the IDLH during interior firefighting, prepared to enter should the need arise. The incident commander has the flexibility to determine whether more than two outside firefighters are necessary in cases where more than two firefighters are conducting an interior attack. When the involved structure is very large, additional firefighters may be needed to remain outside so that a safe and effective rescue can be performed. Where firefighting tactics require entry from different locations or levels, firefighters may have to be stationed outside each point of entry (or egress).

Before proceeding further on the discussion of firefighter rescue, it is important to note that rescue teams staffed with only two firefighters can be dangerously inadequate. The physical, mental, and psychological stresses associated with the rescue of a fellow firefighter are immense. Many fire service leaders believe that four personnel should be considered the minimum. Two, however, meets the OSHA regulatory requirements.

According to OSHA, at least one of the outside firefighters must actively monitor the status of the inside firefighters and may not be assigned additional duties. The second outside firefighter may be involved in other fireground activities, but any additional assignments for the second firefighter must be weighed against the potential for interference with this requirement. However, both must be able to provide immediate assistance to the two interior firefighters. Since this is a performance-oriented standard, OSHA does not specify all compliance scenarios. From OSHA's perspective, proper assignment of firefighting activities at an interior structural fire must be determined on a case-by-case basis and is dependent upon individual circumstances.

Some examples of activities often performed by the stand-by team members include pump operations, incident command, advancing and directing hose to the entry team, and outside hoseline operation. The distance of an individual from the entry point, an individual's training and equipment, and the communication link between the individual and the interior firefighters are considerations in making the assignment. Outside firefighters assigned additional duties must be able to immediately react to perform rescue without delay. In determining whether the standard has been met, all the variables of the incident are considered; the judgment of the incident commander is critical to compliance.

OSHA's respiratory protection standard **does not** require fire departments to hire additional firefighters; it **does not** require four-person engine companies or four personnel on truck companies. Fire departments may assemble the numbers required on the scene by waiting for others to arrive. The fire may be attacked from the outside, size-up may occur, water supply may be established, and emergency rescue necessary to save lives may take place prior to establishing a two-out standby team. Small fire departments may rely on mutual aid agreements with neighboring jurisdictions to provide additional firefighters where necessary to ensure compliance with two-in/two-out. It is important to reiterate that arriving companies are not required to follow two-in/two-out procedures when a confirmed life hazard in a structure exists; in this case, firefighters can proceed with rescuing civilians as the situation requires.

This OSHA standard applies to all workers engaged in firefighting duties, whether they work for municipal fire departments, industrial fire brigades, private incorporated fire companies (including incorporated volunteer fire companies), or private industry fire departments contracting to public jurisdictions and Federal firefighters. In 23 States and two territories, the State, *not* the Federal government, has jurisdiction and responsibility for enforcing regulations regarding worker health and safety. These so-called "State plan"; States have received the approval of Federal OSHA to provide their own enforcement programs. They must establish occupational safety and health programs for all public employees that are at least as stringent as the programs for private sector employees. Federal OSHA has no direct enforcement authority in States that do not have State OSHA plans unless the local governments voluntarily adopt the OSHA provisions.

All career firefighters-whether in State, county, or municipal governments in the States or territories where OSHA State plan agreement is in effect-are protected by all Federal OSHA health and safety standards. The following States have OSHA-approved plans and must enforce the two-in/two-out provision for all career and combination career/volunteer fire departments: Alaska, Arizona, California, Connecticut, Hawaii, Iowa, Indiana, Kentucky, Maryland, Michigan, Minnesota, Nevada, North Carolina, New Mexico, New York, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington and Wyoming.

A number of other States have adopted Federal OSHA regulations for public employee firefighters. These states include: Florida, Illinois, and Oklahoma. In these States, the regulations carry the force of State law.

The 1997 edition of NFPA 1500 includes the two-in/two-out policy required by OSHA.

NFPA 1710 and 1720, 2001 Edition

Career Departments (1710)

The National Fire Protection Association (NFPA) has established a benchmark standard that is the first organized approach to defining levels of service, deployment capabilities, and staffing levels for career fire departments. NFPA 1710 defines firefighter rescue teams using two terms, as follows:

- Initial Rapid Intervention Crew (IRIC)--Two members of the initial attack crew who are assigned for rapid deployment to rescue lost or trapped members.
- Rapid Intervention Crew (RIC)--A dedicated crew of firefighters that is assigned for rapid deployment to rescue lost or trapped members. (This is the same as a RIT).

Later in the standard, NFPA states that "Personnel assigned to the initial arriving company shall have the capability to implement an initial rapid intervention crew" and under 5.2.3.2.2(8), "the initial full alarm assignment shall provide for the…establishment of an IRIC that shall consist of a minimum of two properly equipped and trained personnel."

As to the point at which an IRIC is replaced with a RIC, NFPA 1710 states that

> when an incident escalates beyond an initial full alarm assignment or when significant risk is present to firefighters due to the magnitude of the incident, the incident commander shall upgrade the IRIC to a full rapid intervention crew(s) that consists of four fully equipped and trained firefighters.

The standard also recommends that the RIC report to the incident commander or the operations chief and states that "*This dedicated crew is not to be confused with the IRIC*". Both IRICs and RICs should be equipped with an appropriate protective ensemble as required by NFPA 1500.

Volunteer Departments (1720)

In developing this companion standard, NFPA took into consideration the unique aspects of the volunteer fire service in terms of the scope of services they provide, how they are deployed, and how they tend to be organized. In NFPA 1720, RIC is defined, but IRIC is not. The standard provides that the fire departments identify minimum staffing requirements, but only that these should "ensure that a sufficient number of members are available to operate safely and effectively."

For initial attack, NFPA 1720 maintains

> Initial attack operations shall be organized to ensure that at least four members shall be assembled before initiating interior fire suppression operations at a working structural fire. In the hazardous area, two individuals shall work as a team. Outside the hazardous area, tow individuals shall be present for assistance or rescue of the team operating in the hazardous area. One of the two individuals assigned outside the hazardous area shall be permitted to be engaged in other activities.

Finally, 1720 discusses how a RIC should be incorporated into the incident management system and personnel accountability system; it also suggests that many departments should dispatch an additional company to standby as the RIC. All appropriate protective equipment and specialized rescue equipment should be available to RIC members.

RIT Objectives

The objective and function of a rapid intervention team (RIT) is to locate and rescue lost, trapped, and/or injured firefighters on the fireground. When firefighters face mayday conditions, saving them may require more than basic rescue techniques and training. Firefighters assigned to rescue their fellow firefighters are asked to place themselves in extraordinarily dangerous conditions. For a RIT to be successful, it is essential that team members receive training in special rescue, self-survival, and forcible exit techniques, as well as how to operate as a team. By no means should a RIT consist of inexperienced firefighters.

When fire departments develop and train members that may be assigned to a RIT, they are taking an important step in improving firefighter safety on the fireground or at other emergency incidents. Many fire departments throughout the country have found that this preparation has paid big dividends during incidents involving injured, trapped, or lost personnel.

RIT Training

One of the most important considerations in forming a RIT is training. Training should not only refresh the fundamentals of firefighting and search and rescue, but also should stress an attitude of safety and caution in responding to all incidents combined with specifics on the art of firefighter safety. Over time, there is a tendency among firefighters to become complacent about handling "routine" incidents. A casual, cavalier attitude toward answering calls can lead to disaster or result in injury or death. Basic firefighting skills and survival methods are reinforced during RIT training, and the presence of a RIT at every fire scene serves as reminder that rescue could become necessary, thus maintaining a degree of alertness for all personnel operating incident.

Not every firefighter will be assigned to a RIT, but all members of the fire department should be instructed on the purpose, policies, and rules governing a RIT and the conditions under which it would be deployed. The importance of having experienced, well-trained firefighters is self-evident. Team members must be able to function under extreme stress and pressure. They must base their tactical decisions on sound training and experience and maintain their focus on locating, assessing, and extricating their fellow firefighters.

Members of the RIT should be considered elite firefighters: the best trained and equipped, mentally astute, and physically able to act and respond to any situation that may develop. Unfortunately, few departments employ this philosophy in practice. More often than not, any responding company is used as the RIT. Even worse, different people from different companies are haphazardly assigned to be a RIT.

Suggested Area of Training

Most skills needed by RIT members are not complicated or technical, but for the most part, build on the basics learned in firefighting and rescue classes. These skills can be learned in a short period of time, but continual practice of the manual skills is essential to achieve and maintain competency. The training should focus on specific firefighter rescue skills and potential situations that may be encountered. A good step to take is a review of pre-plans to identify the more complex structures and land uses, and then use the pre-plans as possible scenarios where firefighting would be more risky. Also, one should consider scenarios where fire is intentionally set, possibly aided by accelerants or riddled with booby traps. These fires grow quickly and can trap crews faster than would be the case in a comparable fire that occurred accidentally. One should study the lessons learned from previous fires that caused firefighter fatalities and read published reports detailing the circumstances surrounding these incidents.

Mentioned previously were the psychological stresses associated with firefighter rescue. It is nearly impossible to simulate in training the stress levels associated with rescuing a downed firefighter where one's efforts directly affect the survivability of another member. NFPA 1043 (the standard that governs live fire training) states that fire departments should *not* use live victims during training evolutions. However, a realistic, life-size mannequin wearing turnout gear with an SCBA and a PASS alarm that is strategically placed in a furnished training "burn building" (or an acquired structure) provides a realistic scenario.

The Tempe Fire Department, Arizona, used an acquired structure without live fire for rapid intervention training. A key element of that training was increasing the "outside stressors" such as noise (PASS alarms, hysterical screaming, apparatus engines, chainsaws, etc.) and decreased visibility (non-toxic smoke, "blackened" SCBA masks) among others. Tempe fire officials indicated great success with this training, and the firefighters left the training scenario with a greater appreciation of the pressure conditions surrounding a mayday situation.

While basic firefighting skills need to be continually addressed and reinforced, emphasis during Rapid Intervention Team training should be on teamwork. For the RIT to be effective, the members must train and work together as a group. Some of the training topics that should be considered include

- building construction;
- incident size-up;
- fire behavior and travel;
- team search techniques and problems (including large area searches);
- use of thermal imagers;
- SCBA changeover and use of emergency breathing support system;
- fireground communications;
- accountability;
- methods of firefighter removal;

  unconscious;

  conscious;
- rescue scenarios;

  entanglement;

  floor collapse;

  confined space;

  above ground;

  ground level;

  below ground;
- self-rescue techniques;
- forcible exit;
- ladder bail out;
- rope/charged hose line slide; and;
- command of RIT operations.

Chapter II. Developing and Improving RITS

When firefighters become disoriented, their air supply becomes depleted, or they suffer injuries or illness that prohibit self-escape, the incident commander must be able to quickly activate a firefighter rescue team. This team must be able to enter the structure, locate the victim quickly, safely remove the firefighter from imminent danger, and provide immediate life-saving measures. The rescue team then must remove the firefighter from the structure and transfer the casualty to a higher level of medical treatment, if necessary.

In many respect, the RIT is one of the most important teams on a fireground. If a RIT prevents even a single serious injury or fatality ,the team is not only doing what is right and necessary to fully ensure firefighter safety, but it also is saving the jurisdiction the costs of medical and disability payments, as well as the potential of a lawsuit. RITS are cost-effective and mission-essential.

