VEHICLE EXTRICATION

A PRACTICAL GUIDE

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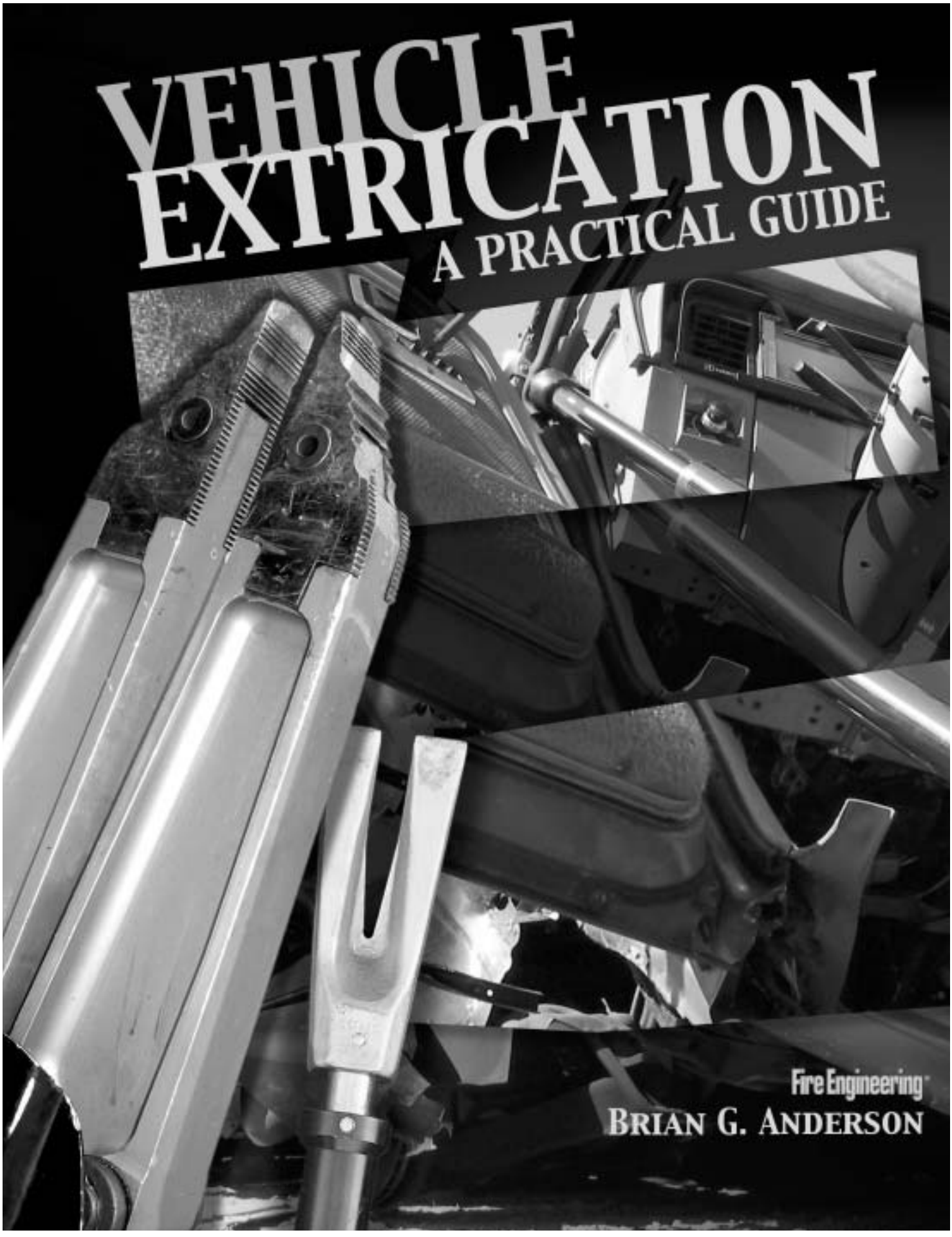

Fire Engineering®

BRIAN G. ANDERSON

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Acronyms

ALS – advanced life support

BLS – basic life support

BPM – blows per minute

cfm – cubic feet per minute

CGA – Compressed Gas Association

EMT – emergency medical technician

ETA – estimated time of arrival

HAZMAT – hazardous materials

kPa – kilopascals

LZ – landing zone

ma – mechanical assistance

MCI – mass casualty incident

NFPA – National Fire Protection Association

PPE – personal protective equipment

PTO – power take off

psi – pounds per square inch

SCBA – self-contained breathing apparatus

SI – international system

SIPS – side-impact protection system

SRS – supplemental restraint system

TPI – teeth per inch

·1·

Getting Organized

Sharp Firefighters, Powerful Tools, and Strong Leadership

Engine 30, respond with Engine 32 to I–95 and Northwest 135th Street for a report of traffic accident with persons trapped…standby…Engine 30, FHP now confirms persons trapped and the vehicle is on fire…FHP requesting an ETA.

This type of dispatch occurs on a regular basis across the United States in small towns, in the suburbs, and in big cities. Extricating trapped victims is the most common type of rescue performed by firefighters. It is also a time when the skill of the firefighters has a significant impact on the survival of the victims.

Many of the extrications performed by firefighters are simple, intuitive operations, requiring nothing more than popping the door to release the occupant. Others, though, can be more challenging, and occasionally a crash will test a firefighter's limits. These are the crashes that are so bad and the entrapment so complicated that even experienced firefighters have to stop and take a few seconds to try to understand what they're seeing. These crashes evoke comments like, "Does this car have two doors or four?" "How many victims can you see from your side of the car?" "Where's the front half of the car?" and "This is really bad." These serious crashes require the highest level of skill from the firefighters, great power from the tools, and strong, confident leadership from the officers.

When the company possesses these traits, along with solid teamwork and just a little good luck, you've got a crew that can make even the most difficult extrications look easy.

