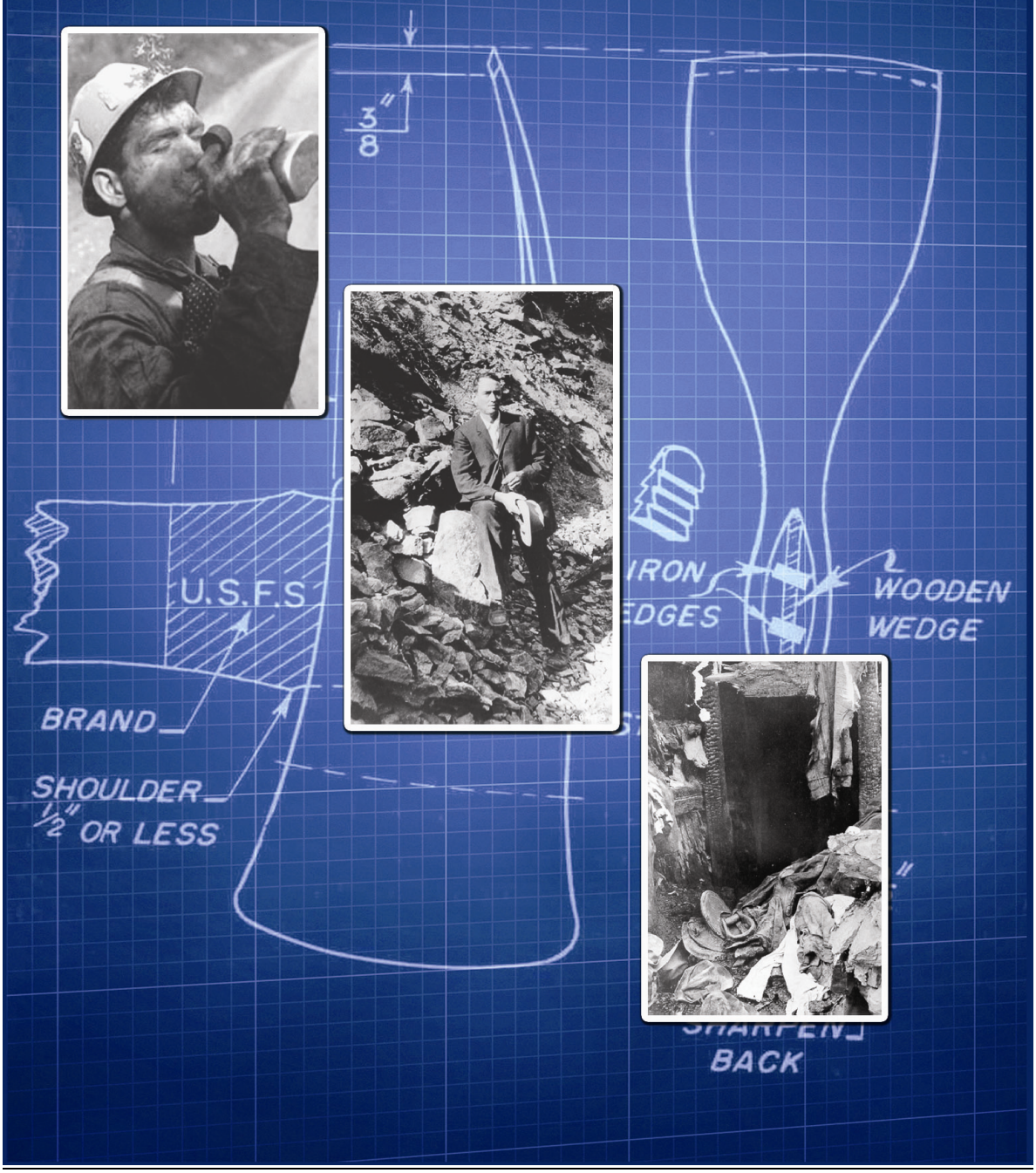
2010 Fireline Safety Refresher Training

Century of Fire



Student Workbook

Mission Statement:

