

Fireline Safety

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NWCG – NIMS Wildland Fire Qualification System Guide -PMS 310-1 (FFT1, FFT2), L-180, S-200, S-216, S-231, S-233, S-330, S-336

Learning Objectives

1. *Recognize the importance of physical fitness and health maintenance in wildland firefighting.*
2. *Identify personal protective equipment used in wildland firefighting.*
3. *Describe actions taken to comply with the Ten Standard Firefighting Orders.*
4. *Explain actions taken to mitigate hazards created by the 18 Situations that Shout “Watch Out!”*
5. *Describe common denominators of fatality or injury fires in wildland firefighting.*
6. *Describe the primary elements of LCES.*
7. *Distinguish among fireline hazards.*
8. *Recognize how human factors affect fireline safety.*
9. *Explain the purpose of after action fire reviews.*
10. *Define accountability.*

Fireline Safety

It is no mistake that fireline safety is the first chapter in the handbook, as safety is the foundation that all other firefighting principles are built on. Always remember that safety is first. Safety is not a class, a certificate, or something you can touch. It is an attitude! Catch it!

Safety must ALWAYS be your main concern!

The issue of safety must not be delegated to the safety officer. It is every firefighter's responsibility to conduct him or herself in a safe manner. You have to have an attitude of safety. You have to want to do it right and perform safely. If you or one of your fellow firefighters gets hurt, you become a liability; you are no longer a firefighting asset contributing to the firefighting effort.

Firefighting is physically demanding and punishing work. Besides being a very hazardous occupation, it will demand your highest physical and mental efficiency, and a sustained expenditure of energy. You must be prepared, and take every precaution to prevent injury to yourself and others.

Jake says, "Safety is no accident. To fight fire safely you will have to work at it."



Physical Fitness and Health Maintenance

Physical fitness goes hand-in-hand with productivity and safety. You will be fighting fire when it is hot, dry, dirty, and windy. If you can't keep up, you will slow down the firefight. Don't think that all of your fire assignments will be of short duration. This isn't a nine-to-five day job. You may be on the fireline for a couple of weeks,

asking your body and mind to work hard and long. You will be as tired as you have ever been. The best way to combat fatigue and achieve high performance is to follow a physical fitness program.

Fitness has two aspects, aerobic and muscular:

Fit firefighters are more tolerant of heat.

- **Aerobic fitness** is a measure of the maximum amount of oxygen that you can take into your body and transport to the muscles. Oxygen intake is the primary factor that regulates work capacity, because working muscles need a continuous supply of oxygen to perform vigorous work for lengthy periods of time. The more efficient your oxygen delivery system, the better you can do the tough job of firefighting.
- **Muscular fitness** includes both strength and muscular endurance. The best physical fitness program is one that balances aerobic conditioning and muscular training, and that starts well before the beginning of fire season.

Take physical conditioning seriously.

Aerobic fitness and muscular fitness together are essential parts of your work capacity. Fit firefighters are more tolerant of heat. They acclimate faster, and work with lower heart rates and body temperatures.

The following fitness levels (Figure 1.1) are based on field studies of firefighters performing firefighting tasks. The levels represent the fitness needed to perform tasks safely for extended periods, with the reserve ability to respond to emergencies. Set up a daily schedule of physical training. Do it as a team if you can (Figure 1.2).

Recommended fitness levels for firefighters						
Time for 1.5-mile run	Chinups	Situps (total in 60 seconds)	Pushups (total in 60 seconds)	Bench press (lbs.)	Leg press (lbs.)	Curl (lbs.)
11:40 minutes	4 to 7 (depends on your weight)	30	20	120	350	50

Figure 1.1 Recommended fitness levels for firefighters. This is a good start. If your department has different guidelines, be sure to follow them. The key is that you be physically fit and ready to fight fire.

Fatigue

Fatigue is a less visible threat to you than the fire itself. However, without enough sleep and rest, even the most fit firefighter will tire after several long shifts in heat and smoke. Tired people make mistakes. On a wildland fire, mistakes often mean accidents and injury.

Work and Rest

Sleep is a prime factor in controlling fatigue. Most fit firefighters can work hard for 24 to 36 hours with short sleep or rest breaks. After that, without adequate sleep or rest, you will succumb to fatigue. **To perform well in firefighting, you should average one hour of sleep for every two hours of work.**

Your pulse rate is a good way to gauge fatigue. Your pulse should recover to less than 110 beats per minute if your break is long enough. Your wake-up pulse can signal potential problems. If it is 10 percent or more above normal, it can mean fatigue, dehydration, or even an impending illness. Ample quality sleep is vital.

Heat Stress and Hydration

Heat becomes a problem when humidity, air temperature, and radiant heat combine with physical exertion to raise body temperature above safe limits. There are three forms of heat stress. The mildest is heat cramps. Heat stress can progress to heat exhaustion and heat stroke if you don't stop, get in the shade, and begin drinking fluids. **Heat stroke is a medical emergency. Delayed treatment can mean brain damage and even death.** See Figure 1.3 for a listing of the symptoms and treatment for heat cramps, heat exhaustion, dehydration exhaustion, and heat stroke.



Figure 1.2 Physical fitness is very important for every firefighter. Set up a routine and follow it. Do it as a team if you can.

Fatigue is a less visible threat to you than the fire itself.

One hour of sleep for every two hours worked.

Jake says, "Even if you drink a lot of water, you may still be dehydrated. Drink more water than you think you need."



Sweat is your main defense against heat stress.

RECOGNITION AND TREATMENT OF HEAT-RELATED PROBLEMS				
	Heat cramps	Heat exhaustion	Dehydration exhaustion	Heat stroke
Symptoms	Painful muscle cramps.	Weakness, unstable gait or extreme fatigue; wet, clammy skin; headache; nausea or collapse.	Weight loss and excessive fatigue.	Hot, often dry skin; high body temperature (106 degrees or higher); mental confusion, delirium, collapse, loss of consciousness and/or convulsions.
Treatment	Drink lightly salted water, fruit juice or athletic drinks.	Same as heat cramps, plus resting in shade.	Increase fluid intake and provide rest until body weight is restored.	Cool the body immediately, by immersing or soaking clothing in cool water; fan to promote cooling; lower temperature to at most 102 degrees; treat for shock; seek medical attention.

Figure 1.3 Recognition and proper treatment of heat-related problems is very important. Drinking enough water is your best method of prevention.

Drink a lot of water.

Sweat is your main defense against heat stress. As sweat evaporates, it cools you, unless the humidity is high. If the water lost in sweat isn't replaced, your body's heat controls break down. Your temperature can climb dangerously high. If you stop sweating, evaluate your condition and take appropriate actions.

Fluid replacement is vital. During hard work in the heat, it's common to lose 1 to 2 quarts of sweat an hour. To combat

dehydration, you should drink water before going on shift, drink often while working, and continue to replace fluids once off-shift. Everyone on the fireline needs to understand the importance of drinking water often. Replacing 12 or more quarts of fluid a day isn't always easy, but it must be done.

Stay away from caffeinated, carbonated, and "diet" drinks. They take water out of your body. Drink water, juices, or non-caffeinated sport drinks. Juices and sport drinks contain energy-restoring glucose. **When on shift, drink once every hour.** Don't wait until you feel thirsty. If you wait until you're thirsty to replace lost body fluids, your body is already exhibiting signs of dehydration. Don't over-hydrate, as it could lead to not enough sodium in the blood. Symptoms are similar to heat exhaustion.

Pace yourself. During breaks, try to get away from the heat. Check your pulse. Heat stress is unlikely if your pulse rate is under 100 beats per minute after 1 minute of rest.

Pace yourself!

Smoke and Carbon Monoxide Exposure

Unlike work/rest cycles and heat stress, which are more controllable, smoke and carbon monoxide (CO) present a greater danger for the firefighter. Heavy smoke and CO are often present on the typical wildland fire. Some exposure is unavoidable. Your objective is to limit exposure.

Too much exposure to CO causes headaches, fatigue, and drowsiness.

High concentrations of smoke particles can irritate mucous membranes and cause allergic and asthmatic reactions in some people. But little health risk is likely for healthy firefighters when the exposure is short.

CO is a tasteless and odorless gas. It doesn't "advertise" its presence, but it is always found in the heaviest concentrations of smoke. When CO enters your body, it begins to replace oxygen in the red blood cells. This reduces your blood's capacity to resupply the cells of your body with oxygen. **Too much exposure to CO causes headaches, fatigue, and drowsiness.**

Smoke and CO make a tough job tougher.

Smoke and CO make a tough job tougher. They reduce work capacity and can impair performance and decision making. They accelerate the onset of fatigue. The solution to this problem is limiting your exposure. Rest in smoke-free areas whenever possible.

Firefighting is a “dirty business,” so clean up before you hit the chow line.



Jake says, “To sustain energy, think about snacking on the fireline.”

Food and Nutrition

Nutritious food is not only a morale booster, but more importantly, it fuels the muscles for hard work. Remember, you may burn 300 to 600 calories an hour and between 5,000 to 6,000 calories during a long shift on the fireline. This will have to be replaced if you are going to avoid fatigue. To replace 6,000 calories, you are going to have to eat a lot of good, healthy food. Think about “steady fueling.” Snack throughout the day.

The key to a good diet is a balanced one that includes food and nutrients in all of the main food groups: carbohydrates (grains,

vegetables, cereals, fresh fruit, potatoes, etc.); fat; protein (meat, eggs, fish, poultry, etc.); fiber; calcium; vitamins; beans and rice; minerals; and sodium.

You should stay away from alcohol, too much red meat, white bread, etc. Eat lots of vegetables and fruits, and drink a lot of water.

Personal Hygiene

Firefighting is dirty work, and it is up to you to attend to personal hygiene. It is not a badge of honor to show up in the feeding line looking like you have just been dragged in by the dog. Wash your hands whenever you can, especially before eating. Inattention to personal hygiene can directly lead to sickness and/or the spread of contagious illnesses. When you can, shower and change your socks.

Personal Protective Equipment

If you are not properly dressed and equipped, you have no business fighting fires (Figure 1.4). You must protect yourself, as best you can, from the dangers of wildland firefighting. Wear only approved safety clothing (check with your agency), or wear cotton material. Do not wear synthetic materials; they will melt when heated and increase the likelihood of major injury.

You are responsible for keeping your PPE in serviceable condition.

To best protect yourself, you must have appropriate Personal Protective Equipment (PPE); you have to wear it, and ensure that it is properly maintained. It may sound strange that anyone needs to be reminded of this basic requirement, but there have been cases

where protective equipment has been left on the engine or back at the station. You, and you alone, are responsible and accountable for your PPE.

If you are not “dressed for the occasion,” stay at home.

Flame-Resistant Shirts and Trousers

The most common materials used in the production of firefighting safety clothing are Nomex® and Kevlar®. If your agency provides safety clothing, ensure that it is clean, without holes, tears, gas and oil stains, and that it is ready for use. **The best policy is not to get on the engine until you are properly dressed.** That way you will never find yourself unprepared to immediately fight fire when you arrive “at scene.”

The trousers should be cuffless and loose fitting. They should be worn over the boots. The shirt should be long sleeved, secured at the collar and wrists, and always kept tucked in. Do not paint names on the shirt, because they will tend to absorb heat. You don’t want your department logo “burned” into your back. It has happened!



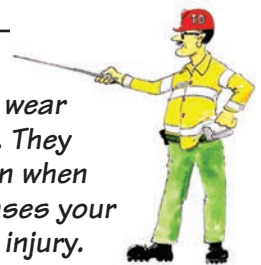
Don't get on the engine until you are ready to fight fire.

Figure 1.4 The most commonly accepted personal protective equipment (PPE) looks like this.

The Importance of a Second Layer

Experience has shown that a single layer of protective clothing is not enough if a firefighter is exposed to extreme heat. There are numerous cases that graphically show the burn lines starting where the undergarments end (Figure 1.5, p. 10). Firefighting safety gear is designed not to burn or melt, but it can and does transfer heat to

Jake says, “DO NOT wear synthetic materials. They can melt to your skin when heated, which increases your likelihood of serious injury. Think how this will affect your personal undergarments.”