Bad crashes are challenging because several procedures are usually needed to free the victims. Firefighters must use combinations and variations of procedures to remove the odd configurations of metal that wrap around the unfortunate occupants. However, before a crew can modify or combine procedures, they must have a broad knowledge base and skill level of the standard procedures. This is when training comes into play. Just like hose and ladder work, practice makes perfect—or at least pretty close. Crews can attain maximum effectiveness at the crash scene through preparation: studying procedures, training with tools, and practicing crash scene scenarios.

However, things don't always work as they do on the drill ground—even when the crew is well trained. In the real world, hose lines burst, power plants don't start, and sometimes tools just lack the power they had when they were new—or they fail. For reasons like these, it's important to have multiple solutions available to the crew. Understanding that there may be multiple solutions for a single problem can help a crew overcome any little snag that occurs during an operation. It is important that crews develop the knowledge and skill needed to adapt to the challenges and surprises of crash scenes.

Gaining Knowledge and Skill

Some procedures are so simple that common sense alone can guide even the most inexperienced firefighter to a successful conclusion. However, as the procedures become more complex, intuition may fail us due to the number of variables. *How can the metal be cut away from the victim's feet when the feet can't be seen? Why are the vehicle safety structures that are supposed to help protect the occupant hurting the occupant when the door is forced open? When metal starts to tear, is it a bad thing—or a good thing?*

There are basically two approaches for dealing with the learning curve of vehicle extrication: reinventing crash scene procedures, or learning from experienced firefighters. Most everyone would agree that learning from those who came before us is preferable. This provides more time to create new procedures and to fine-tune old ones.

This book attempts to illustrate multiple solutions to each type of problem that may be encountered by crews in the street. There is a solution for just about everybody—regardless of the type of tools they carry on their rigs: hand tools, pneumatics, hydraulics, or electric tools. Once a company learns the procedures and is ready to respond, they should focus on organizing themselves in a way that they can operate effectively while applying their skills. This involves understanding everyone's role, why they have those roles, and how they contribute to the team effort needed for top-notch operations.

Role and Responsibility of the Company Officer

Understanding, assigning, and carrying out the roles and responsibilities are critical steps for effectively managing a crash scene—especially those involving the extrication of victims. The early decisions and actions of the company officer and firefighters have a direct impact on the effectiveness of the rescue operation and victim survival. Strong leadership, coupled with sound decision-making and teamwork can result in a scene that proceeds in a coordinated, calm manner. Job responsibilities are assigned based on the structure of the organization, personnel, equipment, and experience. While the number of personnel and their titles vary, the needs, decision-making process, and actions remain the same. At small incidents, the company officer may be directing a crew and managing the overall scene. At large, complicated, or exceptionally long extrications, the company officer should transfer command of the incident to a higher ranking officer, allowing the company officer to concentrate on the extrication without the additional responsibilities of managing the entire scene.

Making tough decisions

In life, for every action there is an equal and opposite reaction. This is not just a difficult physics theory but a simple fact of life that can be observed on a daily basis. Stay in bed all day, and you may avoid being hit by a bus. By the same token, staying in bed all day may lead to bedsores, heart disease, and early death. Life is full of decisions, and life on the crash scene is no different.

Every action on the crash scene impacts someone or something connected to the crash. The multiple factors at a crash scene (including inadequate information) can mentally overload personnel, causing decision-making to be difficult. This is the nature of the fire service. In these situations, officers and firefighters alike have to make decisions based on available information, experience, and training. Decision-making under these circumstances can be stressful, especially for individuals who are newly promoted or lack experience, and this is normal. Nonetheless, at crash scenes, decisions must be made—no matter how difficult. In the words of Captain Joe Price (ret.), "If this was easy, everybody would be doing it."

Size-up

The company officer is responsible for developing a plan to bring incidents to a successful conclusion. As with all incidents, the plan starts with the initial dispatch information. This is the officer's first chance to make decisions that impact the management of the crash scene. When dispatched to an incident, the smart company officer does more than answer the radio, don bunker gear, and climb on the apparatus. The officer should also listen carefully to the dispatch information and determine if the appropriate resources have been dispatched to the incident. Initial dispatch assignments are simply that—initial. After the dispatch, the company officer may find it necessary to make changes in the initial assignment. Company officers who rely solely on dispatchers to make all the decisions about all assignments will eventually come up

short on a response. Dispatchers should not be held responsible for all of the company officer's anticipated needs, especially when the dispatch center is busy. In most cases, it is best to consider the dispatcher's actions as part of the overall team effort required for successful operations.

The following are examples of situations that may require upgrading or modifying an initial dispatch assignment:

- Limited access highway (freeways, interstates, etc.) crashes
  - Additional unit to help block scene the from on-coming traffic
  - Faster response by other units based on access or direction of travel
  - Additional units for tank water when a vehicle fire is reported
- Victim information received while en route to the scene
  - Confirmed multiple victims
  - Confirmed critically injured victims
  - Confirmed entrapment
  - Ejected victims
- Terrain and geography
  - Submerged vehicles
  - Suspended off bridges, overpasses
  - Off-road in mountainous areas
  - Distant locations, which result in extended response times

Size-up upon arrival

After arriving at the crash scene and working with other company members, the officer should perform an initial size-up to determine if adequate resources have been assigned to the incident. The adequacy of the resources is based on the following:

- Scene hazards
- Number of victims
- Severity of the victims' injuries
- Number of entrapments
- Complexity of entrapment

The process of gathering information about the scene and victims is handled best if the officer assigns portions of the scene to the crew members on the unit. One of the most widely accepted methods of scene size-up involves dividing the scene into two areas: the inner circle and the outer circle. By dividing the scene into two areas, the company officer can make size-up assignments to as few as two crew members and still cover the area in a brief amount of time.

The inner circle can be difficult to describe, and the description may be vague because of the differences in crash scenes. The inner circle can generally be thought of as the area under and around the vehicle, within a radius of about 10 ft, or that portion of the scene that would come into the field of vision of a crew member who is within 5 ft of the vehicle. The inner circle can also be described as the area that can only be evaluated by the crew member who is standing next to the vehicle.