The structure, composition, and use of the RIT varies considerably from one fire department to another, according to the research conducted for this report. The team remains available to perform rapid rescue of other firefighters and is called to action according to the department's communications and command policy. The variations among RITS across fire departments tend to be the number of members who are designated and trained for RIT duty, what tools they carry, what size hose they carry, and how the RIT is staffed. Considering current practices, the following guidelines are provided as one example to consider:

1. The firefighter rescue team should consist of at least two (2) personnel on the initial attack (two–out) and be augmented with additional personnel as soon as possible (full RIT). One member of the RIT should be designated as the RIT officer.

2. Multiple RIT teams should be organized as the incident's magnitude and complexity requires.

3. Although the primary focus of Rapid Intervention Teams is their operation at structure fires, all incidents where SCBA, SABA, or SCUBA are required (e.g., confined space rescue, water rescue, etc.) should have a RIT in place.

   At least one RIT should be established, prepared, and equipped to act in the following conditions or incidents

   a. structure fires;

   b. incidents that pose the threat of collapse;

   c. incidents that pose the threat of entrapment;

   d. incidents that pose the threat of getting lost and being unable to find an exit from the structure, due to its size, configuration, or the complexity of the incident (e.g. multiple points of origin); and;

   e. swift water or underwater rescue.

4. RIT members should be obtained from fireground resources that are not already committed to the incident. If the incident commander believes that this cannot be accomplished effectively, then additional resources should be requested.

5. At least one of the RIT members should be free from ancillary duties on the fireground, to monitor interior conditions and crew advancement. Other RIT members can receive minimally demanding assignments, but none should encroach on their ability to respond immediately with the rest of the team if it becomes necessary to engage in rescue operations. Under no circumstances should the RIT be committed to any duties that would hinder or delay their immediate deployment should the need arise.

6. The RIT commander should secure necessary tools and equipment to perform the tasks that may be required.

7. The RIT commander should maintain contact with the incident commander at all times and monitor fireground radio traffic. The RIT commander should continuously perform incident size-up, assess the structural stability of the building, and the progression of the fire attack.

Upon arrival on the fireground, the RIT should report to the incident commander for a face-to-face summary on the fire and details surrounding personnel deployment, including number of interior crews and their location within the structure. The RIT should stage for deployment in the vicinity of where the interior fire crews made entry, but outside the collapse zone of a structure. The collapse zone is typically measured as the distance equal to one and one half the height of the involved structure. For example, the collapse zone for a single-family home that is 30 feet in height would be 45 feet from the base of the house.

The RIT Officer

Typically the highest ranking officer or member assigned to a RIT will serve as the commander. The RIT officer-in-charge will serve as the main point of contact with the incident commander. When assigned by the incident commander (or upon assuming a pre-determined position according to the department's SOP's), the RIT officer should undertake certain fundamental tasks. When done properly, these tasks will go far in dictating a positive outcome should the RIT be deployed. The RIT officer should:

1. Report to the IC to receive orders as to where the RIT, with the tools and equipment, is to stage.

2. Confirm the chain of command (i.e. to whom does the RIT report). Check the radio channel for fireground operations, and obtain a copy of the building preplan or survey, if available. Preplans contain valuable information on building construction, layout, and hazards. The preplans should be used in concert with tactical worksheets to track interior companies' locations and assignments.

3. Make a size-up of the overall scene, considering the following

   - type of building, roof construction, and age;
   - possibility of collapses;
   - points of access and egress;

- overall sizes and condition of building;
- number of floors;
- burglar bars;
- history of previous fires in structure;
- contents and interior finish;
- location of stairwells and elevators;
- basement;
- water supply;
- any overall hazard or relevant details;
- weather conditions and temperature;
- extent of fire development;
- location and experience level of interior crews;
- reports that the fire may be suspicious (e.g. multiple area of fire or smoke upon arrival).

4. Consider the extent of the fire and the progress being made in controlling the fire. How successful is the attack? Could the situation deteriorate? Are there signs that it is deteriorating and that the offensive strategy may soon change to a defensive one? How long has the incident been underway?
5. Closely monitor radio traffic for clues to the interior conditions, e.g., calm, efficient transmissions may indicate a controlled environment, whereas raised voices, low air alarm, pass alarm sounding during transmission, and excited, chaotic traffic may indicate a deteriorating interior situation.
6. Check with and brief members of the RIT on conditions found, information received, observations made, and hazards identified. Communicate with other RIT members who have conducted their own size-ups.

Practices from the Field

Here are some examples of how different types of departments use RIT's in practice:

Prince George's County, Maryland: Rapid Intervention Crews

This large metropolitan fire department adjacent to the District of Columbia has created what they term Rapid Intervention Crew, or RIC. Their Standard Operating Procedure on Emergency Operations[3] provides a detailed example of SOP's for a RIC.

PGFD defines a RIC as: "A crew of at least two members available for rescue of a member or a team if the need arises. RICs shall be fully equipped with the appropriate protective clothing, protective equipment, SCBA, and any specialized rescue equipment that might be needed given the specifics of the operations underway."

The PGFD SOP's also state: "The "2 In/2 Out" concept shall be employed during the initial stages of an incident, where only one team is operating in the hazardous area." The initial stages of an incident shall encompass the tasks undertaken by the first arriving company with only one team operating in the hazardous area. If the first arriving unit does not have sufficient personnel to accomplish "2

[3] Prince George's County Fire Department, "Emergency Operations." Standard Operating Procedures, G. O. #3-1, 1 October 1996.

In/2 Out", the second due engine will be responsible to establish the "2 Out" crew until relieved or reassigned by the incident commander.

The Department's Box Alarm Assignment includes a provision for "2 In/2 Out":

1. **First Arriving Engine Company Officer:** Ensure that "2 In/2 Out" has been established prior to any interior operations or entry into an IDLH atmosphere. NOTE: If upon arrival at the scene, personnel find an imminent life-threatening situation, where immediate action may prevent the loss of life or serious injury, such action shall be permitted with less than four personnel on the scene, subject to size up and a risk benefit analysis by the on-scene incident commander. Operations that present significant risk to the safety of members shall be limited to situations where there is a potential to save endangered lives.
2. **Second Due Engine Company:** Establish the "2 Out" position if the first arriving has not already established "2 Out". The incident commander may change these assignments based upon unusual circumstances but if the second due is utilized for a non-RIC duty, then the third must be assigned the position.
3. **Second Due Company Officer:** Must ensure "2 In/2 Out" has been established, and stand by as the RIC unless otherwise directed by the IC.

All other Standard Operating Procedures for fire attack remain the same.

Bryn Athyn, Pennsylvania: Firefighter Assist and Search Team (FAST)

In 1998, The Bryn Athyn, PA., Fire Department set forth SOPs to cover the use of five person Firefighter Assist and Search Teams (FAST) on the fireground. The SOP states that "Utilizing the entire crew, including the officer and the driver, we split the crew to provide not just one FAST team, but also a backup support team as well as a resource and safety monitor."[4]

The first-in FAST team usually consists of two firefighters, equipped with a set of irons (Halligan bar and flat-head axe), a thermal imaging camera, and a search rope. Their only function initially is to locate the downed victim. If they are easily able to perform the rescue themselves, then they rescue the firefighter. If not, a second team of two is called in, equipped with life lines, rescuer slings, wire cutters, patient moving devices, forcible entry tools, and spare SCBAs to perform the extrication. In all, five firefighters, including the pumper driver (where applicable), are used in FAST.

By having a second team outside the scene established as IDLH, The Bryn Athyn Fire Department believes they have more flexibility than they would with just a standard RIT team. The second tier is able to perform ancillary functions that can be abandoned in the event of FAST team deployment from the outside, including raising ladders, fire suppression, etc. The second tier also serves as the "safety valve" for both the initial part of the FAST team and downed firefighter, since the second team is there to save both if necessary.

New York City Fire Department: Rapid Intervention Crew-Engine (RIC-E)

The Fire Department of New York City (FDNY) uses a Rapid Intervention Crew Engine (RIC-E) in combination with a RIT team because they believe that the first priority of rescue operations is to

[4] Morton, Mike."FAST Teams."Fire-Rescue Magazine, January 1999: 75-76.

defend trapped personnel and suppress any existing or potential fires, utilizing large handlines. A firefighter in FDNY stated, "the fact remains that, especially when rapid fire spread or collapse occurs, the prompt application of water may be the only means of saving trapped firefighters and protecting members of the RIT/FAST teams…" At FDNY, the RIT team is usually staffed from truck or squad companies, because they are usually trained in forcible entry, laddering, search, and other "traditional" truck company duties.[5]

An April 1999 *Fire Engineering* article points to specific examples where the implementation of RIC-E could have altered the outcome of certain incidents:

- **23rd Street collapse in Manhattan, NY, 17 October 1966,** which killed 12 firefighters. "Only the Herculean efforts of the firefighters pushing back the fire with 2 ½ inch handlines allowed rescue teams to reach the trapped firefighters…" preventing the loss of many more lives.
- **Commercial building fire, 12 March 1987,** in which the Detroit, MI Fire Department lost three firefighters. "In an odd set of circumstances, an officer and a firefighter were killed by the collapse of a fire wall, and another officer was killed in a fall from a third floor window after being trapped by rapid fire spread." The article points out that if it were not for aggressive five stream application by an additional engine company, this tragedy would have been greater.
- **World Trade Center bombing (first), New York, NY, 26 February 1993,** a firefighter became trapped in the bomb crater created by the blast and suffered severe injuries. If it were not for the direct stream lines pushing the encroaching fire back, the life of the firefighter would have been in greater jeopardy.

The most effective use of RIC-E is in combination with a RIT/FAST team. RIC-E teams are trained in both routine and non-routine fireground operations. The three critical training areas include training in stretching and advancing handlines of various sizes; physical strength and endurance training to help firefighters withstand the punishment of firefighter rescue operations; and development of mental toughness, so the RIC-E can withstand emotional rigors of firefighting rescue efforts.

RIC-E tools and equipments are basic; hose, nozzles, and large caliber (master) stream devices. Many of the tools required to rescue downed firefighters are already pre-deployed/staged in a designated area by the RIT crews, including portable ladders and search/guide ropes. However, the RIC-E might encounter conditions that require forcible entry tools (flathead axe, Halligan, sledgehammer, hydraulic tools). In addition, RIC-E personnel carry personal hand lights, door chocks, and spare SCBA cylinders.

Part of RIC-E responsibilities are to size up the scenario accurately so that the RIC-E does not become *another* group of trapped firefighters, and to effectively utilize assets to help the rescue of firefighter(s). Size-up includes type of construction, type of occupancy, area/height, exposure(s), location and extent of fire, water supply particulars, auxiliary fire protection systems, and type and size of handlines already in use.

If used effectively, RIC-E can function in conjunction with the RIT teams to provide fire protection to the rescuers as well as to the downed firefighter(s).

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[5] Fredericks, Andrew. "Engine Company Support of RIT/FAST Operations." Fire Engineering April 1999: 79-96.

Another Organizational Model

Some chief officers argue in favor of what they call a Rapid Action Team (RAT)[6] that is located strategically inside the IDLH as a proactive team to help prevent the interior team from getting lost or from succumbing to fire. The concept is that if the rescue team is located outside the IDLH the team can only react to, not prevent, a crisis situation. These officers express concern over RIT teams operating outside the IDLH environment. However, under OSHA and NFPA procedures, department still must employ a RIT team to protect the RAT, as well as the first-in team.