*Second layers are hot,
but worth it!*



Jake says, "This merino wool stuff reduces chafing while wicking moisture away, increasing cooling."

the skin.

The solution is to wear a second layer of protective clothing. The most practical second layer is a firefighter's undergarments. These garments should be made of cotton (again, no synthetics or blends), or lightweight merino wool. Remember, they must cover the whole

body. This means a long-sleeved tee shirt and "long johns."

Your first impression is that this

will be too hot and uncomfortable. But, this layer of clothing will

"wick" moisture away from the body and help cool it. Your station uniform can be used as the second layer **ONLY** if it is made of a material that will not melt to your skin.

*If your feet hurt, you
hurt all over.*



CDF

Figure 1.5 This is graphic proof of the value of a second layer under the PPE. You can see where the cotton tee shirt ended and the gloves began. Yes, it is hotter to wear, but it is worth it.

Boots and Socks

You must have appropriate footwear. Your boots should be made of leather or another durable material. They should be a lace-up type, with at least eight-inch tops and heavy lugged soles. Hard leather toes provide adequate protection. Boots with steel toes or protection plates and puncture-proof soles will "hold" heat longer, and can cause unnecessary burns.

Cotton, wool, or part-wool socks are recommended. Some people prefer wearing a lighter sock when hiking long distances. Extra socks are a must.

Helmet or Hard Hat

There are many types and styles of nonmetal hard hats that can be used for wildland firefighting (Figure 1.6). The best type is one that provides protection from falling objects and is lightweight. Structural firefighting helmets can be worn, but they are usually heavier and can be tiring if worn for long periods of time. Never begin firefighting without appropriate head protection. Use the chin strap.

USDA Forest Service



Figure 1.6 This is the style of hard hat worn by most wildland firefighters. This one saved a firefighter's life by absorbing most of the blow from a falling snag.

Gloves

Gloves should be made of leather, fit well, and be long enough so that a gap does not exist between the shirt sleeve and the glove (Figure 1.7). Gloves specifically made for firefighting have a "gauntlet" attached to the glove that protects the wrist area. The only time that firefighters should not be wearing gloves is when they are "feeling for hotspots" while overhauling or mopping-up.



CDF

Figure 1.7 Gloves would not have prevented this accident, but they would have prevented these terrible injuries. A picture like this got the author to wear gloves when he was a firefighter.

Eye Protection

Protecting your eyes is very important; they are very vulnerable. You should be provided with a good set of OSHA approved eyeglasses, safety glasses, or sunglasses. Goggles tend to "fog up." If you do use goggles, they should fit well and easily accommodate eyeglasses, if necessary. Keep them clean and always have them with you.

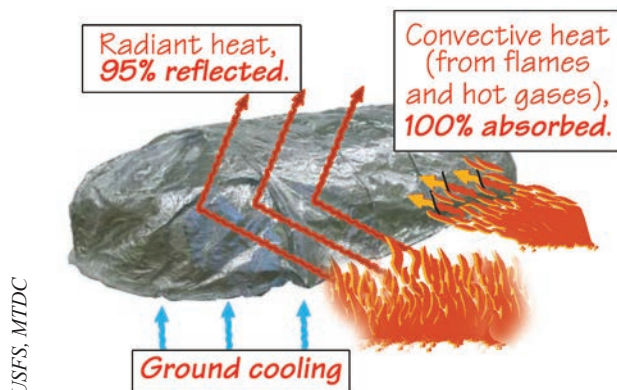
Hood or Shroud

A hood or shroud is constructed to keep the heat off your ears, neck, and face. A hood is pulled over your face; a shroud is attached to your helmet. They are usually made of Nomex® or Kevlar®. When wearing a hood or shroud, your body may not be able to cool itself as well; remove hoods during rest breaks or mop-up.

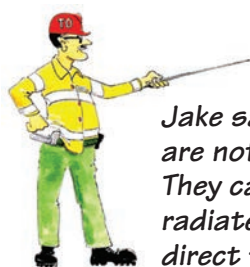
Hoods or shrouds will protect your ears and neck. Remove them during rest breaks.

Fire Shelter

The individual fire shelter is a critical piece of required firefighting safety gear. Fire shelters have saved hundreds of lives. The shelter protects a trapped firefighter by reflecting radiant heat and trapping cooler, breathable air (Figure 1.8). However, don't take more risks "because you have your shelter." The shelter is a "last resort"



Fire shelters have saved hundreds of lives.



Jake says, "Fire shelters are not bomb shelters. They can protect you from radiated heat, not from direct flame impingement or convective heat."

effort to survive. The key to proper use of the shelter—don't wait until it is too late to deploy it (Figure 1.9).

Figure 1.8 The fire shelter design has evolved over the years. They are designed to protect you from radiant heat when escape is not possible, and to provide cooler, breathable air to protect our lungs and airway..

If entrapment seems likely, attempt to escape, but only if you are certain you will make it to safety. If there is

doubt that you can escape, deploy your shelter. **When it is time to deploy your shelter, there is no time to read the instructions!**

Practice deploying your shelter as often as you practice laying hose or laddering a building. Always train

The cab of an engine can be used for protection... understand the limitations.

If you are going to work during the night, you will need a head lamp and an extra set of batteries.



Figure 1.9 They waited until it was too late to deploy their shelters. The firefighter operating the chain saw never heard the order to move and deploy. These two firefighters are in real trouble.

wearing gloves, helmet, and backpack, if you use one. Practice removing your shelter from the carrying case while moving. Even practice deploying the shelter while lying on the ground. You must be able to successfully deploy your fire shelter in 25 seconds or less.

When it is time to deploy your shelter, pick a site that is clear of flammable vegetation and away from heavy fuels and flammable equipment. It is absolutely necessary for the fire shelter to be held down on the ground before the fire front arrives (Figures 1.10 to 1.12). With prolonged exposure, temperatures can reach over 150 degrees. But you can survive such temperatures... dry saunas often reach 190 degrees. Breathe through your mouth, stay calm, and stay in your shelter.

You must ensure that there is a seal between shelter and the ground. Do not deploy your shelter in a field of rocks or boulders.

Your most important considerations are:

- Carrying a fire shelter is not an excuse to take risks on the fireline. Leaving the shelter on the engine is not an option. There have been cases where people used the shelter carrying case to hold other things. Don't be that dumb!
- Your highest priority is to avoid entrapment. If entrapment is imminent, escape if you can. The shelter is a last-resort option.
- During an escape or entrapment, protect your lungs and airway at any cost. Your lungs and airway are very delicate and do not tolerate a lot of heat. While you are in the shelter, keep your face close to the ground where air is cooler.

USFS, MTDC



Figure 1.10 Pick a site that is clear of flammable vegetation and away from heavy fuels, or in rocks or boulders.

USFS, MTDC



Figure 1.11 Open the shelter and enter it...you can do it from a standing position or from the ground.

USFS, MTDC



Figure 1.12 Just you and your water bottle belong inside the shelter. Note in the cutaway shelter how the firefighter is lying face-down, holding the shelter down by the handles and flooring, and creating a seal between the shelter and the ground.

Stay away from heavy fuels.

- Drop your gear as soon as you realize your escape may be compromised. Take your fire shelter and your tools. Drop all dangerous flammable objects and any items that may slow your escape. On the South Canyon Fire, some of those who died did so with all of their gear. Drop it; get away from it, especially items like fusees and packs that can burn.
- If you are entrapped, get on the ground before the fire arrives—Don't wait to deploy. There are many documented cases where people did wait and died.
- Deploy your shelter where flames will be least likely. Help the shelter protect you. Get away from large accumulations of fuel. If there is a road, use it. Also, anticipate where the heat is going to come from, and try to protect yourself from it. Get rid of any tools after you use them to clear a spot for the shelter.
- Once you are inside your shelter, stay there. Conditions outside the shelter will be far worse than those inside. Moving from one protected place to another, exposing yourself to the full fury of the heat, is a bad idea. Stay put.

If someone is in a shelter near you, talk to them.

- If you have deployed your shelter with someone else, communicate with him or her. Survivors have reported that talking with your fellow firefighters can help you through your ordeal. You are scared. There is considerable comfort in sharing your thoughts.

- ***Train with your fire shelter as though survival is at stake.***

It may be! Train, committing the steps to memory (Figure 1.13).

Practice under as realistic conditions as you can. If you have a smoke ejector, create a little wind to simulate extreme conditions. It will be a lot harder to deploy it...but more real. Some train with real fire... it isn't recommended.

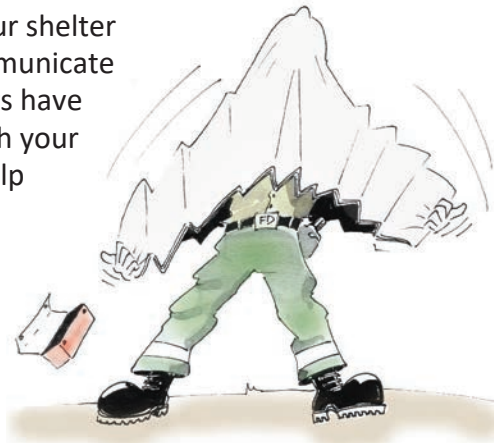


Figure 1.13 When it is time to deploy is no time to read the instructions or practice. Practice deploying your shelter—Your life may depend on it.

Another issue that may come up in training is, “Do I attempt to use the cab of the engine for protection, or only use the shelters?” It all depends on the situation. The key is, if you cannot escape, seek refuge in the best place possible. If you are in light fuels and the cab of the engine is readily available, use the cab for protection. In heavier fuels, where the duration of intense heat will be longer, the cab may not be the best place. When the plastics and rubber in the cab begin to heat, they release some real bad gases...that may drive you from the engine. The worst thing is to transition from one protected area to another through an unprotected area. That is how a lot of firefighters have died. In heavy fuels, use the engine as a shield, but deploy on the ground away from where the fire is coming.

Train with your shelter as if your life depended on it. It may!

Water

A vital part of your PPE is some form of water carrying device. Water is so important.

Always take water with you.

Chaps

If you will be working around or operating a chain saw, you will be required to wear chain saw chaps.



If you are going to be operating a chain saw, wear chaps.

Turnout Gear

If turnout gear (coat, pants, and boots) is all you have, you should wear it. You will be limited by this bulky gear, but don't fight fire without protective safety gear. If this is all you have, work with your chief to obtain proper wildland firefighting safety clothing. You should also remember that wildland firefighting gear is not a replacement for turnout gear. Do not attempt to fight a structure fire with the lighter weight wildland gear.



Self-Contained Breathing Apparatus

Normally, self-contained breathing apparatus (SCBA) is not used during wildland firefighting. But, if you have it available, you should know how to use it, and should use it if conditions warrant. Remember, SCBA equipment is good only for a limited time, usually less than 30 minutes.

Respirator

A respirator is an air-filtering device that is worn over the nose and mouth. Full-face respirators also provide eye protection. Respirators have been used in the industry for years. You will begin to see them more and more in wildland firefighting. Respirators are NOT a substitute for SCBAs.

Respirators filter airborne particles and, depending on the filter media, can filter some chemicals. The firefighters wearing respirators may feel more comfortable in smoky conditions because their lungs are not being invaded by airborne particles, but they may still be exposing their lungs to other dangerous chemicals. Wear the respirator when exposed to heavy smoke, but return to fresh air as soon as it is practical to do so.

Experience has shown that wearing a respirator is not very comfortable. The firefighter will be able to remain calm even under the most smoky of conditions, but will sweat profusely under the mask.

Hearing Protection

If you will be working near or with power equipment (portable pumps, chain saws, engine pump panels, etc.), you should have hearing protection. Ear muffs or plugs are just as important as gas and oil for this type of equipment. All firefighters should have ear plugs in their pockets.



Respirators are not SCBAs.

Carry and use ear protection.

Head Lamp

If you will be working the fireline at night, be sure you have a proper head lamp and an extra set of batteries.