The outer circle is considered as all that *isn't* the inner circle. The outer circle extends from the edge of the inner circle to the outer edge of the

crash scene. Determining the outer edge of the crash scene can be difficult at times, especially when the vehicles were traveling at a high rate of speed, when the crash occurred in poor weather, or at night when visibility is limited. When establishing the boundary of the outer circle, the crew is making a judgment call that all vehicles, victims, and hazards will be found within the inner and outer circles.

Presence of hazards

Hazard recognition can be difficult, especially at night, during bad weather, and at large incidents. The company officer must focus on getting the big picture—a solid understanding of what is going on at the scene. As the officer pulls up to the scene, the next phase of hazard recognition begins, picking up where the original dispatch information ended. The officer should address the hazards created by the following:

- Traffic.
- Damaged utility service.
- Vehicles involved in the crash.

A plan should be developed and implemented to mitigate or stabilize the existing hazards. The process of hazard mitigation and stabilization is covered in chapter 3.

Determining adequacy of resources

Medical units. One of the difficult decisions the first arriving officer must make on the scene is the number of medical units required for treatment and transportation of victims. Following are factors that impact this decision.

- Are the responding medical units advanced life support (ALS) or basic life support (BLS)?
- How many personnel are on the medical units?
- What is the medic crew's degree of involvement in performing the extrication?
- Is the area served by a trauma center and/or trauma helicopter?
- What is the severity of injuries?
- Most importantly, how many victims are there?

As the number of victims and severity of injuries increase, so does the likelihood of discovering too late that inadequate resources have been assigned to the incident. Depending on the type and number of resources available, the officer should decide whether the incident should be handled as a mass casualty incident (MCI) or as an ordinary crash incident.

MCI is the term used to identify incidents when the sheer number of victims overwhelms the initial units, requiring the assignment of additional units and the application of procedures that promote the rapid assessment, treatment, and transportation of the injured. If only a few victims are injured, and the incident is to be handled in a routine manner, the officer must determine the number of units required to treat and transport the victims.

One easy way to handle the math in this type of situation is to consider how many personnel and units would normally be required to

adequately and properly handle one critically injured crash victim. For example, if it would normally take one medical unit per critical victim, and there are three critical victims on the scene, three medical units are needed. If this procedure for determining the number of units needed seems high, consider that with inadequate medical resources on the scene, somebody is not going to be treated in a timely fashion. If the situation requires the dispatch of mutual aid, so be it. On scenes with multiple victims, we can hope to get the victims off the scene quickly, but the reality is that, without adequate resources, treatment gets bogged down along with transportation to the receiving hospital. This applies to both MCIs and ordinary crash scenes.

In many cases, crew members assigned to a medic unit are committed to the assessment and treatment of the trapped victim from both inside and outside the vehicle. These crew members should wear bunker gear, which provides good personal protection. If additional resources are available, a replacement medic unit should be used for transportation from the scene, relieving the original crew (whose bunker gear is cumbersome to work and drive in) from that responsibility.

Hospital or trauma center assistance. Occasionally even the best-trained and most experienced extrication crews are confronted with an entrapment for which there is no good, timely solution. These extrication scenes may drag on for hours, grinding down the personnel charged with the task of disentangling the victims. In some cases, the occupant may not have any significant injury and may remain medically stable throughout the incident. On the other hand, there are situations when the crash victim is critically injured and may require advanced treatment from hospital or trauma center personnel during the extrication process. Victims with the following needs may benefit from the involvement of hospital or trauma center personnel:

- On-scene administration of blood
- Amputation due to entrapment
- Completion of near-amputations
- Procedures to relieve tension pneumothorax (collapsed lung)

To successfully utilize hospital or trauma center personnel on a crash scene, policies, procedures, and agreements should be formalized before an incident occurs that requires these types of resources. Once the policies are in place, all personnel who are affected by the policy should know their role and responsibilities at a crash scene (see Fig. 1–1).

Suppression units. The role of suppression units at crash scenes varies widely across the country. In some areas, engine companies are responsible for extrication; in other areas, truck companies handle the task. It is becoming common for suppression units to be staffed with personnel that are not only firefighters, but emergency medical technicians (EMTs) or paramedics as well. Suppression units, whatever their form, generally have several responsibilities on a crash scene, which include the following:

- Scene safety and management
- Fire suppression
- Extrication of trapped victims
- Assistance in medical treatment
- Helicopter landing zone (LZ) set-up

MIAMI DADE FIRE RESCUE
MEDICAL OPERATIONS MANUAL

FIELD SURGICAL KIT / AMPUTATION

PROTOCOL 31

A. Introduction

In the rare event of a patient entrapment in which all resources have failed to successfully extricate the patient, or in which the patient's life is in immediate danger with prolonged extrication, field amputation of the trapped extremity should be considered. The Field Surgical Kit also carries equipment necessary to perform surgical airways, insertion of a chest tube, and placement of central venous access.

B. Procedure for Requesting

General Care

1. Prior to instituting a request, ensure that a TRT unit has been dispatched and is en route.
2. Either the Rescue OIC or Incident Commander can request that the Fire Alarm Office notify the Medical Director or Deputy Medical Director of the need for a possible field amputation or other advanced procedure.
3. The Fire Alarm Office will make contact with a Medical Director as quickly as possible. Only the Medical Director, Deputy Medical Director, or their appointed representative, is authorized to conduct this procedure.

   NOTE: In the event the Medical Director or the Deputy Medical Director is not available for transport to the scene, either may request the assistance of the Ryder Trauma Center Attending Trauma Surgeon or their designee.

4. The identified physician will be transported to the scene in the most expeditious manner after consultation with the Incident Commander.
5. The Incident Commander or designated physician must confirm that at least one Field Surgical Kit is available at the scene. Sources for a Field Surgical Kit include:

   a) One kit is located at each Air Rescue station
   b) One kit is located at the JMH/Ryder Trauma Center
   c) One kit is carried by the Technical Rescue Bureau OIC

6. Once on scene, the physician will assess the situation at hand and make the decision regarding the requirement for amputation. The physician on scene will have the final say as to the appropriateness of a field amputation.