The intent of annual fireline safety refresher training is to focus line-going personnel on operations and decision-making issues related to fireline and all-hazard incident safety. Refresher training will ensure firefighters have information regarding current initiatives, the upcoming fire season, and any policy/guidance changes. Refresher training is provided in order to recognize and mitigate risk, maintain safe practices, and to reduce accidents and near misses.

http://www.nifc.gov/wfstar/

INTRODUCTION

Annual Fireline Safety Refresher Training is required for all personnel participating in wildland fire who may be subject to assignments on the fireline. Check **your** specific agency policy to determine if this training package meets refresher training requirements. You are expected to be an active participant for each exercise and discussion.

PREREQUISITES

Students should have successfully completed S-130 and S-190 and have at least one season as a firefighter.

COURSE OBJECTIVE

Upon completion of this training, the student will be able to understand and apply basic safety principles for wildland firefighting.

COURSE MODULES

DESCRIPTION	GROUP DISCUSSION/EXERCISE	PAGE
Module 1 **Introduction**	Course introduction and overview.	**4**
Module 2 **The Fires of 1910**	Use the timeline provided to spark discussion topics.	**8**
Module 3 **Is Your LCES Adequate**	Tactical Decision Game regarding the adequacy of LCES with changing conditions and fire behavior.	**11**
Module 4 **Human Factors – The Gap**	Discussion topics relating to differing viewpoints in personal experiences.	**17**
Module 5 **Fit for Fire**	Self evaluation exercises relating to physical, psychological and environmental aspects of personal wellbeing.	**18**
Module 6 **Weather and Wind Warnings**	Exercise recognizing the indicators of specific cloud formations.	**24**
Module 7 **The Fire Triangle**	Analyzing a fire scenario and determining fuels, weather and topography.	**26**
Module 8 **Helicopter Operations**	Communications exercise focusing on clear, concise communication with aviation resources.	**29**
Module 9 **Troubleshooting the Mark III**	Review of set-up, operation and troubleshooting of Mark III pump operations.	**31**
Module 10 **2004 Module: Downhill Line Construction**	Discussion of tactical decision making processes and analysis of a case study of a tragic incident.	**37**
Conclusion/Fire Shelter	Hands on fire shelter visual inspections and deployment.	**42**

The 2010 Fire Refresher was built for firefighters, by firefighters.

Module 1- Introduction

Overview

Objective: Introduce course topics to students, review 2009 season statistics and discuss reference material.

Purpose: Introduce course and the material that will be covered.

Method: Students will watch video and facilitator will lead a class discussion.

Content: 2009 Fatalities, Entrapments and Serious Accidents, 2009 Wildland Fire Statistics, 2009 Safenet and Safecom– Contributing Factors, 2010 IRPG info