Personal Gear for Extended Deployment

There are other items that are not necessarily safety gear, but you will want to have available to you if you are away from your home station for an extended period. Some of the more important ones are: a tent, a sleeping bag, extra clothing, toothbrush and paste, comb, bandana, hair bands to secure long hair (hair is flammable), foot powder, extra boot laces, matches, watch, rain gear, toilet paper, small towel, prescription medications, etc. Put these and any other necessary personal hygiene items in a bag and have it available at a moment's notice. Follow your agency's guidelines regarding personal items. Realize that air travel may present some limitations or restrictions.

Jake says, "Always have a 'ready bag,' out of county bag' or 'forest bag.'"



Ten Standard Firefighting Orders

The Chief of the Forest Service, Richard E. McArdle, issued the Standard Fire Fighting Orders to USDA Forest Service employees on June 28, 1957. A task force, established by the Chief, developed these orders to study ways they could strengthen efforts to prevent firefighting fatalities. This task force studied 16 fires on which 79 firefighters had been killed. These basic safety orders have been required training ever since they were first issued.

The Ten Standard Firefighting Orders address safety issues that are not meant to be compromised. They are intended to be absolute! Some say that you can't fight fire without "breaking" one or two of them. But, which ones? When? There used to be signs along the highways of this country that read, "You may only need your seat belt once, but which once?" The same applies to the Ten Standard Firefighting Orders. How do you determine when you can ignore one or more of the Ten Standard Firefighting Orders without disastrous results?



Learn, understand, and follow the 10 standard firefighting orders!

The reality is that the orders primarily apply to individual firefighters and first level supervisors.

Studies have shown that we, as a society, don't like to follow orders. The two most commonly violated laws are probably speeding and jay walking. We find it very easy to violate these rules; some firefighters apparently find it very easy to violate the Ten Standard Firefighting Orders. There are a number of reasons why we routinely violate these rules. Following are three of the most common:

- **Ignorance** (or lack of training) - When you have not been adequately trained to recognize potential problems and how to respond appropriately.



Jake says, "When can-do turns to make-do, it often turns to do-do!"

- **Machismo** (or an excessive "can do" attitude) - When you feel you are immortal and nothing can hurt you! You are overconfident and feel you can extricate yourself from any situation.
- **Apathy** (or lack of empowerment) - When you think someone else will take care of you, or it isn't your job to question violations.

Know your limitations and work within your level of experience.

You must understand how ignorance, egotism, and apathy will affect you and those around you. Fighting fire is a lot like driving a car. When you get into your car, you usually have some idea where you are going and the route you will take. In firefighting, these are called your objectives and your plan. You use maps in driving, and you should use maps in firefighting. As you drive down the road, you watch for hazards and signs that indicate when to stop, slow for a curve, how fast you are allowed to go, and detours. In firefighting, you look for changes in weather, fuels, or topography. Your observations may cause you to change your route (strategy) or how you are driving (tactics).

Then there is the Vehicle Code that gives you the rules of the road. In firefighting, these are called the Ten Standard Firefighting Orders. As a driver, you are required to take a test in order to secure a driver's license. A booklet is provided so that you can study for the test. You also have manuals and tests in firefighting.

The main difference between driving your car and fighting a fire is the development of conscious and subconscious skills. You usually drive on a daily basis, learning and practicing all the time. You allow your subconscious to do a lot of the work. When was

the last time you consciously thought about putting your foot on the brake to slow down? Your brain detects the need to slow, but your subconscious moves your foot and applies the brakes. When was the last time you spotted a danger sign and took the time to pull out your copy of the Vehicle Code or DMV guidebook to look up what you are supposed to do? You would be injured or dead before you found the answer. Yet, we rely on printed copies of the Ten Standard Firefighting Orders and the 18 Situations that Shout “Watch Out!” to bail us out on a wildland fire. So, the real difference between driving and firefighting is that we practice driving daily, while most of us do not train for firefighting in such a way that we “train” the subconscious to do some of the thinking for us.

Firefighting is like driving a car. Train to ensure that your skills become automatic!

You train to learn skills. You train to ensure that the skills become automatic. You train to develop a team. There is a saying, “Practice makes perfect.” A more practical saying for a firefighter should be, ***“Practice makes responses instinctive.”*** You also need experience so that you can recognize the subtle changes in weather or fire behavior that tell you what is going to happen.

Let’s take each of the prioritized orders and dissect them in an attempt to learn their meaning, purpose, and importance to every firefighter. Consider them your rules of engagement.

Practice makes responses instinctive.

The reality is that it is nearly impossible to comply with all of the orders, especially if the fire is growing in intensity and size. We are not saying don’t try to comply with the orders. It is just the opposite—use the orders to guide your planning process and the establishment of your Rules of Engagement.

Your Rules of Engagement

Wildland fire safety has an increasingly complicated set of rules, guidelines, and reminders aimed at keeping firefighters from getting killed or seriously injured. These rules, guidelines, and reminders have evolved over time, frequently as the result of some serious accident. They are emphasized in training, reinforced in drills, briefed before assignments, debriefed after assignments, and even posted on the inside of the latrine door! Yet investigation reports consistently cite violations of the rules, apathy toward the guidelines, and/or forgetting the reminders as contributing factors when firefighters are killed or seriously injured.

Know the rules of the game, just like you do in a game of poker.

If you don’t, you will lose!”

Safety rules must never be compromised. You may have some latitude in how you apply them to your situation, but their intent is absolute.

The 10 Standard Firefighting Orders are your rules of engagement. They are listed in their order of importance and the order in which you would normally apply them. However, it will be easier for you to remember them if you think of them in terms of the four groupings shown below.

The first three orders deal with the actual and predicted weather and fire behavior. Following these orders will keep you out of trouble.

How is the weather going to impact fire behavior?

Where is the fire?

How will the fire behavior impact your operation?

Fire Behavior

1. **Keep informed on fire weather conditions and forecasts** – Weather itself won't kill you, but the resulting fire behavior (or heat stress) might. Know what the weather is doing. Know what it's predicted to do during the current and upcoming operational periods.
2. **Know what your fire is doing at all times** – Know where the fire is, what it's doing, and where it will go next. Plan for contingencies. What would you do, for example, if the fire spotted below you?
3. **Base all actions on current and expected fire behavior** – This fits with Firefighting Order #1. Plan for what you expect to happen. Build in options, and consider worst-case scenarios.

Although all ten fire orders are about safety, the next three will get you out of trouble if you err and find yourself in a place you should not be.

Where is a safe place to move to? How will you get there?

You have to know what the fire is doing.

If you are not calm, no one else will be.

Safety

4. **Identify escape routes and safety zones, and make them known** – Decide on a safety zone and the route(s) needed to get there. Identify your trigger points – events or conditions at which you and your firefighters will disengage and move to safety.
5. **Post lookouts when there is possible danger** – Use lookouts not only to watch the fire but also to track the weather so you can get a jump on any changes. Posting a lookout is not a waste of a firefighter; it is one of the ways you keep yourself and your firefighters out of trouble.
6. **Be alert. Keep calm. Think clearly. Act decisively** – You can't lead effectively if you don't know what's happening around you.

Operational Control

7. **Maintain prompt communications with your firefighters, your supervisor, and adjoining forces** – Maintain two-way communications. Not only do you need to direct your firefighters, you also need to keep them informed of what’s happening around you. You also need them to keep *you* informed.
8. **Give clear instructions, and be sure they are understood** – Too many firefighters have lost their lives due, in part, to not having clear instructions. Be sure you understand what your supervisors expect from you, and make sure you clearly communicate your expectations to your firefighters.
9. **Maintain control of your forces at all times** – Know where your people are, and make sure they know where you are.

How are you going to talk to those around you?

Do you know what the boss wants done?

Do your people know what you want done?

Firefighting

10. **Fight fire aggressively, having provided for safety first** – This is probably the most misunderstood of the orders. The safest fire is one that has been extinguished. So the sooner you put it out, the better. If you’re not aggressive enough, the fire will run you all over the mountain. However, don’t be stupid and take unnecessary risks. If you have to back off a frontal attack because of intense fire behavior, work the flanks instead. This still qualifies as an aggressive attack, but it’s a safer way of doing business.

If you have met the intent of the first nine firefighting orders, you can fight fire.

This last fire order has several meanings, depending on the authority and responsibilities of the agency. For the more traditional fire departments, it means putting the fire out. But for a land management agency, it may mean they will be managing the fire for resource benefit and declaring the fire out when it goes out on its own.

If you consider the Fire Orders as a functioning tool tied with the sequential process, the first three orders represent safety management; the next three are about command and control. The first nine orders allow the tenth Fire Order to be followed. Start with order #1, and don’t proceed to the next until the previous has been addressed.

Jake says, “Managing a fire is just as dangerous as fighting to put it out!”



Jake says, “Mitigate the Firefighting Orders in the order they are presented.”



How to Really Comply with the Fire Orders



Keep informed on fire weather conditions and forecasts.

Weather is very influential on the intensity of fire behavior and how it spreads. Of the three primary weather factors that impact a fire (**temperature**, **relative humidity**, and **wind**), wind is the most influential.

There are two types of weather information:

- **Tactical weather information** is weather that is taken and recorded at the scene of the fire. It includes the temperature, relative humidity, wind speed, and direction that you measure and record at regular intervals during the life of the fire. Remember, the primary purpose of recording weather is to enable you to detect changes, and you can only detect changes if you have data to compare with. When you record the weather readings, you should also make notes as to the state of the fire behavior. Note the flame length, color of the smoke, the ease or difficulty of control, and local wind patterns. This will allow you to start developing an understanding of fire behavior under differing weather conditions.

You may want to use off-site weather information to supplement your own weather readings. There may be a lookout that takes weather readings. Ask for the readings and record them. If you expect a weather change like one that may be tied to the passage of a cold front, get weather readings from a station some distance (10 to 20 miles) away, so that you can get a “jump” on the pending change.

- **Strategic weather information** is the information you receive from a weather forecast. It is of a general nature that provides weather trends (e.g. temperature up 7 degrees, relative humidity down 5 to 10 percent, etc.). You can use this data to predict the expected tactical weather information. That, in turn, will aid in the development of your fire behavior predictions.

To comply with this Order, you must take the weather on-site, and ask for a forecast. You should attempt to track several weather factors:

Do you expect a change in the weather...what will that mean?

Strategic weather is the general weather for the area.

Weather and fire behavior are interrelated.

Jake says, “A change in weather can get you in trouble very quickly.”



- Take the weather on the fireline. Record the temperature, relative humidity, wind speed and direction, and cloud type and the extent of cover.
- Assess fire behavior, taking special note of the flame length, smoke color, spotting, and rate of spread.
- Check the actual weather factors against the latest forecast. Obtain off-site weather information when necessary. Note any differences and analyze what impact this will have on your fire.



Know what your fire is doing at all times.

You can learn a lot about the fire status by listening to the radio as you respond. Some of this information will have to come from your supervisor, or it may have to be gathered by you during initial size-up. You should know the direction and rate of spread; the location of the existing fireline, breaks in fuels or natural barriers; type and status of the fuels; fire behavior and problems with spotting.

If you can't determine this information by personal observation, send someone to scout out to get it or ask someone (supervisor, air attack, or lookout).

Some of the factors that you should track are:

- Location of fire perimeter
- How fast it is spreading
- Direction of spread
- Fuel cover (present and potential)
- Fire behavior
- Location of fuel or natural breaks
- Spotting activity

If you do not have current information on fire status, you are out of compliance with this Order, and you will not be able to develop a safe, effective plan of attack.

If you do not know what the fire is doing, you are in violation of a fire order.



If you cannot see the fire yourself, post a competent lookout who can.



Base all actions on current and expected behavior of the fire.