Enhanced/Multiple RIT Teams

Larger-than-average RIT teams are employed in cities and counties where staffing is greater or where the buildings present a high degree of risk (e.g. many old, substandard structures). In these larger RIT teams, an additional crew is responsible for enlarging openings to help remove a downed firefighter. This crew is equipped with pike poles, jacks, chain saws, and other forcible entry tools. Their prime responsibility is to see that another opening exists if the firefighter cannot be removed through traditional openings (widening window openings, breaching walls, etc.).

[6] Cowardin, D. "*RIT or RAT – Which Way Should You Go*." American Fire Journal, April 1999:25

Chapter III. Two Examples of Rapid Intervention Teams

In this chapter, we discuss in greater detail how two departments have organized their resources for firefighter rescue. The Pittsburgh, Pennsylvania, Bureau of Fire and the Tempe, Arizona Fire Department are two departments that can serve as examples for other fire departments that are refining their current firefighter rescue/protocols or that are starting from scratch. The strategies of these two departments expand upon the notable ideas from other fire departments that were mentioned in the preceding chapter.

Pittsburgh

The Pittsburgh Bureau of Fire (PBF) began its aggressive effort toward preparing for firefighter rescue after a tragic fire on February 14, 1995, which left three firefighters dead. The three firefighters became lost and disoriented in a Bricelyn Street house fire. Efforts to rescue them failed, and the three firefighters died after their air supply depleted. This event was the impetus behind some of PBF's personnel become today's leaders in firefighter rescue training.

The PBF is a large metropolitan department that protects approximately 55 square miles and a resident population of 350,000. That number increases to 600,000 during day time as commuters arrive to work in the city. The PDF staffs 33 engine companies, of which three are quint companies, and 11 ladder trucks. Each engine is staffed with a captain and three firefighters; the quints are staffed with a captain and four firefighters; and the ladder trucks are staffed with a lieutenant and three firefighters. Including the five battalion chiefs and deputy chief, the minimum on-duty strength of the PBF is 186 firefighters and officers.

Upon receipt of an alarm for a structure fire in a single-family home, the PBF will dispatch three engine companies, one ladder truck, a battalion chief (for incident command), an air compressor unit, a safety unit (support vehicle staffed with four firefighters), and a second battalion chief for safety. An additional engine is dispatched and assigned as the firefighter rescue team, which in Pittsburgh is referred to as the "Go-Team".

Once at the fire scene, the Go-Team reports to the incident commander and subsequently assumes a location on the fireground that enables the firefighters to view two sides of the involved structure. A new standby policy is being submitted for approval, which, depending upon the magnitude and complexity of the incident, would place the Go-Team on one of three levels of activation:

- Level 1: This level is used on first alarm assignments. Firefighters stage outside the structure and have their breathing apparatus on and ready to use but without the face piece in place. They carry a basic tool complement such as axes, Halligan bars, other forcible entry tools, a rescue pack, and search ropes.

- Level 2: If an incident is upgraded from a first-alarm assignment to a second or greater, the Go-Team enters into Level 2 operations. Level 2 involves deploying a tarp for tool deployment where bigger, more complex tools will be placed. Tools, for example, include chain saws, (wood and masonry), hydraulic rescue/entry tools, and various other "heavy" tools, in addition to duplicates of the more basic tools placed during Level-1 operations.
- Level 3: If the Go-Team is deployed (even during an incident where the Go-Team was initially in Level 1 staging), the Go-Team will upgrade to Level 3. Immediately, a second team will be placed on call in the initial Go-Team staging area (assuming it is still the most advantageous location based on the location within the structure where the team is operating). The tool staging area will be augmented (or created if jumping from Level 1 to Level 3) to include shoring and cribbing equipment, air bags, and other urban search and rescue equipment.

The PBF has recently approved purchasing RIT bags, which will be placed on frontline apparatus. The RIT bags will be used by the Go-Team upon arrival, and will carry illuminated search ropes, utility rope, pre-made pulley systems, wire cutters, extra SCBA, and a recently released commercial device called "Sling-Link", a pre-made, multi-functional harnessing system. Although the PBF does not currently use thermal imagers, they are in the process of procuring cameras for each of the ladder trucks.

The department plans to establish firefighter rescue training in the near future. Each PBF firefighter will be sent through basic and advanced firefighter rescue training. Although a Go-Team in the PBF may currently include firefighters without specialized firefighter rescue training, the PBF has acknowledged this deficiency and will be sending all members of the department through an aggressive training program. After the Bricelyn Street incident, all members received self-rescue survival training.

Since the Bricelyn Street tragedy in 1995, the PBF has experienced several incidents where the Go-Team was deployed on a real incident with positive results. They have continued to evaluate their preparedness for firefighter rescue and to identify areas in training and equipment that need improvement. Methods and technology pertaining to firefighter rescue continue to change, and improve, as do other aspects of firefighting. The PBF is setting a good example for other departments to follow.

Tempe

The Tempe Fire Department, is one of 19 independent cities that make up the Valley of the Sun-Phoenix Metropolitan Area. Tempe has approximately 170,000 residents and is protected by a fire department with six fire stations. This population increases to about 200,000 during the work week. Automatic aid agreements are in place with most neighboring departments within the Valley of the Sun. The automatic aid agreements, and the way in which these departments respond to incidents regardless of political boundaries, are exemplary. The closest appropriate fire/rescue unit is dispatched by Global Positioning Satellite System to an incident regardless of which jurisdiction the incident is in and from which jurisdiction the unit is coming. The departments train together and operate from the same set of standard operating procedures on operational incidents. The radio and dispatch frequencies are all compatible. The Valley of the Sun intergovernmental cooperation serves the citizens in the best way possible.

Because the Regional fire departments are so well integrated, firefighter rescue protocols need to be commonly structured and practical as well. The Tempe Fire Department has been one of the leaders

in rapid intervention training for the Departments in the Valley of the Sun. The way in which they train for and accomplish firefighter rescue is relatively unique.

On March 14, 2001, a supermarket fire claimed the life of a Phoenix Fire Department firefighter. Thereafter, Tempe and other Valley departments began reviewing their firefighter rescue procedures and overall fireground operations. Historically, Tempe dispatched two engines, one ladder truck, and one battalion chief to a structure fire alarm. Upon receiving confirmation of a working fire, an additional engine would be dispatched for firefighter rescue. After the March, 2001 fatality, Tempe modified its dispatch and included the third engine and a second battalion chief on the initial dispatch. The third engine is still dispatched as the rapid intervention company, but it is included with the initial alarm. If there is confirmed fire or arriving units report a working fire, an additional engine, air truck, and rehabilitation units are dispatched to the incident; this is referred to as a working fire dispatch.

The engine from the working fire dispatch joins the third engine from the initial dispatch for firefighter rescue; together, the two engines make up the rescue sector.

Tempe's rapid intervention personnel stage at every point of entry on the fireground. If there are multiple points where interior firefighters entered, additional units are assigned to the rescue sector to cover those points. In order to maintain span of control, and depending upon how many units are assigned, the rescue sector may have a chief assigned to it and may be upgraded to a rescue *branch* within the incident command structure. If the incident warrants a rescue branch, a separate radio channel is assigned for rescue.

During standby operations prior to deployment, the rescue teams are expected to track the movement of the companies inside the building. Tracking is done by listening to the radio transmissions of the interior teams (firefighters are trained to give frequent updates on their progress within the building and the fire conditions being encountered) and by visually tracking their movement as best as possible from the outside. Firefighter movement can be tracked by actually seeing the interior firefighters through windows or other openings, or by looking at how the smoke conditions are changing, as it generally is indicative of fire streams being applied by the interior firefighters. The rescue team also documents the movements and any situational updates on tactical worksheets.

Rescue personnel confer with the incident commander and view any pre-fire plans that may contain floor designs and building layouts. The rescue teams pre-deploy uncharged hoselines to take into a structure. Whether or not the rescue team takes the line in depends on where the firefighter(s) is located within the structure. Rapid location of the downed firefighter is one of the guiding principles of Tempe's rescue team. The team gathers and stages tools including a thermal imager in addition to pre-staging the hose- lines. (Each fire unit in Tempe is equipped with a thermal imager).

In the event the rescue teams are deployed within a structure, the first of at least two teams has three objectives; rapid entry into the structure; rapid location of the downed firefighter; and rapid assessment of the downed firefighter and the situation-to include a recommendation of additional resources that will be necessary to remove the victim. The second team is responsible for getting the downed firefighter out of the building or into a safe haven for further evaluation or patient packaging.

If the rescue teams are deployed for a firefighter rescue, the alarm complement is doubled. For example, on a single-alarm fire, if the rescue teams are deployed for a downed firefighter, the alarm will be increased to a full second-alarm assignment; a second-alarm fire will be upgraded to a fourth

alarm, etc. The rescue teams will also be back-filled during deployment in the event the rescue team finds themselves in trouble.

To help the incident commander direct and manage the incident in the event a mayday is transmitted from an interior company, a checklist has been developed to ensure that all tasked are being covered. The checklist is outlined below. It is an excellent template from which the incident commander can base his or her operations during an extremely stressful situation.[7]

- Request emergency traffic.
- Identify mayday company/person (name, company, problem, and location).
- Deploy rescue sector.
- Request additional alarms (x two).
- Change plan to offensive/defensive strategy-rescue mode.
- Assign additional companies to rescue sector.
- Obtain Personnel Accountability Reports (PAR) on all crews, including their location.
- Reinforce firefighting positions. Utilize large handlines (2.5 inches).
- Assign chief officer to the rescue sector.
- Assign second chief to rescue branch. Move to channel two or three.
- Maintain radio and crew discipline.
- Open all doors and windows.
- Ventilate and maintain tenability; provide lighting.
- Assign safety sector.
- Assess structural stability (safety sector/branch).
- Expand rehabilitation sector (air utility near rescue entry).
- Establish treatment and transportation sectors (request ambulances).
- Assign chief officer to medical sector/branch.
- Assess technical rescue requirements.

The Tempe Fire Department takes a unique and aggressive approach to firefighter rescue training. Some in-service drills conducted by Tempe are designed specifically to refine existing firefighter rescue skills or to introduce new skills. While other drills conducted may not be primarily focused on firefighter rescue, the drill includes a component that addresses a downed firefighter and how he or she would be rescued in this environment. Every aspect of training in Tempe now includes a firefighter rescue component. For example, if members of the Tempe Fire Department are participating in a confined space entry drill, a scenario with downed firefighter during the confined space operation will likely present itself and require mitigation by the crews on the drill.

[7]Tempe Fire Department Policies and Procedures: Rescue-Lost Firefighter. Policy 205.02, Rev. 03/12/97.

Training for firefighter rescue in Tempe also covers, as best as possible, the mental stresses associated with having to rescue a fellow firefighter. To drive up stress levels on a drill site, training officers will ensure that distractions are in place, such as running chain saws, activated PASS alarms, and radio feedback. Training officials in Temple feel that presenting the rescuers with the outside distractions will force team members to communicate and operate in non-traditional ways, thus preparing them better for an actual scenario where the stress levels will obviously be exponentially higher, as it is in the "real thing."