02/03 PROTOCOL 31.1

Fig. 1-1

Specialty units. During the crash scene size-up, the company officer should determine if the units assigned to the incident can handle the crash and the extrication. This decision should be based on the ability of the personnel, the complexity of the extrication, and on the equipment needed to perform the required procedures. As soon as it becomes apparent that the on-scene resources can't perform the tasks required, specialty units should be requested. Specialty units may be in the form of squads, technical rescue units, or heavy rescues—based on regional needs and tradition. These units should be equipped with the tools and personnel needed to perform specialized or complicated extrications.

Wreckers. When wreckers are needed to assist with rescue operations, they should be requested early in the incident. Routine towing requests are typically handled by law enforcement personnel and may be handled differently than requests for assistance to perform a rescue. When requesting a wrecker, the officer should clearly indicate that the request is needed for a rescue, and that it is not a routine towing request. By making the request clear to the dispatcher, there is less chance of the request being handled as a routine towing request (see Fig. 1–2).

Developing the tactical plan and assigning tasks

When developing a tactical plan and assigning tasks, a company officer can be overwhelmed by the multiple problems that need to be resolved before the situation can be brought to a successful conclusion. Tactical priorities must be assigned, but the question is *where to begin*? While every scene is different, the following approaches may be helpful when selecting a course of action:

1. Actions that stop the incident from getting worse—if a vehicle has struck a tree and a small fire has started in the engine compartment, the fire usually needs to be extinguished before any victim treatment begins. The fire is a factor that can cause the incident to deteriorate if left unchecked.
2. Actions that will do the most good for the most victims—if all the victims are in a similar medical condition, actions that free the greatest number of victims are most appropriate.
3. Actions to extricate the most severely injured first—if given a choice between extricating an unconscious victim and a conscious victim with a cut arm, extricate the unconscious victim first.

These guides are helpful for basic decision-making, but local capabilities and resources ultimately dictate the type of approach, especially at MCIs or disasters.

When there are overlapping needs, Chief Daryl Newport of Palm Beach County (FL) Fire Rescue, suggests that usually 90% of the problems on a crash scene can be resolved by one or two actions. Consider the example of a car that has rolled over several times and has come to rest on its side with five teenagers trapped in the vehicle. The roof side of the vehicle is exposed to the crew, and the frame side of the vehicle is against a tree. As the victims move around inside the vehicle, the vehicle rocks, nearly rolling over onto the flattened roof. Assessment is difficult because the flattened roof makes it almost impossible to see