The fire and associated fire behavior is always changing. If you can't predict what the fire is going to do, how can you develop a meaningful plan to attack it? You must continuously evaluate the fire behavior and detect subtle changes. Is the fire doing what you thought it would? If not, why? Some of the factors that you must **continuously review** are:

- **Weather** - Is the weather what was predicted? Has it changed? Do you expect it to change? How will these changes impact the fire and the firefighters? You can anticipate the fire will burn hotter if it is above an inversion layer during the morning, and within a thermal belt or mid-slope zones during the night.
- **Topography** - Is the fire moving into areas with different topography? What will this mean, and how will you have to adjust your plan to accommodate these changes?
- **Fuels** - Are the fuels of such a nature that they will support fire behavior that will make your present plan invalid? Is the fire moving into heavier fuels, and can you prevent it?
- **Time of day** - Is the heat of the day still ahead of you? If so, what can you expect to happen in a couple of hours? What changes in temperature, relative humidity, and winds can you expect later in the day/night, etc.? Fires usually burn hotter and more intensely between 1000 to 1700 hours, when temperatures are higher, relative humidity is lower, and the winds normally increase.

This is not a one-time Order. To comply you must monitor fire behavior constantly.

Three things can happen: the fire behavior stays the same, it lessens, or it gets worse!

Have a plan for all three.

Make an effort to plot your fire behavior predictions on a map. Then check to see "how you did" in estimating the rate of spread. As you are plotting things on the map, be sure to indicate time frames as well. Keep track of when the fire reached each location, when it spotted, when you implemented specific suppression activities, etc. That way you will be able to spot gaps in your plan.



Identify escape routes and safety zones and make them known.

A **safety zone** is an area that can be used by firefighters seeking refuge from an unexpected change in fire behavior or burning conditions. A safety zone must be void of fuels, such as in "the black" (as long as all fuels are burned). Other

examples are roads, rock slides or outcroppings, green areas (lawns, meadows), or wet areas (lakes, swamps, wide creeks). The key is that it is an area that will protect the firefighters from injury. If the area requires the deployment of fire shelters to be safe, it does not technically qualify as a safety zone (Figure 1.14).

You may have to construct safety zones. You can do this by burning-out an area, or clearing a zone with equipment or hand tools. The terrain or fuels may require you to construct several safety zones. The type of fuel, terrain, expected fire behavior, and the number of people the site will have to accommodate will dictate how big the safety zone should be. Remember, safety zones should be so carefully selected and properly prepared that the use of a fire shelter should not be necessary in order to survive.

The distance between safety zones is dictated by how much warning you can expect to get if conditions change, how fast you think conditions could change, and how fast personnel can be notified and moved.

An **escape route** is the way you get personnel from where you are working (and in danger) to a **safety zone** (Figure 1.15). Escape routes must allow you to move quickly and safely. Very seldom will a route that takes you uphill qualify as an acceptable escape route. Have two routes selected. That way, if one route is cut off, you still have a way to get to the safety zone. Make sure all escape routes are clearly marked.

This Order should stop more operations than it has in the past. Safety zones, and the routes to them, are your first line of

Jake says, "If you don't have a safety zone and an easy way to get there, simply move off the line."



Figure 1.14 "Chief, we underestimated the time it would take us to get to the safety zone!"

A safety zone does not require the deployment of shelters to make it safe.



Figure 1.15 Do not panic!

protection. If you don't feel comfortable with the location or size of the safety zone, or the route(s) you have to use to get to it, **speaking up!** If you are not comfortable with the safety zones and/or escape routes, you are not in compliance with this Order. Strategy and tactics can be modified to ensure safe retreat.

Lookouts can take the surprise out of a situation.



Post lookouts when there is possible danger.

If you can't see what is happening around you, you must establish a mechanism that will provide timely, accurate, and meaningful information. You may be able to rely on aircraft or a nearby lookout, but in most cases, experienced firefighters will be assigned as on-site lookouts. The lookouts must be knowledgeable in fire behavior so they know what to look for, and understand the significance of any changes. They must have a way to communicate with others to provide a warning or to obtain changes in assignment. Most of all, the lookout must be able to recognize hazardous situations.

Lookouts are NOT fighting fire, they are your eyes!

Lookouts are a way to take the surprise out of a changing situation. If you don't have a way of keeping informed of changing conditions, you are not in compliance with this Order.



Be alert. Keep calm. Think clearly. Act decisively.

The key is to understand and avoid what may cause you to be less alert, to get overexcited, or to become mentally disorganized.

Physical and mental fatigue, the stress of the situation, and heat and carbon monoxide will all "gang up on you" during a fire fight. Fatigue will begin to take its toll when you don't eat properly or get regular rest. Heat stress will begin to affect you if you don't drink enough water. Carbon monoxide (a natural product of combustion) can build up in your system to the point where it will reduce your ability to think clearly.

There may be a lot going on, but stay calm... think.

If you are going to be able to effectively deal with the situation, you should:

- Maintain self control.
- Ensure that you get enough to eat and drink, and get adequate rest.

- Develop contingency plans.
- Monitor the situation closely.
- Seek information and advice from others.
- Take regular breaks from the action.



Maintain prompt communications with your forces, your supervisor, and adjoining forces.

You must maintain communications with your crew members, your supervisor, lookouts, and adjoining forces. The purpose of this Fire Order is to ensure that you can report or receive changes in instructions, warnings of changing conditions or impending danger, changes in status, or progress reports.

If you are going to rely on a radio as your communications link, make sure that you have tested the link, have an extra set of batteries, and have established check-in times. You should also have a contingency plan in case the radio link doesn't work.

If you are not linked with those above or below you in the chain of command, you are not in compliance with this Order.

If you do not have proper communications, how can you report or receive information on dangerous situations?



Give clear instructions and be sure they are understood.

If fire personnel don't know what is expected of them, how can they effectively contribute to the overall plan of attack? Be clear and concise in your communications. Ask to have instructions repeated if you do not completely understand them. If you are the one receiving the instructions, make sure that you know what they mean.

This Order is directed at all fire personnel. EVERYONE on the fire is giving or receiving orders. Ensure that instructions are given to, and understood by all, then follow-up to ensure compliance.

Repeat the instructions if you have to.

All too often, poor communication within the crew is the weakest link.



Maintain control of your forces at all times.

The best way to remain in control is to ensure that your instructions are clear, concise, and understood. Ensure that you maintain communications, know the location of crew members, know the status of the fire, and know when and how you will move your forces to safety. As the situation worsens, you may want to concentrate your personnel in one area.

Anticipate the unexpected! Do some "what ifs?"

The key to maintaining control in compliance with this Order is being prepared to react quickly and effectively to the unexpected.



Fight fire aggressively, having provided for safety first.

This order is a general statement that says that you should take meaningful and bold actions to fight the fire, but do so safely.

If you can't ensure that you and your force are capable of fighting the fire on your terms, stop and reevaluate. Ask yourself, "Do I have the forces, skills, and tools necessary to safely control this fire?" ***If not, change your plan.***

What safety considerations need to be taken into account **prior** to fighting fire aggressively?



Jake says, "Being aggressive does not mean you can fight fire ignoring safety. You can be both aggressive and safe."

- Take action only after thoroughly scouting the area.
- Receive and understand instructions and assignments.
- Ensure lookouts alert personnel to danger.
- Maintain good communications.

- Ensure that strategy and tactics do not endanger firefighters.
- Know where your escape routes and safety zones are.

If you don't attack the fire, it usually will not go out right away. Get in there and do what you are told to do . . . just do it safely.

Do not consider review of the Ten Standard Firefighting Orders as something you do only once when you first arrive at the fire. You must constantly review them. Reevaluate the fire situation to detect changes and/or the unexpected, and be prepared to react quickly to provide safety.

The Ten Standard Firefighting Orders deal with fire behavior concerns, safety precautions, and operations . . . all of which are summed up in SAFETY FIRST. If you cannot comply with one or more of the Orders, or cannot mitigate the issue, move back and develop a new plan. This is not a failure on your part to do the job. This is just good thinking.

Jake says, "These orders are your rules of engagement...do not violate them, period!"



Situations that Shout "Watch Out!"

The 18 Situations that Shout "Watch Out!" represent situations with specific hazards to be mitigated. Someone probably died for each of these situations to be placed on this list.

Each of the 18 situations should raise a warning flag when you detect it. Know and understand the risk and the ways to eliminate or mitigate the hazard. It is not enough to just identify the situation; you must know how to change the conditions so that the danger is eliminated.

If you find yourself in one of these situations, Watch Out!

Know and understand the risk.



1 Fire not scouted and sized-up.

You are entering a situation where you have no information on the fire, what it is doing and what it may do. DANGER! If there is an air attack assigned to the fire, get information from it. If this isn't available, have an experienced person scout the fire, using a safe route of travel. Get some timely and reliable information before committing to a strategy of attack. You have to identify the hazards and know what you are up against.



Moving into unfamiliar country without enough information is dangerous.



2 In country not seen in daylight.

At night it is easy to get lost and disoriented. Be careful of cliffs and steep terrain. Work as close to the fireline as possible. Do not attempt to work without headlamps. Keep in close contact with supervisor and crew. You need to scout the fire to identify hazards, escape routes and safety zones, and evaluate the overall safety of the planned suppression action. If you can't scout it, talk to someone who has seen the country during the daylight hours.

It is dark; you haven't seen the country during the day.

***Safety zones and escape routes not identified.***

Don't proceed unless you know where the safety zones are and how to get there. Contact your supervisor, now! This is especially critical if working away from the fire's edge. If on the fire's edge, you may be able to use "the black" or burned-over area as a safety zone. If you continue to fight fire and have not designated escape routes and a safety zone, you are violating a safety order.

No safety zones or escape routes.

***Unfamiliar with weather and local factors influencing fire behavior.***

Know what the fire is doing. Monitor the wind, humidity, and temperature; if they change, be alert. Obtain a weather forecast and a fire behavior prediction, if available. Knowing the weather will help you predict the fire behavior. You must be more alert in strange country than in areas you know.

You don't know what the weather is going to do.

***Uninformed on strategy, tactics, and hazards.***

If you don't know the plan, contact your supervisor as soon as you can. Get briefed on the strategy, tactics, and any special hazards. You are not going to be very effective, let alone safe, if you don't know the plan. Be sure to ask about contingencies, in case something unexpected happens. Know how to react to something before it happens.

Stay informed.

***Instructions and assignments not clear.***

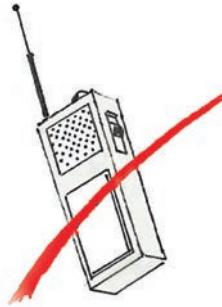
Not sure what you are to do? Do not assume anything. Better find out! Contact your supervisor and clarify your assignment. Be sure you receive information on who is in charge, hazards, assignments, strategy and tactics, escape routes and safety zones, etc. Make sure your crew understands what you told them. Have them repeat it.

What is the plan?



No communications link with crew members or supervisor.

If you can't communicate with your crew or supervisor, you can't get vital information or pass on information to them about changing conditions, injuries, blowups, etc. You must maintain communications! Find them, now!



You don't have a means to talk to anyone.



Constructing line without a safe anchor point.

If you have not anchored your fireline, you run a real risk of the fire going around your line and outflanking you.

You must anchor your line. Tie it to a road, creek, lake, or something that will hinder the fire moving around your line. If you can't adequately anchor your fireline, keep a close eye on that part of the fire.



No anchor point.



Building fireline downhill with fire below.

This approach is very dangerous for several reasons and special care should be taken. There is potential for rapid uphill fire runs. If your only escape route is uphill, the fire will more than likely beat you; and, even though you may have anchored your line on the ridge, it is meaningless if you are below that point. It can be done, with special precautions (see Chapter 5 Fireline Construction), but this is a last-resort situation. Avoid this situation whenever you can. This is a "three-star" watch out! If you are attempting a downhill attack, be very careful.

The fire is below us!!!



Attempting frontal assault on fire.

The head of the fire is usually the hottest part. It will be smoky and visibility will be limited. Unless the fire is small, or you are with a sizable force, this approach is usually not very effective.

This is a "watch out" for several reasons: you may not have a good anchor point; the fire may outflank you; the heat and smoke may be very intense; and, the fire may be moving very quickly and not give you time to be adequately set up. If this is the selected strategy, be sure you have safety zones and escape routes established. Even if the unexpected occurs, keep in very



The fire is heading right toward us.

close communication with your supervisor and the forces in the area, and stay very alert.