Chapter IV. Tactics and Tools

This chapter presents information on tactical procedures that have proven effective when a RIT is activated. Tools and equipment necessary for firefighter rescue are also discussed. In addition to fire department and USFA, there are commercial vendors that officer training on the tactics and tools for self-rescue and rapid intervention.

Basic Firefighting

Firefighters who call for a mayday are often disoriented and cannot find their way out of a structure. Among the basic principles of firefighting that should be reinforced and emphasized in drills are: maintaining the integrity of a least a two-person team, also known as the "buddy system"; maintaining contact with a hoseline and how to find the way out using a hose while in the dark; maintaining contact with a wall or search rope during search operations; and familiarization with emergency breathing features of the self-contained breathing apparatus when the SCBA's air supply becomes depleted.

Personal Alert Safety System (PASS) Device

All fire department personnel engaging in interior firefighting operations should utilize SCBA equipped with a Personal Alert Safety System (PASS) device. The PASS device is designed to produce an audible alarm if the user is stationary for more than 30 seconds (time varies with individual manufacturers). The intent of the device is to notify other firefighters of a problem and to guide them by sound to the firefighter in distress. Once the PASS is activated, it must be manually reset on the module. Newer models are integrated into the SCBA so that when the air is turned on to the system, the PASS is also activated. This prevents firefighters entering an IDLH without their PASS activated.

Firefighters must be diligent about preventing their PASS devices from accidentally activating and manually resetting them in the event of manual activation. Firefighters engaged in interior operations should not treat a PASS activation with complacency; it is designed to indicate a firefighter requiring assistance.

Buddy System

Firefighting activities should always be done in teams when operating in an IDLH environment. Each member should also have a portable radio.

Two-person teams are safer than individual firefighters operating in a structure for a number of reasons. Two firefighters can monitor interior fire and smoke conditions better than one; they can also look for signs of collapse more efficiently and effectively. If one member of a two-person team is in trouble, be it from a medical condition such as a heart attack, an SCBA malfunction, an air depletion scenario, or entanglement from debris inside a fire building, the second member of the team can offer immediate assistance and call for help. A firefighter operating independently of others may col-

lapse from over exertion and may not be noticed as missing until a Personnel Accountability Report (PAR) is conducted. Regardless of assignment to an engine, ladder, or rescue company, maintaining the integrity of a two-person team is imperative.

Some departments deploy resources on a company basis, staffed with three, four, or five firefighters operating in concert with one another as a unit. When given a task on the fire- ground, they proceed as a company to carry out these assignments. The advantages are obvious, both from a safety and an efficiency standpoint.

Exiting With a Hoseline

Basic techniques taught during entry level firefighting programs describe how to escape a zero-visibility environment using only a hoseline. However, as years elapse from the time of basic training, this technique may be forgotten.

Exiting a structure in zero visibility for a firefighter with a hoseline should be simple, fast and easy. A firefighter operating a hoseline should search along the hose until he finds a coupling. Once found, a firefighter must "read" the coupling and determine the male and female ends. The male ends points towards the nozzle and fire, while the female ends point towards the water source, which is away from the fire. Once oriented on the hose, a firefighter can follow the hoseline in the same direction the female coupling points. This scenario must be regularly practiced with gloves on under zero-visibility conditions, entangled hose, and varying degrees of debris present (beds, fallen building materials, wiring cable, etc).

Operating Without a Hoseline

Considerable efforts are employed to safely locate and extinguish a fire. Some of these operations are done without a hoseline. Truck company operations (e.g., ventilation, searching for the seat of a fire, and checking for fire extension in void spaces), and rescue company search and rescue operations (in some jurisdictions the truck company is designated as the primary search and rescue team) may be carried out without a hoseline. Interior operations conducted without the benefit of a rope or hoseline are considered "high risk" and should be avoided.

Search ropes can be used during interior fire operations in lieu of staying in contact with a hoseline. Some modern search ropes are illuminated and point to the outside, if used properly, and are also flame resistant (to a degree). Other companies that do not use illuminated search ropes have found success in using basic rope. One drawback to a rope of this composition is inability to withstand exposure to high temperatures, rending the rope useless. In some cases, the floor of the structure on which the search rope lies may be hot enough to melt the rope. In a rope, one can tie knots in a pattern indicating the direction to the exit. Any pattern can be developed so long as personnel train on it and know the pattern. (See Figure 4.)

Maintaining contact with a wall from the moment a search team enters a structure should facilitate egress when operating in environments with little or no visibility. This is often referred to as a left-hand or right-hand search; meaning, if you enter a structure and maintain contact with a wall with either the left or right hand, you should be able to search the building and maintain orientation. Even if operating with a search rope, one member of the team should remain in contact with the wall and the remaining team members should remain in contact with the firefighter in contact with the wall. Teams can extend their reach with the use of tools by lying on one's stomach and using the

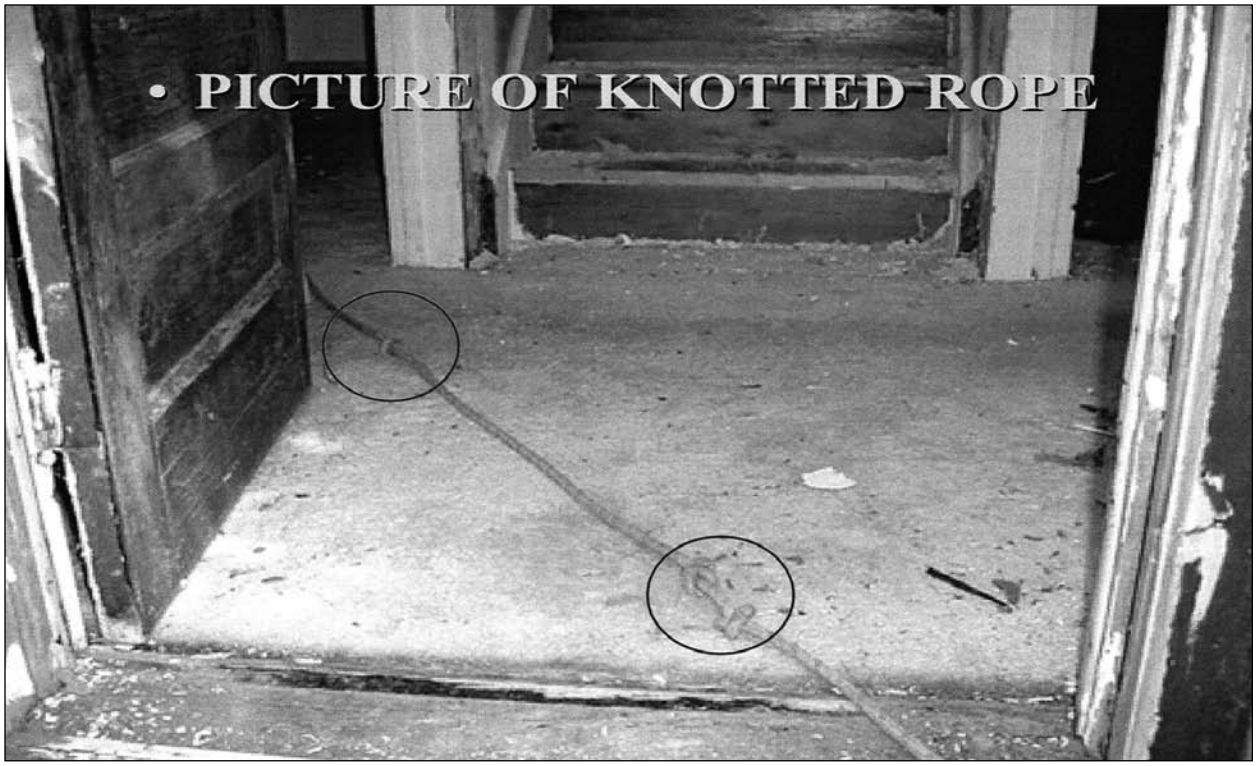


Photo courtesy of Jim Crawford

Figure 4. Example of Knotted Rope pattern used by RITS.

legs for extension from the wall or by additional ropes clipped to the main rope. Two firefighters lying on their stomachs and using tools to extend their reach should be able to brush the surfaces of any given room in the majority of single-family residences. In very large homes with spacious rooms and an open design, the principles of search remain the same but should be accomplished with a greater number of firefighters. In some residential settings, when contact is lost with the wall, one can re-establish contact by feeling the floor, determining if a hardwood or tile floor exists, and follow the joints in the wood or tile grout lines to the wall.

Maintaining orientation within a structure is of paramount importance to firefighters operating inside. Reinforcing these basic training techniques will help firefighters avoid calling a mayday. However, fire behavior cannot always be predicted. Even with excellent training, firefighters may need to be rescued from life-threatening conditions. When firefighters recognize an imminent life hazard to themselves or to other firefighters, they should have the right tools to call for help.

Emergency Breathing Procedures

Firefighters who become lost, trapped, or injured are at risk of their SCBA being depleted of air for egress from the structure. Proficiency in emergency breathing procedures can provide the air needed to exit the structure. At least annually, all personnel certified to wear SCBA should practice emergency breathing procedures with a partner in a safe environment with zero visibility. Competence with your equipment will assist rescue efforts and ultimately expedite egress during a true emergency.

Departments that participate in automatic and mutual aid agreements may find their breathing apparatus not compatible with one another. As such, Rapid Intervention Teams must have access to a

breathing apparatus for the departments to which they provide mutual aid. The access includes on the scene and before the emergency occurs to ensure proficiency. Training with unfamiliar equipment is a must prior to the emergency. It is certainly not possible to know the types of SCBA that each company is wearing, but mutual aid companies sent to a jurisdiction for RIT responsibilities may encounter a victim from the host department; in these instances, access to and familiarity with the host department's SCBA is of paramount importance. Neighboring departments should train with one another on rescue techniques and familiarize themselves with one another's equipment.

Personal Escape

Firefighters who find themselves in imminent danger and are unable to wait for a RIT rescue may be able to escape from a structure using some rudimentary but effective escape techniques. Like any other skill, these techniques must be practiced, but since they are often performed from an elevated level, fall protection and qualified instructors must be employed.

Some examples of personal escape taught by various agencies and departments in the fire service include the headfirst ladder slide, charged hoseline slide, rappel with a personal escape rope, and wall breach. These are only some techniques being taught, not all of which are universally accepted as "best practices." They each have merit under certain conditions.

Headfirst Ladder Slide

In the headfirst ladder slide, the firefighter dives out a window headfirst and grabs the top rung of the ladder or windowsill with his or her boots while simultaneously reaching for the rungs of the ladder. To be successful, the ladder must be positioned perhaps two to three inches, extended above the sill. The extended portion of the ladder serves as the edge for the boot to grab, which will hold the firefighter. This motion should stop the firefighter's fall. The firefighter then must invert him or herself and descend the ladder in the traditional manner.

To be effective, the window must be cleared of glass and debris. It must be stressed that this method of escape should be considered as an absolute last resort, and should only be considered after extensive training and practice under controlled scenarios.