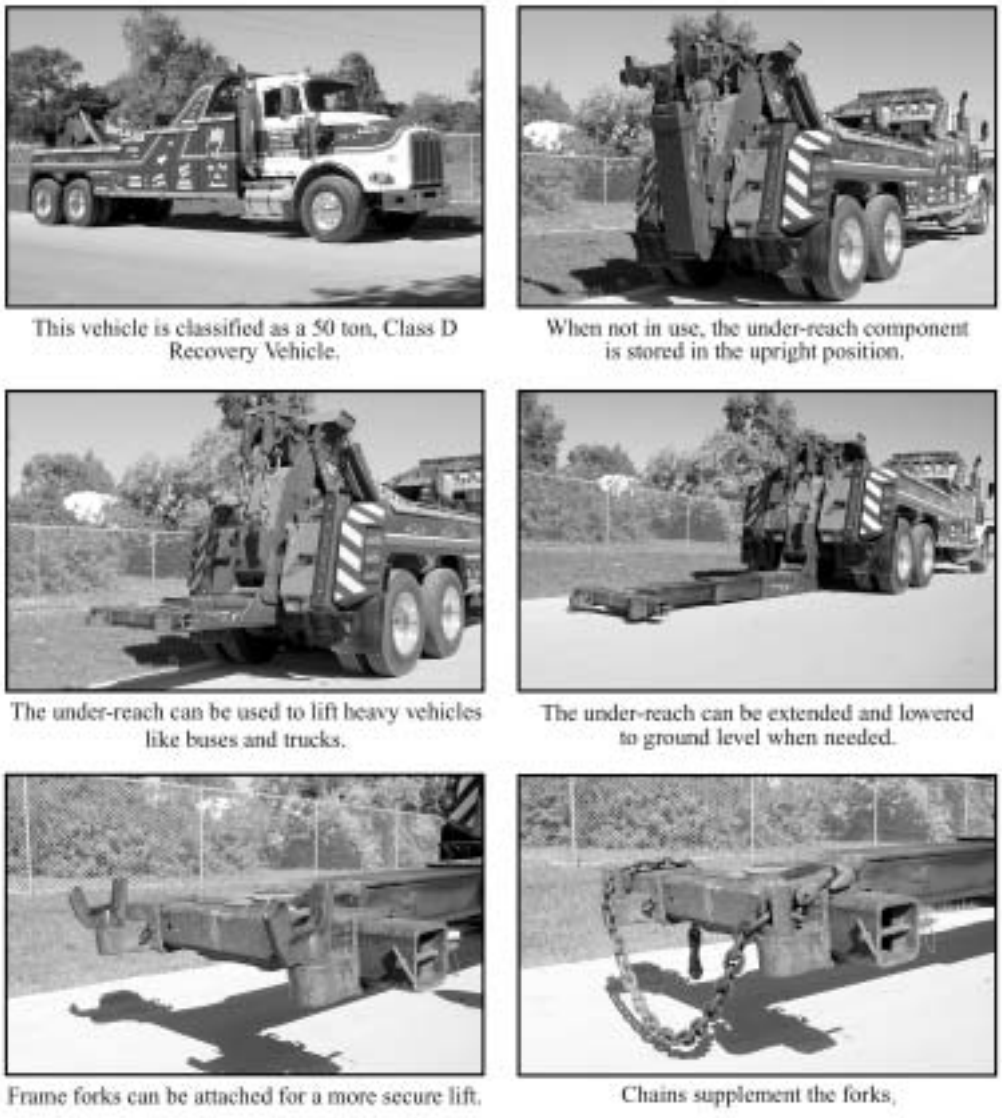
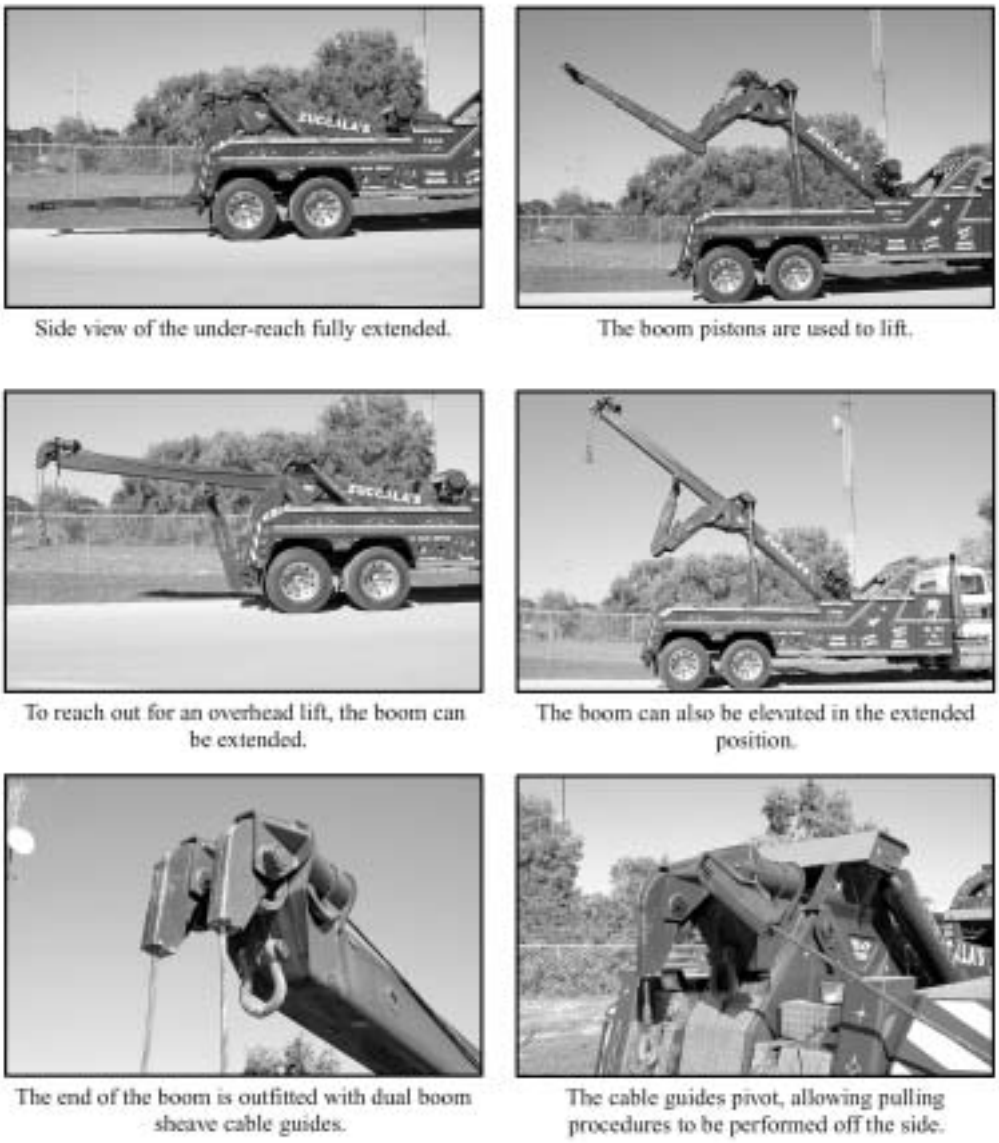


Fig. 1–2 Overview of a Heavy Duty Recovery Vehicle

the occupants, let alone treat them. It becomes apparent the roof must be removed to release the victims, but cutting the posts will certainly cause the vehicle to roll over onto the roof. *Which one or two actions can be taken to make the situation better?*

If the officer orders the vehicle to be tied back to the tree, potential problems are prevented. The odds of the vehicle rolling over are greatly reduced once the vehicle is tied to the tree with a rope, strap, or chain. With the addition of a



Side view of the under-reach fully extended.

The boom pistons are used to lift.

To reach out for an overhead lift, the boom can be extended.

The boom can also be elevated in the extended position.

The end of the boom is outfitted with dual boom sheave cable guides.

The cable guides pivot, allowing pulling procedures to be performed off the side.

Fig. 1–2 *(cont.)* Overview of a Heavy Duty Recovery Vehicle

little cribbing between the ground and the body of the vehicle, there's a good chance the roof can be removed safely, providing access for victim treatment and removal. In this case, stabilizing the vehicle and removing the roof solve the vast majority of the problems on the scene.

Hooks with latches are attached at the end of each cable.

For 2:1 mechanical advantage, a block can be attached to the cable.

In this example, the cable guide swivels up, allowing the cable to pay off the rear.

When using the block, rear mounted recovery anchors are used.

The cables are powered by dual winches.

The operator can use truck mounted controls or remote contols to control each function.

Fig. 1–2 *(cont.)* Overview of a Heavy Duty Recovery Vehicle

The basic tactical options

Meaningful tactical solutions and decisions can be made only after first identifying the problem. Before the officer and crew can make decisions about the tools and procedures needed to extricate a victim, they should first answer the simplest, yet most critical question: *What is trapping the person inside the car?* The officer and crew must aggressively examine the deformity of the vehicle and

then identify the components that are preventing the victims from getting out of the vehicle. As the severity of the crash increases, the ability to even identify the components of the vehicle decreases, making it difficult for the officer to develop a plan. If a vehicle is involved in a severe crash, it may be difficult to determine where the dashboard ends, where the door begins, or how many doors are on the vehicle. After quick and careful examination of the vehicle and the trapped victim, the officer and crew can select a course of action to free the victim.