11 Unburned fuel between you and the fire.

This is very dangerous, especially if the fire is burning in your direction. This is also dangerous if the fire is not presently burning in your direction, because the situation may change and catch you by surprise. Post a lookout, someone to warn you when the fire is getting closer. Be prepared to vacate the area by making a preplanned escape route to a designated safety area.

There is a lot of "green" between us and the fire.



12 Cannot see main fire; not in contact with someone who can.

If you can't see the fire, you can't know what it is doing. Do not let yourself get into this situation. Contact your supervisor, and advise of your situation. Find a place where a lookout can see the fire. You need to know if you or your crew are in danger and if you should be moving to the safety zone.

Where is the fire?



13 On a hillside where rolling material can ignite fuel below.

The danger here is not just a fire starting below your position; you need to be on the alert for rolling rocks and logs. It is not uncommon for a fire to free logs and rocks, allowing them to roll downhill. They can do this with little or no warning. Use trenching to hold the rolling material. Establish safety zones and escape routes. Any time you are working on a mid-slope, you should be very careful and vigilant.

Rocks and burning material are rolling down the hill.



14 Weather becoming hotter and drier.

Conditions are changing and the fire behavior will not be far behind. Hotter weather brings increased fuel combustion and fire behavior, and the chance for blowups and spotting. Check your position and the safety zones. Be prepared to move on a moment's notice. Watch for spot fires.

Is it getting hotter?

15 *Wind increases and/or changes direction.*
Wind is one of the most influential factors in fire behavior. It can quickly change the rate and direction of the spread of the fire. This condition may bring more spotting; an increase in fire spread and intensity; and the potential for a reburn. Check for the passage of a front (look for any indicator cloud formations). The shift of wind may be as much as 180 degrees; a flank may become the head.



The wind just changed direction.

16 *Getting frequent spot fires across fireline.*
The fire conditions are changing. Humidity and fuel moisture is lower. Wind may be carrying burning embers for some distance. Anticipate a change in fire behavior. Heavy spotting can also cause extreme fire behavior and area ignition. Be alert if you begin to get spot fires below you. Spot fires make your fire fighting more complex and dangerous.



The fire is beginning to spot.

17 *Terrain and fuels make escape to safety zones difficult.*
Some types of terrain can dramatically increase the time it will take you to escape an advancing fire. If the terrain is rough and fuel cover thick, you will have difficulty moving toward a safety zone. You will have to post lookouts to give you adequate time to move. Improve your escape routes; clear brush or do what it takes to reduce the time it will take to get to your safety zone.

The fuels are really thick; this is steep country.

18 *Taking a nap near the fireline.*
You should sleep in shifts and with the rest of your crew. Never sleep in the "green," on the fireline, or away from the crew. Using a bulldozer for an alarm clock is risky business. You also run the risk of being hit by a falling tree or snag. If you must rest, do so in the black or an established safety zone, and only with the permission of your supervisor. Post a lookout.

I'm beat. I'm going to take a nap.

Common Denominators of Fatality or Injury Fires

There are several common denominators of fires that involve a firefighter fatality or “near miss.” They are: small fires, innocent appearance, light fuels, uphill runs, and turbulence. These fires do not appear to be a problem, but a sudden change in some factor causes erratic fire behavior (Figure 1.16). Why do tragedies or “near misses” occur under these conditions?

Common denominators of fatal fires

Denominator

Why?

Most of the incidents occurred on relatively small fires or isolated sectors of large fires. Most of the fires were innocent in appearance prior to the flareup or blowups. In some cases tragedies occurred in the mop-up stage.

Firefighters underestimated the potential. Firefighters did not recognize subtle changes in weather conditions or fire behavior.

Flareups generally occurred in deceptively light fuels.

Firefighters underestimated the extreme rates of spread and heat possible in light fuels.

Accidents occurred in chimneys, gullies, or on steep slopes.

Fires and "super-heated" gas move up steep slopes and canyons with surprising speed.

There was a shift in wind direction or in wind speed.

There have been times that a wind event has been predicted and the impact of such an event not appreciated. There are more times that an unpredicted and unexpected shift in wind occurs. This may be associated with the passage of a cold front.

Suppression tools such as helicopters or airtankers have adversely modify fire behavior. Winds created by wing vortex can change the wind conditions on the ground.

A low pass by a helicopter or airtanker can cause the fire to flare up or spot across the fireline.

Figure 1.16 These are the common denominators of fatal or near-miss fires.

Firefighters tend to be complacent or “lower their guard” on small, innocent-looking fires, or a relatively inactive line. If not keenly watching for signs of change in the weather or burning conditions, firefighters can be caught without warning...and without an escape route.

NEVER underestimate the speed of a fire in light fuels.

Fire intensity can change more quickly in light fuels than in heavy fuels. The light fuels are more responsive to changes in relative humidity. If this is tied to an increase in wind or a change in topography, extreme fire behavior is probable.

A fire spreading uphill resembles a fire spreading with a strong wind. The rate of spread will usually increase as the slope increases. Not only are the flames closer to the fuel, but the movement of heated air (convection) is more likely to carry firebrands and start spot fires. A fire burning on level ground (up to 5 percent slope) will spread twice as fast when it reaches a 30 percent slope. The rate of spread will double again as the slope reaches 55 percent.

Jake says, “If slope and wind are aligned in the same direction...this is a big WATCH OUT!”



Normally, you would think that grass fires can move the quickest. Not necessarily true. Wildland fires in any fuel can move quicker than you think, especially if the fuels are dry and you have a wind. Sometimes, all you need is very dry fuels (Figure 1.17).



Figure 1.17 This sequence of photographs was taken when the Old Fire crossed Highway 18 on October 28, 2003. The time from the first to the last shot is 54 seconds. Note that the terrain is relatively flat and the smoke is going straight up. Within an hour the fire destroyed over 300 homes just east of Lake Arrowhead, CA.

Turbulence created by whirlwinds, microbursts, or vortexes of low-flying aircraft can suddenly fan an inactive fire back to life.



Jake says, "In all of the cases of a fire fatality, the fire simply moved faster than the firefighters could."

The shape of the land also has an effect on fire behavior. Box canyons, narrow canyons, and gulches tend to act like the chimney of a stove. As radiation and convection increase, spot fires are more likely, as if a damper were opened in a chimney. Isolated extreme fire behavior is possible with even minor changes in topography. ***The firefighter should always be alert and watch for light fuels, wind shifts, mid-slopes, steep slopes, and chimneys. "Look up, look down, look around." Don't ever underestimate the dangers involved with wildland firefighting.***

It has been mentioned that there probably should be a 19th Watch Out . . . ***"We will be our own lookout!"*** The



Jake says, "Don't even consider saying something as stupid as 'I will be my own lookout!!'"

whole purpose of a lookout is to have an experienced firefighter in a position to view the larger picture. If you can be in two places at once, fighting fire on the fire and on a hill watching a wider view of the fire, go for it. If not—get a lookout!



LCES:
Lookouts,
Communications,
Escape routes,
and
Safety zones.

LCES

The acronym LCES was developed by Paul Gleason, a highly experienced and respected fire specialist employed by the USDA Forest Service. He was concerned that trying to remember the Ten Standard Firefighting Orders, 18 Situations that Shout "Watch Out!" the Common Denominators to Fatal Fires, etc., overloads the firefighter. His goal was to provide a simple way to help firefighters remember some key elements to survival. LCES stands for *lookouts*, *communications*, *escape routes*, and *safety zones*. The four primary elements of ***LCES*** {***lookouts***, ***communications***, ***escape routes*** and ***safety zones***) are the operational components of the basic rules of engagement within the Ten Standard Firefighting Orders. Their combined goal is hazard control on the fireline; more specifically, entrapment avoidance.



- **Lookouts** - Lookout(s) are the eyes of the crew and its leader. Lookouts should be in a position from which they can see the fireline, the fire itself, and the crews that are working the line. They should be able to recognize and anticipate dangerous situations, and must report changes immediately. The size and complexity of the fire may require more than one lookout. They need to be experienced; able to recognize dangerous situations.

- **Communications** - The fire officer, crew leaders, and lookout(s) should have a quick, reliable, and tested way to communicate with others. This may be by direct radio contact, or through a lookout or other relay point. If you plan on using the radio system, have an alternative way to communicate in case the radios fail for any reason. Establish regular reporting times. The communications link down to the individual firefighter may be by word of mouth. It can be very noisy on the fireline. As the noise gets louder, the distance between individual firefighters will have to be shortened to ensure adequate communication.

Jake says, "Move to safety before you have to. This is common sense."



- **Escape Routes** - Note that routes is plural. Have at least two planned routes of escape. If your primary route is cut off, know what you are going to do. Every person on the fireline must know the plan, and what is expected of them. Everyone must also know what will trigger a move to the safety zone. It is important to remember that, as the crews tire, they will not be able to retreat as quickly. You may have to shorten the distance between the work site and the safety zone, or provide an escape route that is "faster." Escape routes should not be measured in feet or chains, but in minutes and seconds. Make a conservative estimate of the time you will need to get the crew to safety. Use that as the guide to how many seconds of travel time you can tolerate. If you are constructing an indirect line, the establishment of two escape routes may be a challenge.

Have a plan of escape, and make sure everyone knows it.

- **Safety Zones** - Safety zones are places of refuge; places you can be assured of your safety. Their size is dictated by the fuel, terrain, weather conditions, and worst-case fire behavior. **The use of fire shelters should not be necessary.** However, that isn't to say you can't use them. Some commonly used safety zones include "the black" or burned area, natural features like green meadows or ridge-top meadows that can be burned; clearings constructed as part of line construction; clear cut blocks; etc. Safety zones should

Stay calm.

*Like a pilot, always have
a way to go.*

*There is much more to
LCES than four words!*



*Jake says, "If you meet the
requirements of the Ten
Standard Orders, you don't
need LCES; you have that
covered."*

NOT be downwind from the fire (in chimneys, saddles or narrow canyons); require steep uphill escape routes; or be located near heavy fuel concentrations. The time required to get to the safety zone is also critical.

Sometimes, escape routes and safety zones can be compromised and rendered useless. This may require you to deploy your shelter at what is called a **deployment site**. Do not confuse this with a safety zone...it isn't one. **This is a last resort location.**

LCES tries to provide for a "safety net" if something goes wrong. It focuses on enabling the firefighter to move to safety. The elements of LCES should be as commonplace in the firefighter's vocabulary as fire shelter, helmet, gloves, water, and shovel. The elements

of LCES are interconnected and interdependent, like a chain. The LCES chain is only as strong as its weakest link.

But wait, Let's really look at what LCES means, infers, and requires. LCES is much more than having a lookout, a means to talk with him or her, and a way to get to safety. If properly understood, here is what LCES really means:

The Lookout - This person has to be able to see the fire and where the crews in his or her area of responsibility are working. The lookout has to be alert, thinking clearly, knowledgeable, and experienced. Specifically, the lookout has to:

- Know the location of the escape routes and the safety zones, so they can properly direct the crews.
- Be experienced enough to properly evaluate the present and potential fire behavior. The lookout has to anticipate what is happening and why, and has to report any changes in fire behavior.
- Take weather readings periodically, record them, and report any changes or trends.
- Be briefed on the strategy and tactics that are to be followed and used. The lookout has to know how the "game is going to be played," so that he/she may be able to detect any conflict between the plan and what is really happening on the ground. There may be cases where a strategy or tactic is in

*The lookout is both eyes
and ears for those on
the fireline.*

*The lookout needs to
see the broader picture.*

conflict with fire behavior, terrain, fuels, etc. If there appears to be a problem, this has to be communicated.

- Ensure that, as the fire and fireline construction proceed, the view is not compromised. If a lookout can no longer see the active front of the fire or the crews that are working... you don't have a lookout. Before this happens, have plans to move to another site or add another lookout to provide full visual coverage.
- Set trigger points when specific actions will be set in motion.
- Handle other communication tasks, such as appointing a relay person. There may also be times when the lookout can provide some logistical functions such as ordering lunches, water, fire hose, etc.
- Look at the big picture. See how the small part of the fire you may be watching fits with the rest of the fire, the broader weather picture, etc. Don't just focus on one spot. If you do, you may miss something very important.