This escape technique has its advantages if a multitude of conditions are met, but its disadvantages and the headfirst ladder slide associated dangers are greater than other escape techniques. As such, it is one of the more hotly debated self-rescue techniques in the fire service. For example, a Deputy Chief of a New England fire department wrote a scathing article in the January 2001 issue of *Fire Engineering* that criticized the editors for publishing an article in a previous edition describing and essentially condoning the use of this technique for personal escape. For some departments this technique is among those worth evaluating as a last ditch effort. The headfirst ladder slide itself can kill or seriously injure; it should be used only when interior conditions have become so untenable that a continued presence in the environment would likely result in death.

Charged Hoseline Slide

As implied by the title of this technique, a firefighter lowers him or herself out of an elevated structure by rappelling down a charged hoseline. Firefighter employing this method of escape must secure the hose within the fire building to a stationary object well enough to prevent the weight of the firefighter from pulling the hose out of the window and falling to the ground. Personal ropes or

webbing can be used for this purpose. The hose can be tied to a tool that is placed diagonally across the inside of a window or tied to a large, immovable object in the room. This evolution should be considered when it is possible to keep an encroaching fire in check while setting up the escape. A second hose- line can be used for this purpose, but firefighters should be trained to use the single hose- line technique.

Personal Rope Rappel

All firefighters should be equipped with and trained on the use of a personal escape rope. Attached to the working end of the rope should be a carabiner large enough to be coupled around most fire department hand tools. Self-locking carabiners that can be operated with one hand should be used for this purpose. A personal escape rope should be 25 to 50 feet in length and should be stored in a firefighter's turnout gear or in a bag attached to the SCBA harness. A firefighter should be able to reach his or her rope without the assistance of another firefighter or by having to remove the SCBA.

A firefighter trained in this technique should be able to escape from a structure by using a personal rope and a tool placed diagonally across the inside of the windowsill. The weight of the firefighter rappelling off the rope will pull the tool tight against the structure. Holding onto the rope behind the back allows for a crude but controlled descent. Depending upon the height from which the firefighter began the escape, entry into a lower floor may be necessary if the escape rope is not long enough to lower the firefighter to the ground. Another option is to hang from the rope and await the placement of ground or aerial ladders. Some agencies that teach this technique recommend using a "swiss seat" harness made from webbing and a carabiner to control the firefighter's descent, as opposed to using friction through one's arms and around the back. Using the "swiss seat" harness is safer, however, it is more time consuming to set up.

Wall Breach

An effective form of escape, but often not employed, is the wall breach. While operating in an untenable environment, the best way and possibly only way for escape may be to breach a wall and enter an adjoining room/apartment and hopefully less fierce environment. After breaching a wall and entering a new room, the opportunity for finding a passable means of egress may be possible. It may be necessary to breach multiple walls before reaching a safe haven or opportunity for exit. Of course this technique, like each one presented here, has its limitations, such as an impenetrable wall (thick masonry walls, for example).

When breaching a wall, it may be necessary to remove the SCBA from one's back while still maintaining a tight seal with the mask, and thus a breathable air supply. Electrical wires, plumbing, and wall construction must be considered as one breaches a wall. Also, furniture on the other side of a wall may obstruct a firefighter's path from one room to another. Moving laterally by two or three feet may present an easier route of travel should the first try result in obstructions. Practicing this method of escape is of paramount importance, particularly in developing a firefighter's confidence in the breathing apparatus and face piece, which is often referred to as mask confidence.

RIT Equipment

There can be many situations that result in firefighters transmitting a mayday. As such, RIT firefighters must be equipped with tools to combat different scenarios and effect rescue. Some crews transmit a mayday after interior firefighters become disoriented and/or run low on air. Other maydays are

transmitted after a partial collapse within the structure or after falling through a floor. Regardless of the events that led to the need for firefighters to be assisted, the RIT must be prepared and equipped to make a rescue. Different tools will be needed depending upon the type of rescue that must be made.

It is impossible to predict exactly which tools may be needed for a specific mayday; as such, the RIT should deploy a variety of tools that can be used for most anticipated scenarios. The following is the minimum equipment that should be made available to a RIT:

- extra SCBA complete with harness, regulator, and extra masks (consider that mutual aid companies may use different SCBA system);
- search rope;
- forcible entry hand tools such as axe, sledge, Halligan bar, and bolt-cutters;
- mechanical forcible entry tools such as chain saw, metal cutting saw, and masonry cutting saw;
- hoseline
- ladder complement;
- thermal imaging camera; and
- high intensity handlight.

There are pre-assembled systems and commercial systems that should be considered as well. Syracuse Fire Department District Chief Mark McLees details a concept entitled "The Rapid Intervention Rope Bag," in the April 2000 edition of *Firehouse Magazine*. This concept can be used for removing a firefighter from below grade or from an elevated floor to the outside and safely to the ground. The bag consists of 90 feet of half-inch rope, two large hooks, a pulley, and a carabiner. Familiarization and training with his techniques are recommended.

RIT equipment should be deployed on the fireground in a designated RIT staging area prior to receiving a mayday. If a mayday is transmitted and when the incident commander activates the team, the appropriate tools should be selected based on the circumstances behind the mayday. The situation may be obvious; however, if the team is activated because personnel are found to be missing after a Personnel Accountability Report, the circumstances may be less obvious. Rescuing a disoriented firefighter will require a different complement of tools than saving a firefighter who is entrapped after falling through a floor. Training under realistic, but controlled conditions, will help better prepare a RIT for the rescue.

RIT Water Supply

If local SOPs and the situation dictate the use of a hoseline, the RIT should use one from an engine that is not involved with supplying the primary attack lines. Interior firefighters may have transmitted a mayday in the first place because of a water problem. The water problem could be based on an interrupted water supply or on mechanical failure of the pumping engine. Either scenario potentially leaves interior firefighters combating a fire without water. A rapid intervention crew with a charged handline from the same pumping engine as the interior crews will not be effective in this scenario, since they would not be able to combat the fire either. There are some schools of thought that main-

taining a hoseline will slow down the RIT when they are searching for the downed firefighter(s). The ability to deploy quickly, carry a hoseline, and balance the needed equipment is certainly laborious and manpower intensive.

An engine dedicated solely to the RIT should be employed whenever practical on a fire. Furthermore, if a water supply separate from that of the primary pumping engine can be established, it too, should be utilized for the RIT. Utilizing this scenario, a RIT will more likely be able to ensure a water source independent of the other interior crews. Should interior crews transmit a mayday after they lose water at the nozzle, the RIT should be able to advance on the fire and protect the interior crews until egress is possible with its separate and independent pumping engine and water supply.

Although possible, it is unlikely that two pumping engines will simultaneously experience mechanical failure on a fire. The idea of a separate water supply for a RIT is to establish redundancy, as it becomes increasingly less likely that all systems will fail.

RIT Responsibilities Prior to Deployment

In addition to developing a staging area for RIT tools, the RIT must constantly monitor interior fire conditions from the outside of a structure. As much as possible, RIT members should track the location and progress of the fire. Based on the color and travel of smoke, firefighters can fairly accurately predict interior conditions and the location of the fire within the building. Upon arrival, the entire RIT could perform a complete walk-around and size up. In extended operations, the walk-around should be repeated frequently by at least one member of the team, as long as doing so does not diminish the response capability of the team.

It is also important to monitor the building for signs of collapse. If exterior walls begin to bulge outward or if the roof begins to sink inward, collapse may be imminent. These conditions should be transmitted to the incident commander, and the team should be prepared for imminent deployment. As a reminder, Rapid Intervention Teams should stage outside of a structure's collapse zone in a position where they can view two sides of the structure, if possible.

The RIT should also monitor crews in the building as much as possible by listening to radio transmissions, establishing visual contact, and listening to orders given by the incident commander to the interior crews. Although it is difficult to pinpoint a location within a building, Regional locations can greatly aid the RIT.

Transmitting a Mayday

There are instances when the self-rescue techniques previously discussed cannot remove one from peril. In these instances, firefighters should transmit mayday and request help from other firefighters.

While there are variations in the naming of firefighter rescue teams (e.g., Rapid Intervention Team, Rapid Intervention Crew, GO Team FAST Team, Standby Team), the term "mayday" is becoming universally accepted by fire departments as an indication that an interior firefighter or crew needs immediate assistance.

A mayday should be reserved for situations where continued presence in the environment would result in serious injury or death. When transmitting a mayday, the firefighter(s) should state their location within the structure as accurately as possible (using floor and quadrant of the building, if

possible), the nature of the problem (e.g., medical, partial collapse, depleted air supply, disorientation, trapped under falling debris), and how many firefighters need assistance.

Unfortunately, some departments operate in a structure fire without a radio. A radio is the interior firefighter's lifeline. Department should equip every firefighter operating on a fireground with a radio. Notwithstanding the expense, radios should be considered as basic a piece of personal protective equipment as a helmet.

A proper mayday may sound like this: "Engine 1 to command…MAYDAY, MAYDAY, MAYDAY…We are running low on air and cannot find our way out…I believe we are on the second floor, possibly quadrant D-David...I have a crew of two." Command should immediately acknowledge receipt of the mayday, reassure the crew, and begin the deployment of the RIT.

The above sample transmission is ideal as it includes situation, location, and crew size. Incident commanders should recognize that if an interior crew transmits a mayday, they would likely sound anxious and possibly panicked. Officers should be trained to maintain composure over the radio with even the most difficult transmissions. Calm communications set the tone on an incident for all firefighters, beginning with the on-scene report of the first arriving units. Maintaining a calm tone becomes even more critical when applied to emergency transmissions, such as a mayday. Frenetic transmissions can adversely affect on-scene and responding firefighters.

Communications Procedures After Mayday Transmission

When a firefighter transmits mayday over the radio, the incident commander must react swiftly by deploying the Rapid Intervention Team. Other units on the fireground, unless they have an emergency, should not complicate the rescue effort with radio traffic or suggestions. It is a good practice to keep the interior crews that are sounding a mayday, the RIT, and the incident commander or rescue branch officer on one channel, while switching all other units on the fireground to another tactical channel.

Utilizing separate radio channels will allow the RIT to speak directly with the trapped crew(s) to help determine their location without having to wait for radio airtime. The balance of the on-scene crews can continue to try and meet the demands of the incident. The incident commander must monitor both tactical channels and coordinate the rapid intervention team and the on scene crews. Multiple command officers and the creation of sectors or divisions will facilitate this process. A command officer in charge of an operations sector/division can coordinate the interior crews at the direction of the incident commander while monitoring the progress of the rescue effort.

Instilling both individual and unit discipline into firefighters will inevitably facilitate a mayday rescue effort. Upon receipt of a mayday, interior crews much maintain their composure, they should not converge on the area where the mayday was transmitted. Having all interior firefighters converge upon one location within the structure will complicate the rescue effort, particularly during a partial interior collapse. While all intentions are admittedly good, multiple crews recklessly converging upon the area may create or contribute to a collapse. The mass of people may prevent the RIT from accessing the downed firefighter. While the natural instinct of a firefighter (upon hearing that a firefighter is down) is to react, self-discipline will lead to a more successful rescue effort. Interior crews not assigned to RIT duties must aggressively defend the area encompassing the rescue effort.

Adequate training in basic firefighting, self-rescue techniques, and specialized firefighter rescue for all firefighters will instill confidence in on-scene firefighters, including those in need of rescue, those

attempting the rescue, and those standing by during the rescue effort. Furthermore, those standing by may have an assignment that makes the rescue possible, such as fire containment. Maintaining discipline and following the incident commander's orders are extremely important to a successful outcome.