When selecting the best tactical option for an extrication, how does the officer know if all the options have been considered? In other words, how do you know if you didn't think of something? This uncertainty can be reduced by remembering that almost all extrication procedures are based on one of following four tactical options.

1. Spreading—the process of spreading or pushing apart is the most common action used on the crash scene. The adz (flat portion) of a Halligan is used to create a purchase point for the spreaders by spreading the door metal away from the body of the vehicle until the door is forced open. Rams are used to spread or push the dashboard out of the occupant compartment.
2. Pulling—components are pulled apart when the space between two objects is too large or too flimsy to be spread or pushed apart. A come-along can be used to pull a door open when the space created by the spreaders is inadequate to gain access to the occupants. A front seat may be pulled rearward to gain access to an occupant who is trapped on the floor under the dashboard.
3. Removing—when pushing or pulling an object won't provide the space needed to access or remove victims, severing and removing the object may be the only other choice. If a victim is trapped in the rear seat of a two-door vehicle, spreading or pulling isn't the best approach to creating a big space. In this situation, performing a third-door evolution with an air chisel is the preferred procedure.
4. Securing—preventing vehicle movement may be required in some situations to prevent fatal injuries. For example, if a passenger has been partially ejected from the car, and the vehicle has pinned the occupant between the ground and the vehicle, any additional movement could cause fatal injuries. In this case, it's necessary to secure the vehicle and prevent even the slightest movement.

To bring this concept of four tactical options into focus, consider the procedure of dealing with a badly damaged door. To gain access to the occupant in the front seat, the officer has a choice of three of the four standard tactical options:

1. Spreading—after sizing up the vehicle, the officer can direct the crew to use the spreaders to *spread* the door off the latch. With the door popped off the latch, the operation can be continued to push the door open, overcoming any resistance caused by the damage to the hinges. The spreading option can be used until the spreaders are opened completely.
2. Pulling—if the spreaders haven't created enough space, the *pulling* option can be used by attaching the come-along to the door and an anchor point.

3. Removing—if the latch or hinges are exposed, the shears may be used to cut through them, and the door can be *removed* from the vehicle.

Before committing to and implementing a particular procedure in complex extrications, the officer should quickly visualize the procedure step by step to determine if it leads to the right outcome. By performing the steps of the procedure mentally, the officer may be able to identify problems before they occur or may see that the planned procedure simply won't work. This mental process must be done quickly if it is to be valuable. If the plan seems likely to work, the officer can brief the crew on the tactics to be used to perform the extrication. Briefing the crew will provide them with a critical understanding of the objectives and an opportunity for a crew member to identify any possible problems.

To understand the value of running through the procedure mentally before committing to it physically, consider the following scenario.

A compact car leaves the roadway and rolls over several times coming to rest on its roof. As the vehicle rolls, the unbelted driver is partially ejected through the windshield. The roof is pushed down and the driver is lightly trapped between the roof and the dashboard. The right front seat passenger is belted and remains unconscious in his seat, with his head pressed against the roof. After sizing up the entrapment, the officer decides to quickly cut the roof off the car to take the pressure off of both occupants. Only when the officer runs through the plan mentally does it become apparent that cutting the roof posts will remove the very components that are holding the vehicle off of the victims. If the roof posts are cut and can't support the car, the car would fall flat creating a bad situation for the occupants.

When performing simple procedures such as popping a door, the mental process of running through the procedure can be completed in a matter of seconds. Experience and training allow the officer to predict the limited number of outcomes associated with the procedure, making the process almost unnecessary. The process becomes much more important, however, when the extrication is complicated or when a vehicle comes to rest on its side or roof. These are the situations that can result in tactical errors, validating the use of the mental process before applying the physical process.

Risk/benefit analysis

There are times when the officer has a choice of several procedures to use in a particular situation. There may be drawbacks to all of the choices, each possessing a certain element of risk. The question then becomes, *how does one choose the right procedure?*

Risk/benefit analysis is an important process when making decisions at emergency scenes. Risk/benefit analysis means weighing the risks associated with performing a procedure against the benefits that can be gained from the procedure. In simple operations, risk/benefit analysis is often performed without much thought because the risks and benefits have already been analyzed during training or other similar situations. As situations become complex or unfamiliar, it is acceptable and appropriate to quickly and methodically analyze the options available along with the associated risk and potential benefits.

Officers with the ability to make an accurate risk/benefit analysis perform much more effectively than those who believe that there is only one *approved* procedure for every situation. Over the past 25 years, the quality of both tools and procedures has improved dramatically. Along with these improvements has come the idea that in every situation there are necessary procedures that must be performed, or the extrication crew could be considered negligent. This, of course, is not true since circumstances dictate actions, and the officer must choose the best, real-world solutions for the problem at hand.

To clarify the relationship between risk and benefit, consider the following question: *Is it appropriate to use a ventilation-type saw fitted with a metal cutting blade to perform an extrication?* In areas of the country that have hydraulic rescue tools, most would say that it is never appropriate to use the saw. Saws can be difficult to control for the inexperienced operator; they produce sparks that can start fires, and they throw metal slivers. Considering the significant downside of using the saw when hydraulic tools are available, it seems that the risk of using the saw far outweighs the benefit. The balance of risk/benefit may change however, if an officer is in charge of an extrication with a person trapped and the nearest hydraulic tool is 80 miles away. If the success of the entire rescue and survival of the victim is based on cutting one hinge to free the victim, the officer may decide that the benefit of using the saw far outweighs the risk. If the decision is made to use the saw, the officer is accepting the risk inherent with the operation.