It is physically impossible to be your own lookout!

A good lookout is very busy.

It should be noted that the lookout does not always have to be a person perched on a hill watching what is going on. A crew supervisor, one who is not actively cutting fireline, may be able to meet all of the requirements of a lookout by watching what is happening, and staying mobile. The key is that, as soon as the crew supervisor doesn't meet the requirements of a lookout, one is established quickly.

Communications - Remember, the role of the lookout is to see, track and record, interpret, anticipate, and report. If the report isn't made, all the other stuff is meaningless. The lookout has to have a reliable method of communications and use it. Specifically, the lookout has to:

There is more than just fire that can harm you on the fireline.

- Be able to contact line supervision and crew personnel quickly. This means that the channel of communication is one that everyone is monitoring, not just checking in on every so often.
- Ensure that, if the radio is the selected method of communications, an alternative system is available, and a full set of extra batteries is available. The lookout also has to know the communications system so that, if problems arise, he/she can easily establish an alternative method.

If you can't tell everyone what you see, you fail.

- Provide regular status checks to ensure that the communications system is working. This is to ensure that the fireline personnel know someone is looking out for them, and that no changes in strategies, tactics, and location have taken place. Some of the items that need to be communicated are:
 - Known and potential safety concerns
 - 10 Standard Orders, and Watch Outs!
 - Topography and fuels
 - Fire behavior
 - Weather: present and changes
 - Strategy and tactics
 - Duration of assignment
 - Radio frequencies and other contact information
 - Contingency plans for potential events (medivac, weather changes, etc.)
 - Incident organization
 - Job assignments and duties
 - Gut feelings about the situation, the assignment, or individuals
- Monitor the radio to pick up on what is happening elsewhere, such as weather forecasts; information being passed on by others or between other lookouts; and the latest scoop on fire behavior or personnel performance. The lookout is also the ears of the fireline personnel.



Jake says, "There is a lot more to communications than a radio or cellphone. Communication requires trust, good morale, and mental clarity."

Escape Routes - By orders, you need more than one way to exit the scene and move to safety. These routes have to be identified, and everyone on the fireline needs to know where they are and where they lead. But it isn't just that simple. Here are some specifics you need to know about escape routes:

Flag it!

- There is more to an escape route than just saying, "we go that-a-way." It has to be a path that hopefully doesn't go uphill or have other obstacles that slow the retreat. They also can't be miles in length. They have to be passageways that allow firefighters to move quickly from a point of potential danger to a point of safety.



- A fire usually gives signals that it is changing: there are more frequent spot fires, trees are torching, or the general feel is more tense. Or the weather may give you a clue that things are about to change. There may have been a change in wind speed or direction, the humidity just took a drop, or the clouds are changing shape. If you are looking, you should pick up on some of these indicators.

- When to holler, “Fire!” You need to establish “trigger points” that dictate when to activate a plan. A “when, then...” plan is often used. For example: When something exceeds something, then everyone moves to safety. This may be when the relative humidity drops to a specific percentage. Or it may be when the fire reaches a certain ridge, then everyone moves. The key is that the lookout(s) and fireline personnel all know what the trigger points are, what they are to do when they are reached, who is going to track them, and who is going to sound the alarm.

There has to be some margin of safety in the timing of the move to safety. Ensure that if you have to move, you have the time you need. Do not wait until just before the fire hits. Be sure you factor in adequate travel time for the slowest firefighter who will be using it.

- Know the preferred escape route, but plan a couple of alternatives, just in case. Think now, when you have time—before someone says, “**Run!**” and you say, “We can’t go that way!” and the situation goes from dangerous to deadly.

Safety Zones - By order, you are required to have safety zones where you can seek protection from the fire. A properly designated safety zone should not require the deployment of a fire shelter. This is actually a tough requirement if you are working in tall timber and the potential flame lengths could be measured in the hundreds of feet. Under these conditions, the size of the safety zone would have to be huge. With potentials like that, you have to ask yourself, do I really need to fight fire in that place at that time? But, if you are there, you need to have a safety zone. Here are some specifics about safety zones:

- They have to be large enough to protect firefighters under worse than predicted fire behavior. They have to be scouted by experienced people to ensure they will work in an emergency.
- One of the most reliable safety zones is “the black,” as long as there is no canopy that can support a reburn. In some conditions, you can carry “the black” with you as you work. Any time you are in “the black,” watch for weakened trees, rolling rocks, etc.
- As work progresses along the line, new safety zones will have to be identified and announced to the crew and lookouts. With new safety zones, new escape routes will also need to be designated.

How much time will it take for the slowest person to get to the safety zone?

Sometimes it will be tough finding a proper safety zone. Don't be afraid to say you can't... and change your tactics.

- The most common rule of thumb on the size of a safety zone is four times the expected flame length, plus one foot for every vehicle to be included. So if you are fighting fire in mature chaparral and expect a flame length of 50 feet, you need a clearing with a four hundred-foot diameter, or just under three acres, to be safe from radiant heat!

Note in this detailed discussion, awareness was not specifically addressed. If you follow all of the items listed under the four primary points of LCES, awareness is covered within them.

Just in this one chapter, you have read about lookouts, communications, escape routes, and safety zones in at least four places. Enough is enough...but no. These are key points that only repetition is going to help with it “sinking in” and being recorded in your subconscious.

Now, if that isn't enough, there are some other dangers along the fireline you need to know about.

Fireline Hazards

The fire isn't the only danger on the fireline. There are sharp things, rolling things, falling things, slippery things, and things that bite. All can be dangerous by themselves.



Northtree Fire International

Figure 1.18 Stump holes are very dangerous. Not only will the tree eventually fall, but the stump and most of the larger roots will be consumed.

Fire and Other Hot Things

Most of this handbook is how to deal with the dangers of the fire itself. Along with the dangers of the fire, there is the potential to receive burns from dropping a foot into a burned-out tree stump, burning a hand while “feeling out” for fire during mop-up, etc. One must be very careful when working along a hot fireline (Figure 1.18).

In some parts of the west, the mountains are so steep, it is said, “you can lean against them.” In any terrain, the potential for falls is always present. You must watch your step and ensure that your footing is secure.

Wildland firefighting is usually conducted when it is hot and dry. These two factors can have a real impact on your body. When you sweat, you must replace the water that is lost. You must drink a lot of water to keep your body properly hydrated.

Hyperthermia

Heat related injuries are probably the most common medical aid event on a wildland fire, and it can be just as deadly as being hit by a tree. Ensure that you are properly hydrated and report to your supervisor if you begin to feel ill.



Smoke and Dust

Smoke (products of combustion) and dust will be present along the fireline. If you can work out of the smoke. Research has shown that a firefighter is exposed to the most toxic smoke during mop-up, when the fire is smoldering. So take precautions not to spend extended periods of time working in high concentrations of smoke and steam.

Smoke and dust also impair visibility, so one must be very careful when driving in such conditions.

Heat related injuries are very common on the fireline.

Walking the Fireline

If you are a wildland firefighter, you will be doing a lot of walking. If your footwear is not properly fitted, maintained, and broken-in, you will be “out of service” in short order. Here are some tips for you to follow while walking and working the fireline:

- **Pace and route** - The crew supervisor will set the pace and path to follow. No going your own way! The fireline is not a place to be lost. If you do get split up, move into “the black” for safety and sit still. Someone will eventually find you.
- **Safe distance** - In most cases, stay at least 10 feet apart when walking and working (Figure 1.19, p.42). This keeps you from interfering with the other members, keeps you away from their use of tools, and keep you away from branches that may whip back and strike you. If you must move through firefighters along the fireline, announce your intention by shouting, “coming through!”

Keep your distance; don't be hurt by your fellow firefighter.



Figure 1.19 Keep your distance when working with others close by. Walk and work a minimum of 10 feet apart. And, if you are swinging things, double the spacing.

White ash means heat.



USFS, MTDC

Figure 1.20 Snags like this one can fall at any time, especially when weakened by fire.

- **Darkness** - If it is dark, things can become much more dangerous. You can't see as far or "pick up on" hazards that are lurking in the shadows. Use some form of lighting to mitigate the situation.

- **Hazards** - Some of the specific hazards that you may encounter on the fireline are: falling trees, tree tops and limbs from the activities of other firefighters or their tools (bulldozers, aircraft, etc.). Also, leaning trees or snags, whipping branches, rolling rocks and/or logs, equipment like bulldozers, ATVs, etc., and unstable footing.

- **Stream or canal crossings** - If you have to cross a stream or canal, your footing on slippery rocks and logs will be your biggest hazard. Avoid high log crossings, because one slip may lead to a long fall. If the water is swift, face upstream and use a stick for balance. It is best if you remove your boots and loosen your pack, so if you do fall, the pack will come off easily.

- **Stump holes** - Holes as the result of a blown over tree should be avoided. Also, if you are in an area that has burned, stay away for stump holes burned-out by the fire. They can hold heat for long periods of time and are deeper than you think. Beware of white colored ash. This is an indicator of a lot of heat. Test an area of white ash for heat before working it.

- **Local hazards** - Know what is in your surroundings. Is poison oak present; are there bears or other animals you should know about; are there poisonous snakes or insects; is the water polluted? But most of all, know where the fire is and what it is doing.

Follow your supervisor's instructions, and inform him or her of any hazards you notice.

Snags, Trees with Fire in Them, and "Widow Makers"

A snag is a dead tree just waiting for its time to fall (Figure 1.20). A "widow maker" is a dead limb hanging in a tree that may fall when the tree is cut, or when dislodged by wind or a "drop" from an aircraft. They make little or no noise when they fall, thus they are considered silent killers. There are some indicators you can use to spot a potentially dangerous tree. These indicators are:

- Lots of downed trees in an area. You may be in a stand of lodgepole pine or an area where some of the trees have died. All of these trees can fall at any time, for a number of reasons. Watch out for:
 - Leaning trees.
 - Dead or broken tops and/or limbs hanging in the trees.
 - Trees that have lost needles, bark, or limbs.
 - Conks, basal scars, cat faces, numerous downed limbs, ants, or numerous woodpecker holes. These are signs of a dead or dying tree.
- Stump holes burning in the area.
- Smoke or fire at the base or in the top of a tree. This is again a sign of a dead or weakened tree (Figure 1.21).



Figure 1.21 When this snag fell, it hit a firefighter, severely injuring him.

Stump holes can be very deep and very hot.

There are four situations that will worsen a snag or dead tree problem. They are:

- You are working in the forest and a strong wind is blowing.
- You are working on steep slopes.
- You are working at night.
- You are working in a diseased or bug-kill area.

Give snags, especially those with fire in them, wide berth. Construct a line well away from them. Estimate their height and give them a 50 percent margin on the uphill and side slopes, and a 150 percent margin on the downhill side. Flag them like any other hazard. Get them on the ground as soon as you can. If you are not experienced enough to do it, get someone who is. Snags with fire in them are very dangerous, both as falling objects and sources of spot fires. Don't underestimate the dangers of working around snags (Figure 1.22). If the area cannot be made safe before entering, avoid it.

Trees with fire in them are also deadly, especially those with heavy lateral (overhanging) limbs. These limbs can break loose from the main trunk, especially when weakened by a fire burning in the interior of the tree. Approach very carefully, and have the tree taken down if it is considered unsafe.



Figure 1.22 Snags are one of the biggest killers of wildland firefighters. Be especially careful of dead trees with fire in them. They don't make a sound when they begin to fall.



Figure 1.23 Pick your spot to take a break carefully. Dead trees and gravity are a deadly combination.

“Widow makers” are a little more difficult to detect and protect against. Be especially careful when felling a tree or snag. This will dislodge them.

NEVER sit down and rest in an area where there are snags, burning trees, or “widow makers!”

(Figure 1.23).

Rolling Rocks or Logs

When fighting fire in steep, rugged terrain, rolling rocks and logs are always a danger (Figure 1.24).