Once a Rapid Intervention Team is deployed, the incident commander should immediately call for the next greater alarm and for another RIT, if one is not already in place. The incident commanders should also be prepared to send additional personnel (other than the replacement RIT) into the structure to help with removing the victim, particularly if there are multiple victims. As previously mentioned, the NFPA recommends four individuals for each Rapid Intervention Team; this should be considered a minimum, particularly if there is more than one victim. Many departments deploy rescue teams with fewer than four during mayday events. In the event of even one firefighter entrapment, one RIT may not be enough.

Search Techniques

Upon Locating the Firefighter

Once a downed firefighter is located within the structure, the RIT should turn off the victim's PASS device if it is sounding. This will help reduce the anxiety surrounding the rescue, and allow the RIT members to hear if other firefighters have activated their alarms. After turning off the victim's PASS, rescuers should rapidly assess the victim's breathing and circulatory functions, if possible. If a victim is not breathing or has no pulse, rapid removal is of paramount importance. The air supply and integrity of the SCBA should be checked simultaneously while assessing vital signs. A depleted air supply may contribute to respiratory arrest. Supplying the downed firefighter with a new supply of air may help rectify the problem. After establishing an air supply, the rescuers should eliminate any entanglements and remove the victim from the building (or at least from the IDLH to a safer area).

A guiding principle of firefighter rescue is that survival of a downed firefighter is dependent on two factors: time and air. That is why it is so critical that a RIT deploys, enters, and searches as quickly as possible. A downed firefighter may need air and the sooner it can be delivered, the greater the chances of survival.

With that in mind, there are a few tactical and strategic objectives that should be outlined and reinforced here. When a RIT has reached the victim, the team should provide the firefighter with a redundant air supply (primary and back up). This can be accomplished with a direct line from a cascade system outside the building or with multiple SCBA.

Once the victim has been reached and supplied with air, the RIT should defend the area around the victim with water protection. Creating a defendable space and supplying the victim with air can often buy the necessary time to prepare the victim for extrication from the building. The RIT will work its way outward from the defendable space to a safe place, either within the building or out of it.

In the event the downed firefighter is conscious, and accessing the firefighter will require a prolonged effort due to entanglements, collapse, holes in the floor, etc., it may be feasible to pass him or her a charged hoseline to protect him or herself. In the event a victim is unconscious, it may be necessary to direct a fog pattern directly onto the victim through a vent opening or a hole in a wall or the floor.

Lastly, aggressive ventilation along the route of travel and in the area where the victim is found is essential. Ventilating will release both heat and smoke, which will not only help calm the trapped firefighter but also provide a better working environment in the rescue area. In a small structure, horizontal ventilation in the vicinity of the rescue operation will make it easier for the incident commander to ascertain the exact location of the downed firefighter. Ladder placement, hoseline placement, and the use of enlarged openings can be adjusted once the exact location of the victim is known.

Removal of a Victim

The critical objective for the RIT is efficient and effective victim removal. Sometimes ropes and a crude mechanical advantage system will expedite removal. In other instances, taking the time to set up these systems may take longer than using brute strength to carry or drag a firefighter to safety. In either scenario, it is a good idea to feed the victims SCBA harness between the victim's legs (crotch area) to prevent the SCBA from coming up over the victim's head. This is particularly important if rescuers use the SCBA harness to drag the victim or lower the victim from an elevated floor to ground level with a pulley/mechanical advantage system.

Each rescue will present new scenarios for which rescuers must be prepared. Some victim removal scenarios for which departments must prepare their firefighter rescuers include victim entangled in debris; moving a victim up or down stairs; or moving a victim up through a collapsed floor or out of an elevated window. The scenarios are endless but should be practiced under realistic conditions (limited to zero visibility, typical staffing levels that will be on a fireground for a given department, and heated environments, if possible to simulate safely).

RIT in High-Rise Structures

Staging a RIT at the ground level of a highrise building while firefighting teams are operating on the eighth floor effectively renders the team useless should the interior teams need help. The travel distance the RIT would have to negotiate would seriously diminish their effectiveness. During high-rise fires, the rapid intervention team should be staged *one floor below the fire floor*. A RIT operating in a highrise, therefore, should transport their equipment to this floor and establish their staging and standby area as they do at a ground-level incident. The RIT should size up this staging floor to obtain pertinent information such as floor layout, location of standpipe risers and hose cabinets, stairwell exits, etc. This location should not only provide the RIT with a safe area from which to prepare their deployment strategy but also leave them in a position to act quickly in the event of a mayday.

Multiple RITS

In large structures, particularly commercial structures such as a warehouse or highrise, the areas in which firefighters are operating can be tremendously large. Should only one RIT team be available on a large structure fire, valuable time will be lost waiting for the RIT members to walk around the fireground prior to initiating the search and rescue process. To prevent delays in RIT deployment, the incident commander should establish multiple teams. They can be assigned by sector or division as necessary. Each team designated as and expected to act as a Rapid Intervention Team should be properly staffed and equipped.

Command of RIT Operations

Use of the incident command system on all incidents allows for smoother command in the event a RIT is deployed. The incident commander or the operations section leader will not (and should not) be able to effectively manage a total incident as well as a firefighter rescue. The operations must be further broken down into smaller and more manageable branches and division/groups. A depiction incident command may look like the following example, with the relevant positions defined and explained.

The schematic provided is one example of how the incident command system could be used on an incident. The boxes drawn with dotted lines are components of incident command that are typically only formally established on major, multiple-alarm incidents.

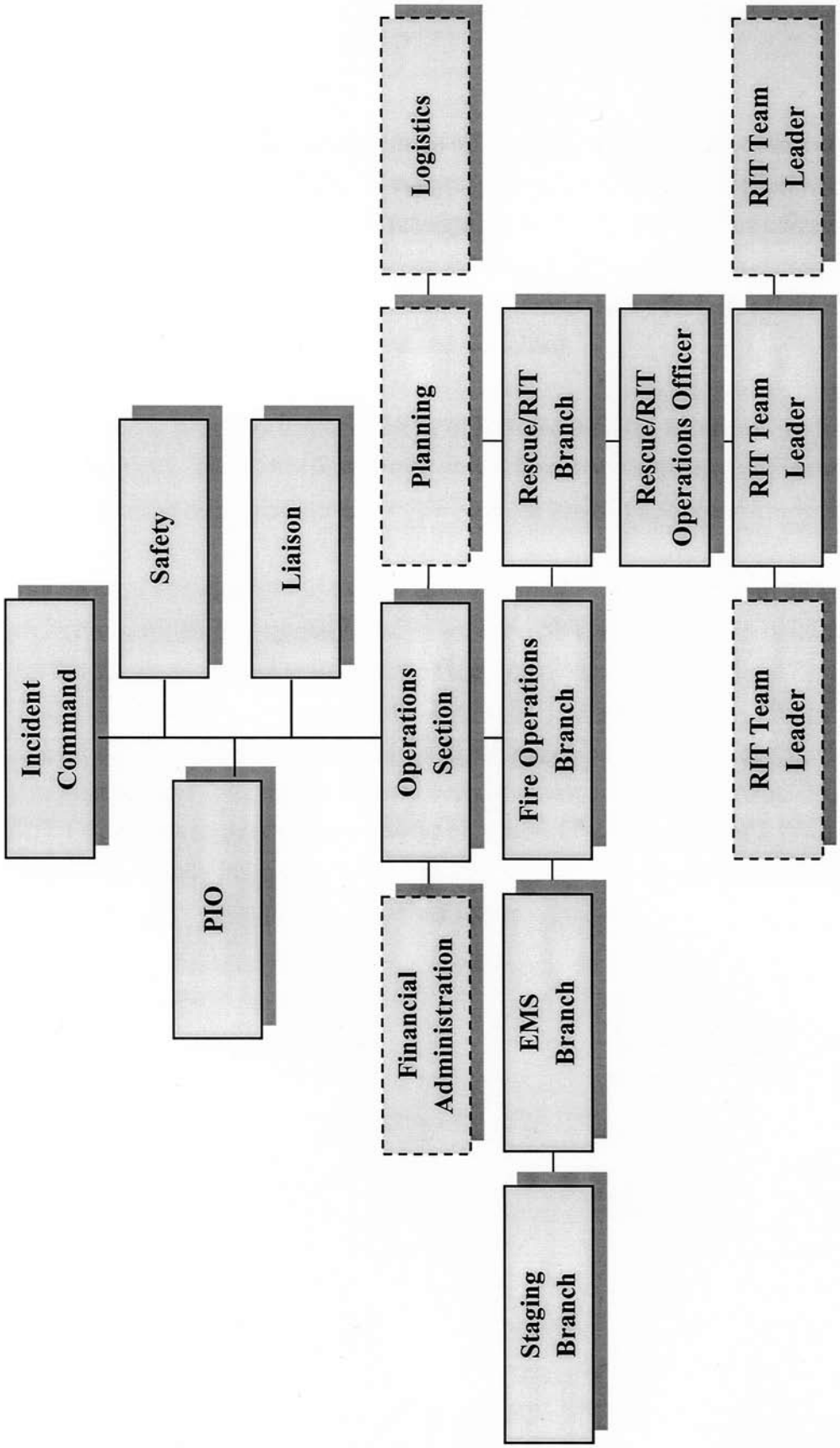
The incident commander has overall command and authority of the incident. The Operation Section, which is frequently lead by the incident commander on smaller incidents, formulates the strategies needed to mitigate the incident. Reporting directly to the Operations Section leader (or incident commander) is the Rescue/RIT Branch Officer. This person is responsible for the firefighter rescue event(s) and the Rapid Intervention Teams. He or she should also monitor how long the teams have been operating after deployment. The Rescue/RIT Operations Officer should serve as an "interior" commander of RIT operations. This position is especially important if multiple RITS are operating on the rescue effort as it allows individual RIT officers to supervise their teams.

Future Technologies

Technologies in the fire service, as in other industries, are constantly being improved and upgraded. Examples are seen with new apparatus, turnout gear, and thermal imagers. This is to name a few of many fields that are developing technology enhancements for the fire service.

One area receiving considerable attention, but which has not yet been achieved, is the technology to track a firefighter's location and movement inside a structure from a remote location using a computer or monitor. A few private companies are reporting progress on developing this capability, but no product has come to the market for field evaluation at the time of this report. Once developed, such technology would allow the incident commander (or designee) to follow a firefighter's movement on a screen that includes the layout/floor plan of the building; computer-aided design should help enable this with newer structures. The technology should also include the ability to determine altitude of the firefighter (that is, the floor of the building on which the firefighter is located).

EXAMPLE OF JCS RE: RIT



Chapter V. Profiling RITS Around the Nation

The U.S. Fire Administration tapped the experience of fire departments throughout the country to obtain a picture of how firefighter rescue teams currently are organized, equipped, trained, and deployed. Working from a comprehensive list of fire departments by State, over 200 departments of different sizes and types located in every State were randomly selected and invited to respond to questions about two-in/two-out, special training, and SOPs for firefighter rescue. Eighty-three departments participated, which was a good enough sample to obtain broad insights and establish a general picture.