When making these kinds of decisions, a risk/benefit analysis can provide the officer with the mental and psychological advantage needed when faced with a particularly difficult challenge. When a risk/benefit analysis is combined with strong leadership skills, tactical paralysis can be avoided in even the most complex incidents.

Plan A, B, and C

Once the decision has been made about how to proceed and the crew has started working, the officer should develop a back-up plan in case the primary plan fails. The back-up plan is often one of the tactical options that was previously considered during the initial phase of the operation. To formulate Plan B, it's necessary to determine where and how problems in Plan A can occur. Problems can arise for several reasons.

- The tool fails to complete the operation. Examples include hydraulic tools that are worn out, poorly maintained, underpowered, or pneumatic tools that run out of air.
- The vehicle structure reacts in a manner that prevents completion of the procedure. Examples include components that are heavily reinforced (strong), or rusted away (weak), or metal that bends or tears in places that weren't anticipated.
- The procedure results in a negative impact on the victim trapped in the vehicle. Consider a severe side impact resulting in a deep V in a door. Attempts to pop the door open using the hydraulic spreaders may push the door in on the victim, causing additional injury.

When developing Plan B, the officer has three options.

1. Modifying and improving Plan A
2. Selecting a different procedure using the same tool system
3. Selecting a different tool or combination of tool systems for the procedure

Consider a crash in which the officer has decided to remove the roof from a vehicle that has a large "C" post. The hydraulic cutters are used to cut the "A" and "B" posts, but when the firefighter attempts to cut through the large "C" post, the depth of the cutter only permits a cut 6 in. deep into a "C" post that is 18 in. wide. What should the officer do? If the department has the luxury of having different types of hydraulic cutters on the unit, switching to a cutter that has a long cutting blade may solve the problem. The firefighter would cut from one direction, then from the other direction to complete the cut. Without the luxury of having two types of cutters, the officer may decide to use a reciprocating saw instead of the hydraulic cutters. These are two solutions to one problem; one solution used the same hydraulic tool system, the other solution used a different electric tool system.

As the officer observes the progress of the extrication, he or she must decide to either stick with the original plan or go to Plan B. If the officer elects to change tactics, it's important that all personnel are aware of the change in plans. If someone doesn't get the word, unnecessary procedures may be performed that could waste critical time.

A tool staging area should be set up with all the appropriate tools needed for the change in tactics. At this point, the firefighter can go to the tool staging area and swap out tools as necessary with little loss of time. If Plan B is put in action, the officer should start considering Plan C. This may seem a little excessive, but it is necessary to have a back-up plan in place in case Plan B doesn't work out. If Plans A or B don't work and it's clear to the firefighters on the scene that the officer doesn't have a new plan prepared, a free-for-all could erupt on the scene, especially if the crew is getting fatigued and frustrated. At this time it's critical that the officer provides strong leadership and command presence to keep the crew on track and focused.

Extrication time estimates

After the firefighters have closely observed the victim entrapment, the officer should ask about the degree of entrapment and anticipated difficulty in relieving any entanglement. This information helps the officer when coordinating and planning for the operations of several units.

Accurate time estimates aren't usually a big factor when the victim is to be transported by ground units to the hospital or trauma center, but the accuracy of these estimates can make or break an air transport operation.

The following examples are useful in illustrating the importance of accurate time estimates when the victim is to be transported to the trauma center by air:

1. After one of two trapped victims is extricated from a vehicle, a ground transport unit transmits that they are en route to the LZ. Knowing that there are two victims that are to be transported to the trauma center, the officer on the trauma helicopter asks the officer at the scene for an

estimated time of arrival (ETA) for the second victim.

2. As the helicopter is lifting off the pad at the trauma center after clearing another call, they are requested at an extrication scene 30 miles away. The helicopter crew starts flying in the direction of the crash, but asks the company officer at the scene for an ETA to the LZ by the ground transport unit.

3. After sitting in the LZ with the engines running for 20 minutes, a helicopter crew member asks for an ETA to the LZ.

The important factor in all of these cases is the quantity of fuel on the helicopter. While ground fire apparatus can operate for hours without refueling, helicopters typically don't have that luxury. Accurate time estimates are important to the aircraft commander because there is a fixed amount of time that the aircraft can be safely operated, depending on the amount of fuel on board the aircraft. So the questions about the ETA to the LZ are not the product of curiosity but instead a factor in determining if the aircraft will have enough fuel to complete the mission. If the helicopter is being dispatched from one call to the next on a busy day, accurate time estimates can help the aircraft commander decide if it's best to stop and get fuel, or proceed directly to the LZ.

After arriving at the scene, the pilot may decide to conserve fuel by shutting down the engines on the aircraft or, if provided with a short ETA, may decide to keep them running. In all of these situations, the company officer and firefighters have a significant responsibility to the aircraft crew and victims when providing time estimates for completion of the extrication and estimated time of arrival at the LZ.

Things the company officer shouldn't be doing

When a firefighter is promoted to company officer, there is a distinct change in the individual's job description. The job description for company officer usually includes phrases like *evaluate situations*, *formulate plans*, *supervise,* and *direct personnel.* Typically there is no mention of *prying doors open, breaking glass,* or *striking with a sledgehammer*. There is a good reason for this: someone needs to be in charge at emergency scenes. Put in the simplest way, most of the time, the company officer should be thinking and directing—not handling tools. This isn't a new concept; it's been around a long time.

The traditional fire service insignias used to indicate rank support this idea. A firefighter's insignia usually includes a hook and a ladder representative of handling tools and equipment. The driver's insignia often includes a vintage fire engine. The company officer's insignia consists of a speaking trumpet. As the rank advances from lieutenant, to captain, to chief, the trumpets on the insignia increase in number. These insignias indicate that the company officer's role is to think and speak, not to handle tools. That's not to say that an officer can't ever handle tools, because that's not the case. There is a problem, however, when three firefighters are standing around watching an officer operate a set of hydraulic spreaders on a jammed door, or when a scene spins out of control for lack of leadership.