They can be dislodged by the fire burning away material that is supporting them, by firefighters or equipment working above you, or by a misplaced hose stream. Bulldozers are notorious for producing

lots of rolling material. **Never work below a bulldozer.** When working in steep terrain, post lookouts, and maintain escape routes.



Figure 1.24 Rocks can be dislodged by bulldozers working above you, or by the fire itself burning fuels that are supporting the rocks.

Sharp Tools

When working on the fireline, always maintain good footing and ensure that the handle of the tool is not slippery. If hit by a retardant drop, clean the handle of your tool. The following are rules for using fireline hand tools:

- Carry hand tools at the balance point of the handle, and on the downhill side.
- Sharp tools should have guards on the cutting edge when not in use.
- Keep tools sharp; dull tools are dangerous.
- When not in use, place tools where they will not be tripped over or hurt anyone.
- Don't use a tool that has a loose head. Keep handles free from splinters and tight in the tool's head.
- Walk and work at least 10 feet from other firefighters.
- Use tools only for their intended purpose.



Chain saws are one of the most dangerous cutting tools on the fireline. Special training is necessary for their operation and use. You don't want just anyone cutting trees down on the line. Only trained and experienced people should be allowed to operate a chain saw. Proper safety equipment and a lookout are musts for saw operations. Know and follow your agency's policy regarding chain saw use.

Know and follow your agency's chain saw policies.

Noisy Tools

You should be concerned with noisy tools for two reasons: If you don't protect your ears, the noise may damage your hearing. The noise may also prevent you from hearing a warning of something dangerous. So, when working around noisy chain saws or heavy equipment, wear ear protection and ensure that you have a way to be warned of pending danger.

Vehicle Hazards

As a new firefighter, you may not be operating heavy equipment, but you should know about the potential dangers that machines present. Bulldozers and other vehicles are always a danger. They are not very forgiving, and the human body is no match for tons of steel. So keep your distance and be sure the operator knows where you are.

Mechanical things also break, especially when put under the rigorous strain of wildland firefighting. Ropes snap, loads shift, brakes fail, and unskilled, tired or inattentive operators make mistakes. Don't assume none of these things can happen when you are around equipment. Keep a heads-up, and leave a way to move out of the way.

If you will be using some form of vehicle to move to and from the fireline, here are some simple rules to follow:

- **Loading** - Follow the instructions of the person in charge of loading; use steps and hand-holds; use lights at night; sit in the seats provided, not on the running boards or tail gates; keep the tools in a safe place; and do not overload the vehicle. When approaching a helicopter, have the chin strap fastened on your helmet,

Eric Kurtz

"Arrive Alive!"

- A**lways drive defensively.
- R**educing response vehicle speed can prevent rollovers.
- R**ed traffic signals and stop signs mean complete STOP.
- I**nsist that vehicle occupants use seat belts.
- V**erify vehicle occupants are seated and belted.
- E**valuate road surface and weather conditions.
- A**bide by federal and state motor vehicle laws.
- L**engthy response distances require frequent rest stops.
- I**nitiate standard vehicle backing operating procedures.
- V**alue occupant and public safety versus time and speed.
- E**nter dangerous curves and intersections cautiously.

Many firefighters have been killed while in vehicles.

or hold it in your hands. Rotor wash has sucked many a helmet up into the rotors, causing thousands of dollars of damage. Also, never approach a helicopter from the rear or from ground higher than the helicopter. Being hit by a rotor blade will ruin your day.

- **Riding** - No horseplay—keep arms and legs inside the vehicle; do not throw stuff from the vehicle; no smoking; and wear the seat belts, eye protection, or life preserver, when applicable. If in an aircraft or boat, don't move around unnecessarily. You know about "rocking the boat."
- **Unloading** - Stay seated until the vehicle has stopped; unload one at a time, or as instructed. Use the steps or designated exit, and move away from the vehicle as directed.

Retardant Drops and Other Aircraft Hazards

It is best that firefighting personnel not be in the airtanker drop zone; however, it does happen. If you are working in and around aircraft, be very careful (Figure 1.25). Retardant is "slippery when wet," so watch your footing. It is also heavy, and when traveling at over one hundred miles an hour as it leaves the airtanker, it can kick up rocks, break the tops out of trees, and knock firefighters off of ridge tops.

Not only does retardant make things slippery, it sometimes knocks things out of trees.

In the past, bucket drops from lighter helicopters weren't too much of a danger. But, the bigger Type I helicopters can drop thousands of gallons of water, and this can be quite dangerous. Use the same precautions when working with helicopters as you do when working with airtankers.



Figure 1.25 If aircraft are working a fire, keep alert to where and when they will be dropping retardant. It might be exciting to be dropped on, but it is dangerous. Avoid it if you can.

Sling loads being delivered by helicopters can also be hazardous. They are heavy, and in a lot of cases, the helicopter pilots don't have a very good view of the load below them. So don't totally rely on them seeing you—move out of the area to a safe location.

Helicopters, especially the real big ones, have considerable rotor wash. This high velocity air can cause the fire to spread across lines, and has been a contributing factor in some fatal fires. This air can also break limbs and tops out of trees. This is just another hazard you must be aware of when aircraft and their associated activities are present on the fireline.

If you are required to be around a helicopter on the ground, follow the instructions very carefully. **Never** approach an operating helicopter without the pilot seeing you and acknowledging your approach. **Never** approach an operating helicopter from the rear. Tail rotors kill!

Snakes, Ticks, and Other Bad Things

We all know about snakes and their bites, but now there are ticks that carry Rocky Mountain spotted fever and Lyme disease. There is often poison oak (sumac) and ivy. The water in streams sometimes contains giardia, a parasite which causes dysentery.

Be aware of the dangers in your area. If you get bitten by a snake or bug, notify your supervisor immediately. Stay away from poison oak (sumac) and ivy as much as you can. If exposed, bathe as soon as you can and put on clean clothing. Don't drink from a stream or lake—only from your canteen or another known potable water source.

Bears, moose, and other wild animals also pose a threat to you as a wildland firefighter. You are on their turf and they may feel threatened. Avoid "close encounters" with big wildland critters.

Power Lines

Downed power lines are killers (Figure 1.26). **Consider any power line that is on the ground as one that is charged with electricity!** Keep everyone away from downed lines. Flag the area to warn others and restrict access. Notify your supervisor and any other firefighting personnel of

Ticks, snakes, and other wild things are always around you in the woods. You are on their turf.



Figure 1.26 Electricity is nothing to fool with. If power lines are down, or involved with your fire, be very careful. Power lines thought to be de-energized have killed firefighters.

Stay out from under high-voltage power lines.



Kari Greer

Figure 1.27 Heavy smoke will allow high-voltage electricity to go to ground. This can be very dangerous. Stay away from poles and tower structures, and from under power lines when the fire will be burning under them.

the situation. Only when the line is cut from the pole by a power company representative can you consider the line safe.

It is also dangerous to spray water directly on power lines. If a pole is on fire, or if downed power lines are near a source of

heat you want to cool, use only a spray-fog. A straight stream of water may have enough conductivity to deliver you quite a shock.



Another danger when fighting fires near high-tension power lines is the potential for dense smoke to allow the power to go to ground (Figure 1.27). One major component of smoke is carbon. Carbon is a good conductor of electricity, thus if the smoke is thick enough, the electrical energy will find a path to ground. This can be spectacular, and very dangerous. ***If a fire is moving***

under power lines, stay clear; do not assume the lines have been de-energized.

Heavy smoke can short out the power lines.

Here are some basic firefighting tactics and safety rules to follow when fighting fire near high-voltage power lines:

- If fire is within 100 feet of the power lines, assume that the smoke is thick enough to short the power grid. Abandon any direct attack and stay at least 100 feet from the outermost wire.
- If the main fire is more than 100 feet from the power lines and there are small spot fires closer to the wires, you can continue your attack. Small spot fires do not generate enough smoke to short out the power grid.
- Never work within 35 feet of a high-voltage tower or pole structure.
- When using water near power lines, do not spray water toward the power lines, or raise the stream above your



Jake says this about downed power lines, "You will only step on one in your life!"

height. Do not spray water into heavy smoke or at burning trees within 100 feet of the power lines.

- Do not use airtanker or helicopter drops near power lines. Retardant could short the lines or contaminate the insulators.
- Sometimes pipe lines and wire fences parallel or cross under power lines. Keep your distance from them. If a line were to drop on them, they would become energized.
- If fighting fire near high-voltage power lines, have a power company representative come to the scene to assist you.

Wildland/Urban Interface Hazards

When homes are present, the whole dynamic of a wildland fire changes. From a firefighting point of view, resources are diverted from line construction to structure protection. This presents a new set of hazards you must be aware of and concern yourself with. Some of them are:

When homes are involved, all the rules change, and some new hazards are present.

- ***Hazardous materials*** - Building materials, when they burn, release dangerous gases. Swimming pool chemicals, junk cars and garbage when burning also can be very dangerous.
- ***Propane tanks*** - Liquid petroleum gas tanks (LPG) are like bombs if exposed to a lot of heat. Keep them cool if you can. If they are venting and on fire, let them burn, but move some distance away. If you are not specifically trained and equipped to deal with a burning LPG tank, let someone who is do the work.
- ***Traffic*** - If you have a fire moving into any well-populated area, people may be leaving on their own, or be under orders to evacuate. You will have to move into the area using the same roads they are wanting to leave on. Narrow and/or congested roads are often a problem, so be alert.
- ***Panicked public*** - Nothing scares an untrained person like a fire does, especially if their home is threatened. If the evacuating public is scared, they can pose a real problem. Your first priority is the protection of life. If you can help move these people from harm's way, it is your duty to do so.



Kari Greer

Figure 1.28 Lightning struck this tree and started the fire. If you had been within 20 feet of this tree when it was struck, the incident would have been dispatched as a "medical aid with fire." Or worse, a coroner's case!

Don't be afraid to say you made a mistake!

When you get tired, you are not as effective.

Lightning

Lightning has killed firefighters. It doesn't happen often, but it does happen. If a storm is in your area, move away from tall trees that may act as lightning rods (Figure 1.28). If you have a vehicle, stay in it until the danger passes. If you are out in the open, sit down away from high points of terrain and wait it out.

Human Hazards

You will learn more about human limitations in the next section about human factors, but here is a brief list of some of the human hazards you should be concerned with:

- **Attitude** - If you or some of the people you are fighting fire with have an "attitude," it could adversely impact you. Firefighting is a full time job, and if your "head isn't screwed on straight," you have a problem that could endanger others.
- **Physical conditioning** - If you are not in proper physical shape, you may not be able to keep up with the crew and pack your weight of the load. Instead of being an asset to the team, you become a liability, a burden, and a distraction.
- **Training levels** - Know your limitations. If you are asked to do something you haven't been trained to do, don't attempt it. Speak up.
- **Experience or lack of it** - Reading this handbook gives you zero experience. Experience is gained by watching and doing. You will know after reading this handbook that fires usually burn uphill faster than downhill. But, unless you have seen how fast this can happen, your lack of experience will be a danger to you. Again, know your limitations and work within them.
- **Fatigue** - It is a fact that when you are tired, your ability to process things is diminished. Just know this is true, and be more careful when you are tired (Figure 1.29).
- **Critical stress** - When you see something that really disturbs you, like injured victims of an accident, your subconscious mind can begin to protect you from the pain and horror. Soldiers in battle and firefighters who have been exposed to dramatic situations all suffer from critical stress. Just be aware that if you have been exposed to something like this, you may want to talk to someone about what you are feeling. It isn't bad if you feel stress, it is only bad if you don't deal with it properly.

- **Viral infections, colds, and influenza** - Another hazard that you may confront is illness. When large groups of people are working and living in proximity, they will spread what they have to others. If you are tired and cold, you may be more susceptible. One of the best ways to prevent the spread of communicable diseases is to wash your hands.
- **Sanitation and food handling** - Washing your hands is also a primary way to help prevent infection from low-quality or improper sanitation facilities and food handling.