Characteristics of Responding Departments

The 83 departments that responded spanned the country but did not necessarily constitute a statistically representative sample of the fire service nationwide. Unfortunately, only one of the respondents was from an all-volunteer department (though many more were contacted and asked to provide information), so that type of department is virtually unrepresented in the data. Eighteen of the responding departments were combination (career and volunteer) departments. The bulk of respondents were career departments, 64 in all (see Figure 5). Virginia, California, Florida, Texas, and Maryland registered the largest numbers of respondents. There were gaps in representation from the Northern Plains and from portions of the South (see Figure 6). Regardless, the information gathered does not offer a view of how the fire service has been preparing for the possibility of mayday calls by firefighters who face critical situations and need to be rescued from life-threatening conditions.

Figure 5. Number of Responding Departments

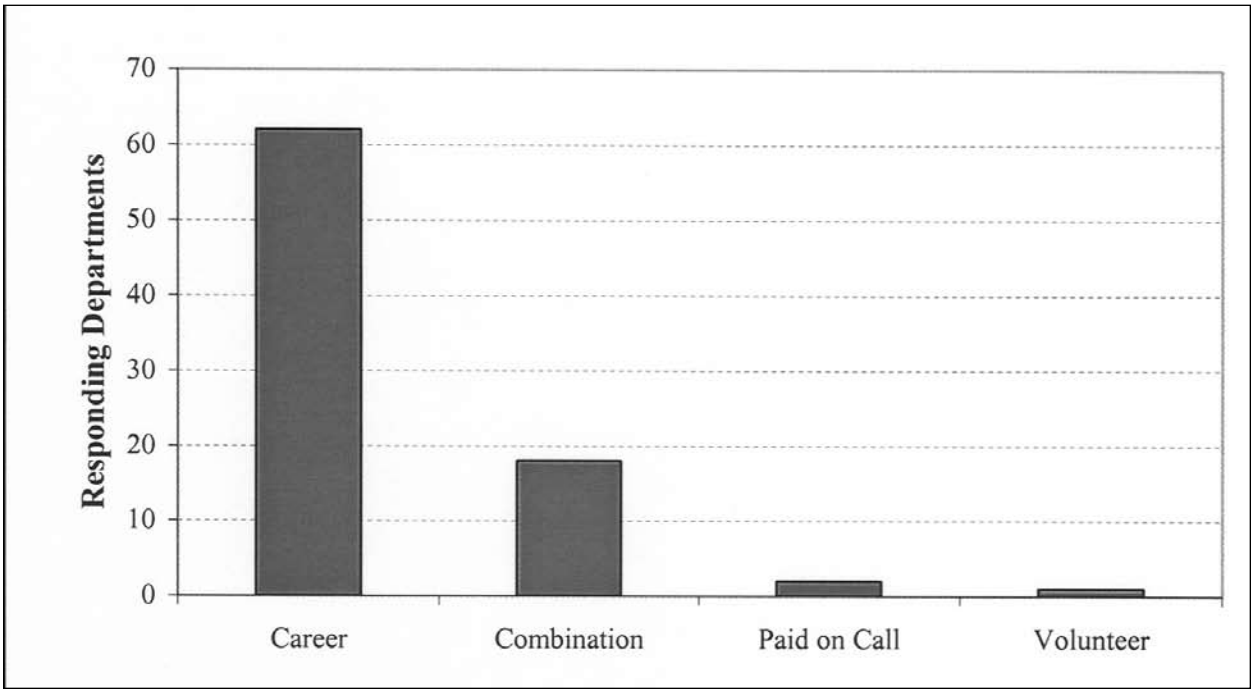
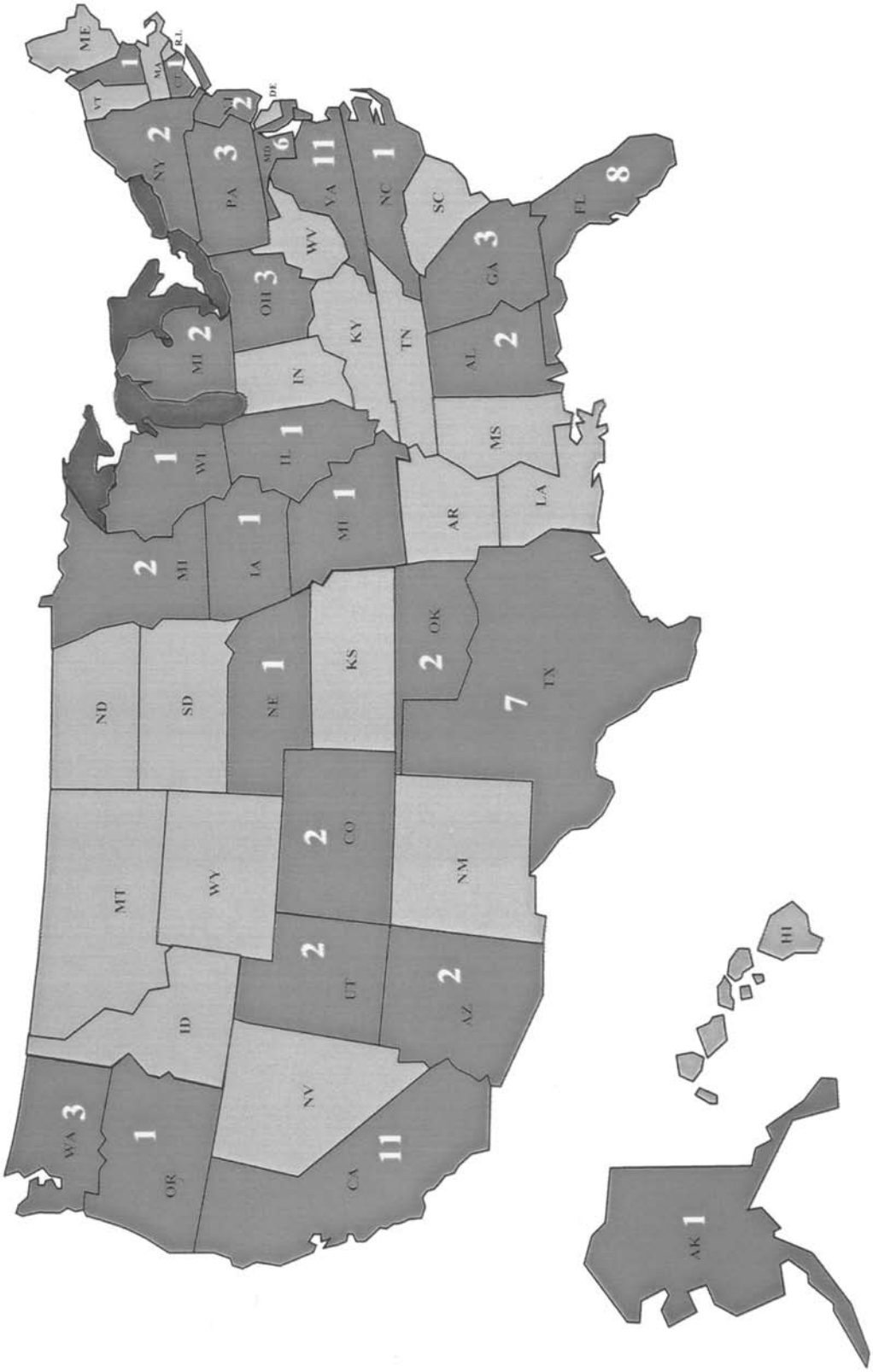


Figure 6. Number of Departments by State that Responded to RIT Research



The range in the size of the protected population went from a low of 6,500 (Turnstall Fire Department in Danville, Virginia) to 3,820,000 (Los Angeles Fire Department in Los Angeles, California). Seventy-seven of the 83 departments reported on the average number of structure fires per year, an important data point relative to RIT. The overall average of structure fires among the 77 respondents was 896 per year.

Two-In/Two-Out and Firefighter Rescue

About 60 percent of the responding departments were in OSHA compliant States. A large majority of the fire departments (93 percent) followed the two-in/two-out rule without a confirmed life hazard on working structure fires. Only six of the departments did not adhere to this rule in the absolute, and there was no uniformity as to the reasons why. One major East Coast city establishes a dedicated intervention company based on the size of the emergency. A big city in the South said they "set up a RIT anytime personnel enter a hazard zone, but the set-up is not immediate before attacking the fire." Two county fire departments indicated that they were planning to initiate a two-in/two-out system, but were still working on formalizing the structure and procedures.

Once entrapment or a known life hazard is confirmed, 61 of the departments said they maintain "two-out" procedures. As far as having had to deploy the "two-out" team for a perceived or actual firefighter rescue, 81 percent said they have never needed to carry out this special rescue. Six of the departments had deployed the two-out team on one occasion; four departments conducted rescues twice, and two departments mobilized the team three times. One of the departments deployed a two-out team six times while another held the record at 12 separate deployments in one year.

Staffing and Equipping Firefighter Rescue Teams

In order to determine the trends in the composition of the firefighter rescue teams, USFA's researchers asked fire departments to describe how they staff their teams and to describe the personnel who are frequently involved in this type of operation. Generally, they have two to four crew members. The responses can be organized into six main categories:

- Non-specific combination of officers and firefighters[8].
- One officer and two or more firefighters;
- One officer and one firefighter;
- Two or more officers and at least one firefighter;
- Two firefighters; and
- Other combination of personnel.

In 42 percent of the responding departments, the firefighter rescue team is comprised of non-specific combinations of firefighters and officers, with no experience criteria. By far, this was the most common answer. As one Mid Western fire department noted, "we use all personnel: rookie, captain, whoever is available." "(We use) any firefighter/officer combination," stated another department. Figure 7 depicts the break out of responses on how teams are staffed.

[8] For this report, "officers" includes fire chief, assistant chief, deputy chief, battalion chief, captain, and lieutenant. "Firefighters" includes pump operators, technicians, drivers, engineers, and class 1-4 firefighters.

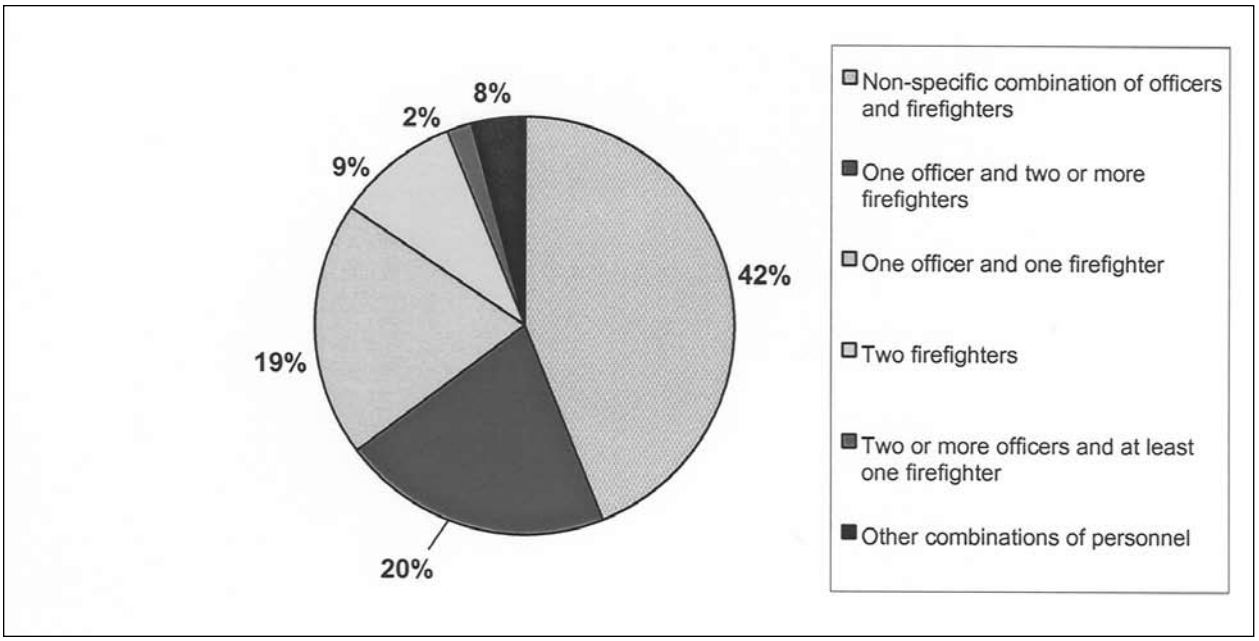


Figure 7. Composition of Firefighter RITS

Mirroring the range of rescue team staffing-from information to formal requirements-fire departments also provide varying degrees of training related to rescuing a downed firefighter. Forty-five percent of the responding departments offer special training that they characterized as the following:

1. RIC/RIT training, orientation and expertise;
2. Two-in/Two-Out training;
3. Rescue training policy;
4. Search and rescue;
5. Forcible entry; and
6. Save your own.