The implications of the officer performing a firefighter's role on the scene can have other negative effects beyond poor scene management. Firefighters may think the officer is "cherry picking," or choosing tasks and responsibilities

based on personal satisfaction and not for the benefit of the victims or members of the company. In most cases, the company officer is most effective when concentrating on guiding crew members as they perform the tasks required at the crash scene.

Role and Responsibility of the Driver Operator

The driver of a suppression unit has three or four jobs at a crash scene.

- Spotting the apparatus at the scene to provide both good scene protection and easy deployment of extrication tools and fire suppression equipment
- Operating the pump when the company officer orders hose lines to be pulled and charged
- Setting up and staging equipment for the other crew members performing the extrication
- Operating the tools when directed by the company officer

The driver operator has a tremendous amount of work to do during the first 10 minutes on the scene. Training and experience help the driver anticipate the order in which tools will be needed, and this determines the sequence in which they should be set up. A tool staging area should be established in an area that is easy to identify, reasonably close to where the work is being performed, yet far enough away not to cause tripping hazards.

The concept of tool staging has been around for a while, but is often dismissed as "Hollywood" or excessive in layout. This is probably because depictions of tool staging areas in training materials seem to spend a little too much time and effort laying out the area. In reality, a tool staging area can be set up quickly by an organized driver, allowing other crew members to work faster. By utilizing a tool staging area, crew members won't have to struggle with getting equipment out of overstuffed compartments when they need a tool. Additionally, when a crew member is finished with a tool, there is a convenient, reasonably secure place to put it. This reduces the likelihood of a crew having to go to a towing company's holding yard to retrieve a tool that was laid in a vehicle during an extrication or turning around to grab a tool only to find that a bystander has walked away with it.

To help identify the location of the tool staging area, a tarp can be laid out and the tools placed on it. While there is no standard or correct size of tarp, a good size to start with is about 10 x 10 ft. The tarp should be a manageable size—easy to lay out, pick up, and able to hold all the tools that the crew normally uses at an extrication scene. This is a good use of old salvage covers that have been removed from the apparatus because of tears or burns. A good section of the old salvage cover can simply be cut to the desired dimensions of the tool staging area. Whether the tarp is made from an old salvage cover, or purchased specifically for tool staging, it should be made of heavyweight material so it will lay flat and resist being blown away. Ideally, the tarp is stored in the compartment with

the other extrication tools to not only speed up the operation but also to remind the driver to establish the tool staging area.

Once the initial tasks have been completed, the driver can begin other non-critical but extremely helpful support functions, such as setting up scene lights, or spreading oil absorbent (if there are oil leaks) in the work area. By spreading absorbent, crew members working around the vehicle are less likely to slip and fall, and tools can be kept oil-free, making them easier and safer to use. During extended operations, the driver should monitor tool systems and maintain fuel and air supplies as needed.

Role and Responsibility of the Firefighter

If viewed superficially, many would think that the firefighter's role is limited to operating the tools that facilitate the rescue of the trapped occupant. While operating tools is important, the firefighter's evaluation and decision-making skills can have a great impact on the overall outcome of the incident. The firefighter's responsibilities can include the following:

- Identifying hazards around the scene, particularly under the vehicle
- Identifying the number of victims involved in the crash
- Contacting victims and determining injuries
- Determining degree of entrapment
- Identifying the best tool for the job
- Recognizing when a selected tactic is not working as anticipated
- Estimating the time required to perform the extrication

Most of the tasks a firefighter performs are individual tasks, such as operating the spreaders, cutting with an air chisel, etc., but firefighters are also part of a team with a common goal. This means that there are going to be situations when the company officer directs one firefighter to back out of the primary operating position and directs another into the area with a different tool. This action is often based on the company officer's observation of progress and the apparent need for a change in the approach being used.

The smart firefighter will back out and let another crew member take over, recognizing that the change is not because of any type of personal failure, but more a case of the bent metal not cooperating with the team. After backing out of the operating position, the firefighter can rest for a moment, reevaluate the task at hand, and be ready to return to work when directed by the company officer.

Summary

Successful operations at the crash scene are the product of strong leadership, capable tool handling, and teamwork. Aggressiveness must be tempered by planning, and individual victories must be considered secondary to the success of the overall operation. Clarity of thought and purposeful action, especially in the most challenging situations, will lead to the right solutions and the best results.

Appendix: Resource Utilization

Case Study: Overturned Tractor Trailer at the Edge of the Everglades

This incident provides an example of the wide variety of resources the company officer may have to consider utilizing at a serious crash scene. Starting with the scene size-up, the officer should predict the type and quantity of resources needed to perform the extrication. In this crash, the tractor trailer rolled over in a remote section of the East Everglades. When time and distance are factors, the company officer needs to request resources as soon as it becomes apparent that they are needed. Should the extrication be completed prior to the arrival of additional units, they can be returned to service.

Scene 1: The crash scene was blocked by trees that were cut by a unit that carried a chain saw. Creating good access to the vehicle and the victim at the beginning of an incident may save time later.

Scene 2: The patient met the Trauma Transport Criteria for transportation to the Ryder Trauma Center, a Level 1 center. The remote location of the crash required the dispatch of a helicopter for transportation. During the size-up, it was determined that the extrication of the victim was going to be complicated and that surgical intervention may be needed. The department's Assistant Medical Director, a surgeon at the trauma center, was transported to the scene by a second helicopter.

Scene 3: When a surgeon comes to the scene, a "Doc box" containing surgical instruments and supplies is brought to the scene by helicopter or another specialized unit.

Scene 4: Ultimately the victim was extricated without surgical intervention.

Scene 5: A Stokes basket was selected as the best choice for victim packaging.

Scene 6: The terrain was rough, making it difficult to carry the Stokes. Instead of a few individuals carrying the basket and running the risk of falling, a line of firefighters passed the basket toward the street and the waiting helicopter.

Scene 1

Scene 2

Scene 3

Scene 4

Scene 5

Scene 6