Human Factors

In recent years, more and more attention has been given to the strengths and weaknesses of human performance skills on the fireline. In some cases, accidents on the fireline happen because something broke, was worn out, or was lost. But most of the accidents on the fireline are due to human error. **Human factors awareness focuses not on what the firefighter did wrong, but why!**

For years, when a firefighter “screwed up” and someone was injured or died, we tried to determine what went wrong and added another “watch out.” We didn’t take into consideration that there might be a reason the firefighter made the mistake. Now we ask, “Why?”

Firefighting is a dangerous, high-risk business. People become firefighters partly because of the thrill of the fight, the teamwork, and the satisfaction when the fire is out. Safety was discussed during training, but we all went out and did what we thought had to be done. If you were properly trained and had a lot of experience, safety was a matter of “common sense.” You knew what was safe and what wasn’t. You automatically did what was safe for you and your crew. Understand your human limitations. Don’t let the “can-do” attitude get you into losing situations. Backing off is not a failure...it is a win for common sense.

Another problem you will have to deal with is communication. Even if you see something important,



Figure 1.29 There are times when you just want to give up. Nothing is going well and you want to go home. Bad days will happen, but people are counting on you to pull your own weight. Firefighting is dangerous, and fatigue can make it worse. Don’t let the “can-do” attitude get you into losing situations. Backing off is not a failure...it is a win for common sense.



you may be reluctant to report it, or you may not really understand an instruction you have just been given.

We are easily distracted.

Whether you are a new firefighter on your first fire or an old-timer with years of experience, communication is imperative. Here are some reasons why communication is important:

- Communication is required for you to receive orders and instructions.
- Communication is required for you to be aware of any new hazards and safety concerns.
- Communication is required for you to make others aware of what you see in a situation.
- Communication will play a major role in how you will learn about the business of firefighting.
- Communication can only be effective if the listener hears and understands what has just been said by the one talking. If a message is not heard, it has not been received. If a message is not understood, it, too, is not received. It is the responsibility of the sender to be heard and understood. It is the responsibility of every firefighter to ensure they fully understand. ***Speak up!***

To be sure that an order or information has been received, you can ask for the information to be repeated back to you. The key is that you have been heard or understand what you have been told. Clear and concise instructions are vital, especially if your level of experience is low. If you are unclear about the order, ask questions.

Why is it that someone “just isn’t listening?” There are some real common barriers to good listening:

Practice making sure people understand what you are saying.

- Preconceived opinions – “I know what he is saying, and I know the answer.”
- Distractions – You are simply thinking about something else or watching an airtanker circling overhead. Or, wondering what is for lunch, or what movie you will go see during your next days off.
- Filtering information – “It really isn’t that bad.”
- Not listening – but starting to answer before the question or instructions have been completed.

- Having an attitude either towards the sender or the message he/she is sending. This barrier of having an “attitude” about someone has been the root of several very disastrous accidents. Separate your personal or emotional “hang-ups” from your responsibility. Every firefighter is responsible for open, effective communication. If you ever feel that attitude is negatively affecting communication, speak up! You may be preventing a dangerous situation.

Another barrier to clear communications is that some words or phrases have different meanings. The fire service is full of special phrases or codes. This is one reason why radio codes are not being used as much as in the past. With a greater level of cooperation between agencies, the codes were a liability...a lot of the same codes had different meanings. The key is that if you hear a word or phrase that you do not understand...ask a question. It means you are listening...and learning.

Don't be afraid to ask questions.

There are five basic communication responsibilities:

- **Briefings** – The passing on of general information.
- **Debriefing** – After an incident or event you ask questions from those involved to learn what actually happened, what went right, and what went wrong. You learn from debriefing.
- **Warnings** – Information about hazards is passed on.
- **Acknowledge messages** – This is where you say you understand the information or order.
- **Questions** – “I do not understand what you are telling me.” You ask for clarification.

Only fools don't ask questions.

The last of these communication responsibilities is the toughest. You will be reluctant to ask for clarification, especially if you are just beginning your career as a firefighter. You must ask questions if you are not sure of the message. If you don't ask questions, how else will you learn?

How can you make a plan if you don't know what is happening around you?

If you are on the fireline and have just been given an order, here is a list of four questions that you should have the answers to:

- What task am I to perform?
- What are the known hazards?

- Where do I go to be safe?
- How do I get to this safe place?

The fireline is not one of the safest places to work, so what can you do to make it safer? Here are a few key things to remember:

- Any hazard or potential hazard should be reported to your immediate supervisor or coworkers.
- If the area is unsafe to work in or around, it should be flagged so others are aware of any dangers.
- There are two options for an unsafe area: make the area safe before entering; or avoid the area if it cannot be made safe.

*Be another set of eyes
on the fireline.*

Situational Awareness

One of the main reasons firefighters get hurt is that they really don't know what is happening around them. Their "situational awareness" is lacking. What is situational awareness? It is:

The gathering of information by observation or having it reported (communicated) to you. It is on the basis of this information that you will make decisions. This process of observing is not a one-time thing you do when you are sizing-up a fire, but a constant and continuous cycle. Just as a soldier in combat is always looking around, you as a firefighter must always be looking around, sensing what is really happening, and assessing how what you see may impact fire behavior, your fellow firefighters, and you.

*The situation is
constantly changing...
and it waits for no one.*

Until you see "fire in action," you cannot really begin to learn what it can and will do under different conditions. You are one more set of eyes watching what is happening. You may see something no one else does, and your observation may be the difference between life and death. There are many accident reviews of fatal accidents where it was determined that someone saw something and did not report it...and it would have made a difference. Don't be one of those! You are part of a team, and you will play a vital part of that team by keeping vigilant and not hesitating to report what you see. If you have situational awareness, you will be able to detect problems before they can hurt you...or others.

Hazard assessment is one the primary reasons for situation awareness. Using the 18 Situations that Shout Watch Out!, the Common Denominators of Fatal Fires, and other bits of information you have learned, will help you assess the situation.

To ensure that you are in compliance, review the rules of engagement and the 10 Standard Firefighting Orders. As mentioned several times, and it will be mentioned several more times in the following chapters, you constantly reassess. Why? Because things are constantly changing:

- **Time of day** - Fires burn more actively in the afternoon.
- **Weather** - As some people say, "Wait a minute and the weather will change." As the weather changes, the fire behavior changes.
- **Location of the fire** - As the fire moves, the topography and fuels being burned, or those about to be burned, may be different.

Most accidents involve human error.

Here are some factors that will hinder your attempts at situational awareness:

- **Inexperience** – You don't understand the significance of what you are looking at.
- **Stress** – You have other things on your mind. They may be related to work or your home life.
- **Fatigue** – You are flat tired. You have been up for hours and you are just not thinking straight.
- **Attitude** – It is the boss's job to keep track of what is happening, or other attitude barriers that compromise awareness.

If a team doesn't train and work together...it isn't a team.

If you are distracted, you usually think about other things...you are in another world. If you are less focused, you will not notice key events or hazards. You will not make good decisions, and more information may just confuse you.

Teamwork

Firefighting is a team effort. Teams are made up of many individuals, but a team is what it takes to fight fire safely and successfully. There may be stars on your favorite professional team, but it is teamwork that takes teams to championships.

A team is a grouping of people who work together, each pulling his or her weight, taking advantage of individual strengths, and compensating for weaknesses. A team understands

Jake says, "Attitude and safety are linked."



the mission and how to accomplish it as a cohesive group. Team members support each other and take pride in what they do. Most of all, they trust that the team and its leadership will work in a safe manner, allowing all members to return safely home and be able to say, "job well done."

Nothing will kill team spirit faster than:

- **Poor communication** - Individuals don't pass on vital information. Or it may involve team members who do not have a working knowledge of English.

- **Cliques developing** - Little groupings of individuals focus on the importance of their grouping rather than on the team as a whole. This breakdown of a team has contributed to the deaths of firefighters.

- **Poor work ethic** - If someone isn't pulling their own weight, the group will begin to break down. Bad apples need to be pulled into the team or let go.

- **Lack of respect** - If team members don't like one another or the team leader, the team will never pull together.

- **Complacency or lack of desire to improve** - A team is always trying to learn and do better. If players don't have the desire, they will never come together as a team.

- **Blaming others** - If team members start to blame other members for a team failure, the team will begin to break down. A team works together, compensating for individual weaknesses.

- **Selfishness** - If individuals put their personal welfare above that of the team, the team will not function as a cohesive unit.

A properly functioning team, with many eyes to spot hazards, hands to do the work, and brains to do the thinking, can do more work collectively than the sum of all the work they could do individually. It is said that a team is "only as good as its weakest

link," but if someone's strength helps the weakest on the team, the whole level of performance comes up a notch. A team is group of people who train and work together with a shared vision, common goals, and a cohesive sense of purpose. If a team does not train and work together, it is just a group of people, not a team.



Jake says, "There is no 'I' in team."

A properly functioning team accomplishes more!

Learn from what you have done...the good and the bad.



Jake says, "Since every fire is different, every fire is a learning experience."

After Action Fire Reviews

One of the best ways to learn from one's actions—whether they were right or wrong—is a post fire review. Most firefighters feel that if an agency conducts a fire review, they are looking for someone to blame. This shouldn't be the case. We should consider all fire incidents as learning experiences, and spend just as much time learning from the fires where events went well as from the ones where things didn't go so well (Figure 1.30).

There are times when good plans and intentions “tank.” Yes, sometimes people screw up. But in most cases, “it’s the fire’s fault.” It just didn’t read the plan...it did its own thing and someone got hurt.

Make it a habit to really analyze your responses and actions, and learn from them. Admit when you make an error, but also pat yourself on the back when things go well. Every fire is a learning experience. You will never stop learning. Use your experiences to teach others. Leading by example and good storytelling is a part of what makes a good firefighter.

Accountability

What does it mean to be “held accountable”? Unfortunately, most people view accountability as something that belittles them or happens when performance wanes, problems develop, or results fail to materialize. After all, when things are sailing along smoothly, people rarely ask, “Who is accountable for this success?”

Webster’s defines “accountable” as “Subject to having to report, explain or justify; being answerable, responsible.” Notice how the definition begins with the words “subject to,” implying little choice in the matter. This confession-oriented and powerless definition suggests what we all have observed—accountability is viewed as a consequence for poor performance; it’s a principle you should fear because it can only end up hurting you.



Figure 1.30 It looks like this firefighter has had a bad day and has something to report. No doubt we can learn something from his experiences. Learn from all the fire experiences you can...the good, the bad, and even the ugly!

Consider the following new definition of accountability:
“A personal choice to rise above one’s circumstances and demonstrate the ownership necessary for achieving desired results—to See It, Own It, Solve It, and Do It.” This definition includes a mindset or attitude of continually asking, “What else can I do to rise above my circumstances and achieve the

results I desire?” It requires a level of ownership that includes making, keeping, and answering for personal commitments. Such a perspective embraces both current and future efforts. Armed with this new definition of accountability, you can help yourself and others do everything possible to both overcome difficult circumstances and achieve desired results.



Jake says, “Be accountable for your actions. See it. Own it. Solve it. Do it.”

Chapter Summary

Firefighter safety is a firefighter's primary responsibility. To do the job effectively, you need to be well trained, focused and physically fit. There are standard rules that you must understand and follow when firefighting, as well as a series of dangerous situations that shout "Watch Out!" You must learn them and understand their significance; you must also understand the importance of weather, and how to analyze it so you can identify how it will impact you and fire behavior.

Understanding and accepting that fighting fire is a dangerous profession and that the fireline can be very dangerous will help you appreciate the various hazards to you, your crew and the public. In addition, knowing the tools, human frailties and challenges that develop on the fireline will make you a better, more efficient and safer firefighter.

Review Questions

1. A fire shelter protects you from what type of heat? [p. 12]
2. What are the three reasons the Ten Standard Firefighting Orders are NOT obeyed? [p.18]
3. What is the difference between the "Ten Standard Firefighting Orders" and the situations that Shout "Watch Out!"? [p.17 and p. 29]
4. What is the most common injury on wildland fires? [p. 43]
5. What is situational awareness and why is it important? [p. 56]
6. What does accountability mean? [p.59]