The training noted above occurs both in formal, classroom settings as well as through "in-house" and "in-service" instruction. About 35 percent of the departments do not provide any specialized training, but simply note that members must have Firefighter I or Firefighter II certification.

Firefighter rescuer equipment often includes radios and forcible entry/rescue hand tools. About 60 percent of the fire departments which answered, supply hoselines to the teams. Twenty-eight percent reported that their team members have flashlights or hand lights; an even smaller percentage (24 percent) operates with search ropes. Only eight departments reported that their team utilizes a thermal imaging camera. Some of the departments have a thermal imager, but do not specifically designate it for a Rapid Intervention Team (see Figure 8 and 9). Five departments said they outfit their team with extra rescue air packs for the downed firefighter.

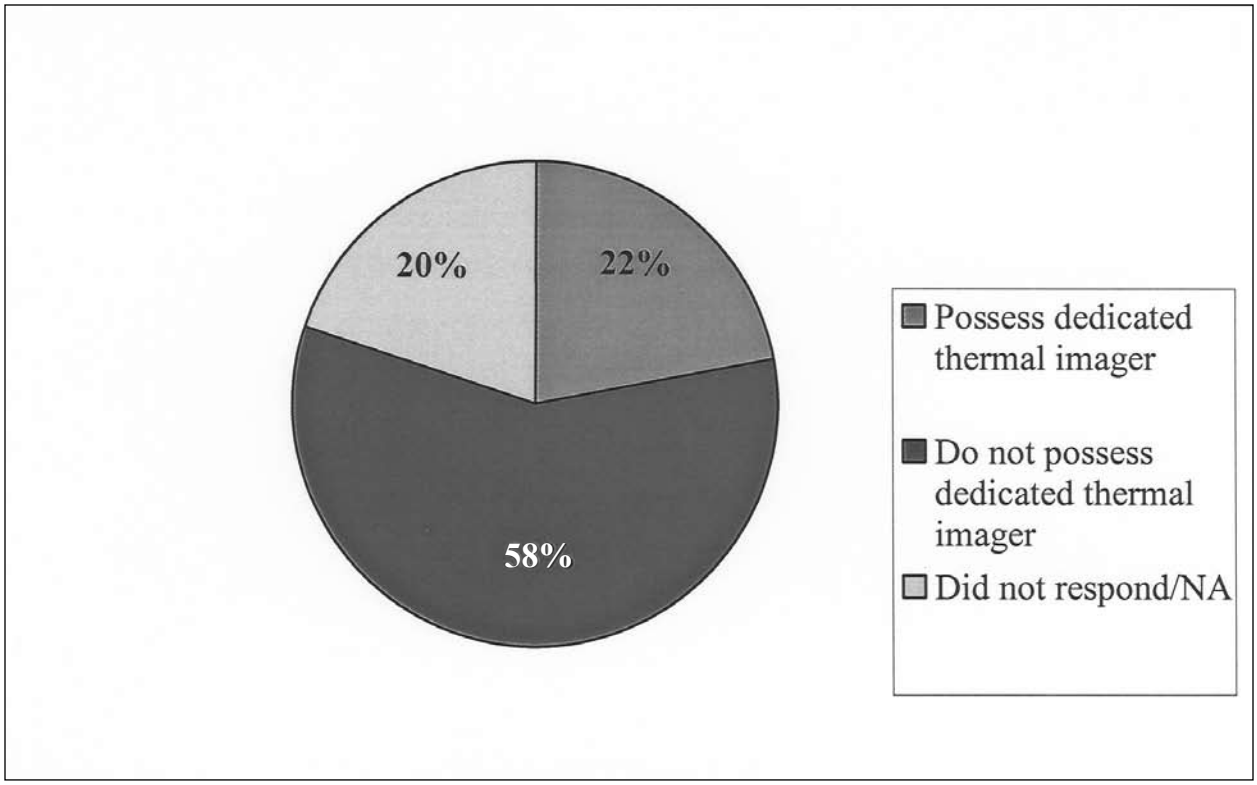


Figure 8. Thermal Imaging Cameras

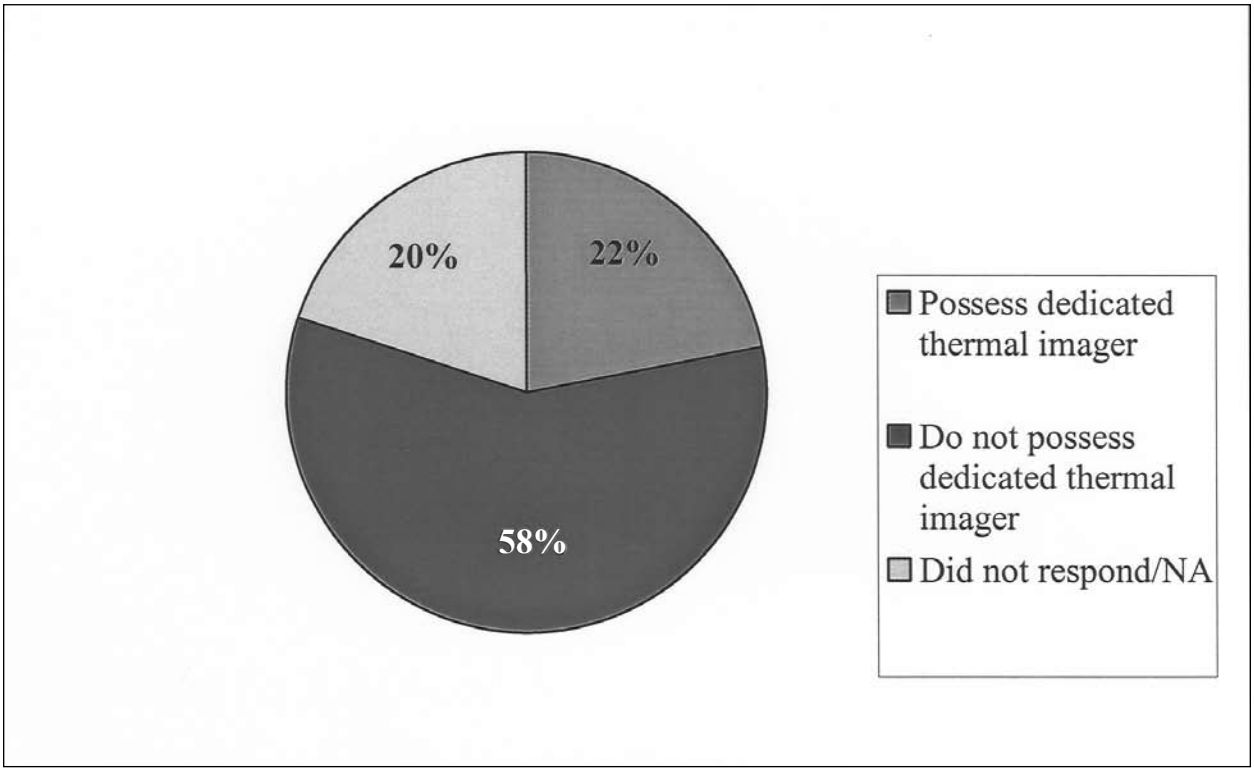


Figure 9. Thermal Imagers Dedicated for Rapid Intervention Team Use

Deployment: Policies and Utilization

Some fire departments have developed operation policies for when and how firefighter rescue is to be carried out. Others are in the process of preparing written procedures. Another group of fire departments leave it up to the incident commander. Typically, when fire personnel need to be evacuated from a fire building, emergency signals are sounded and roll call is taken. A rescue team is deployed if a mayday is transmitted or personnel are found to be missing. Some departments have the companies switch to another tactical channel, but others remain on the fireground channel. One of the departments in the survey follows a 20-minute accountability mark system. If a member is unaccounted for at any of these marks, or if there is communication of trouble, rescue operations begin. Some of the written procedures call for a suspension of firefighting during rescue to the extent possible. One of the departments in the Northwest deploys a RIT whenever the company is unable to make radio contact.

Many departments explained the circumstances that have necessitated a firefighter rescue. Some of the situations included partial building collapse during firefighting operations, collapsed stairs with a firefighter falling into the sub-basement, and rekindling on the first floor that trapped a team on the second floor of a structure. Three firefighters sustained minor injuries when a roof collapsed during a shopping center fire. The members were blocked from the exit and rescued by fellow firefighters. In other situations, an officer was lost in a highrise fire and subsequently rescued, and in another incident a firefighter who was pinned under a collapsed roof was successfully extricated and moved to safety.

Closing Remarks

For fire departments that do not operate with a rapid intervention team, this report hopefully will inspire and provide guidance for them to develop a team. There is a significant amount of training required of all members in a fire department and this is particularly the case with firefighter rescue. Prior to learning the essence of firefighter rescue, members should be trained in the basics of firefighting and self-rescue. As so much of today's training is focused on new services provided to our communities (e.g. hazardous materials incident response, weapons of mass destruction, etc.), often little time is dedicated to reinforcing basic firefighting principles. Nevertheless, basic skills should be continually reviewed and practiced.

Upon receipt of a mayday, rescue crews will have to react to a deteriorating interior condition and will have to do so knowing that a fellow firefighter's life may depend on their actions. Realistic training will help mentally prepare an individual to react in these instances. Incident commanders must also be mentally prepared to take an even greater responsibility and not allow fellow firefighters to enter a structure that will likely result in more deaths.

On December 3, 1999, in Worcester, Massachusetts, the incident commander finally had to say "Enough is enough," suggesting that if more firefighters continued to enter the burning warehouse that claimed the lives of six Worcester Fire Department firefighters, more would be lost. As difficult as this decision must have been, it most likely saved the lives of other Worcester firefighters.

Incident commanders should operate with the rule, "Do not risk a life for what is already lost." Good training and self discipline will help prevent firefighters from needing to call a mayday, will better prepare them if they do face a mayday situation, and will prevent additional firefighters from becoming victims.