2009 FATALITIES, ENTRAPMENTS AND SERIOUS ACCIDENTS
As Reported by the Safety and Health Working Team

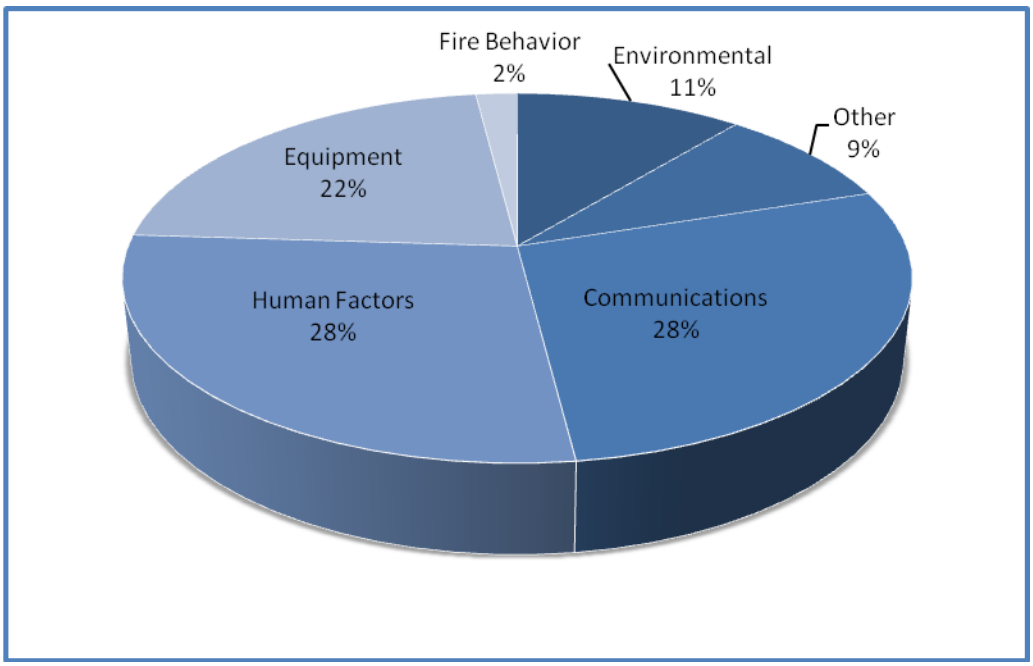
TYPE		FATALITIES
Entrapment	7 incidents – 27 individuals involved 4 shelters deployed	0
Burnover	3 burnovers, 10 individuals	0
Engines, Dozers, ATVs, and Vehicles	8 accidents – 5 rollovers, 2 collisions, 1 other	3
Aircraft	4 accidents	6
Heart Attack	4 incidents	4
Hazard Trees	5 incidents	1
Other	11 incidents	1

2009 WILDLAND FIRE STATISTICS

78,792 Wildfires
5,921,786 Acres

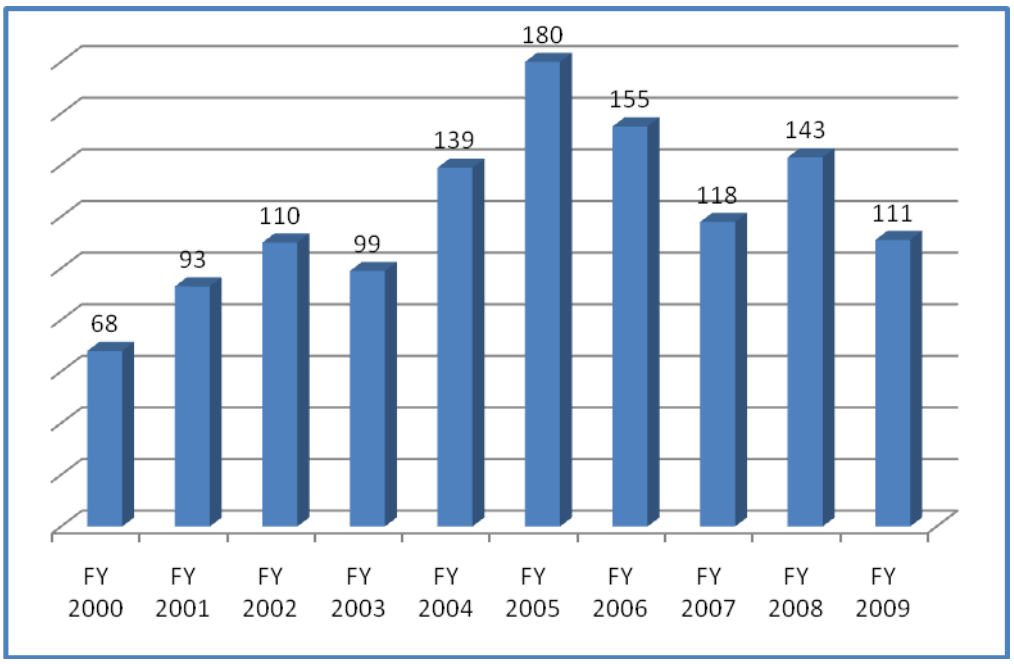
5-Year Average	10-Year Average
78,651 Fires	79,651 Fires
8,256,305Acres	6,904,042 Acres

2009 SAFENET - Contributing Factors

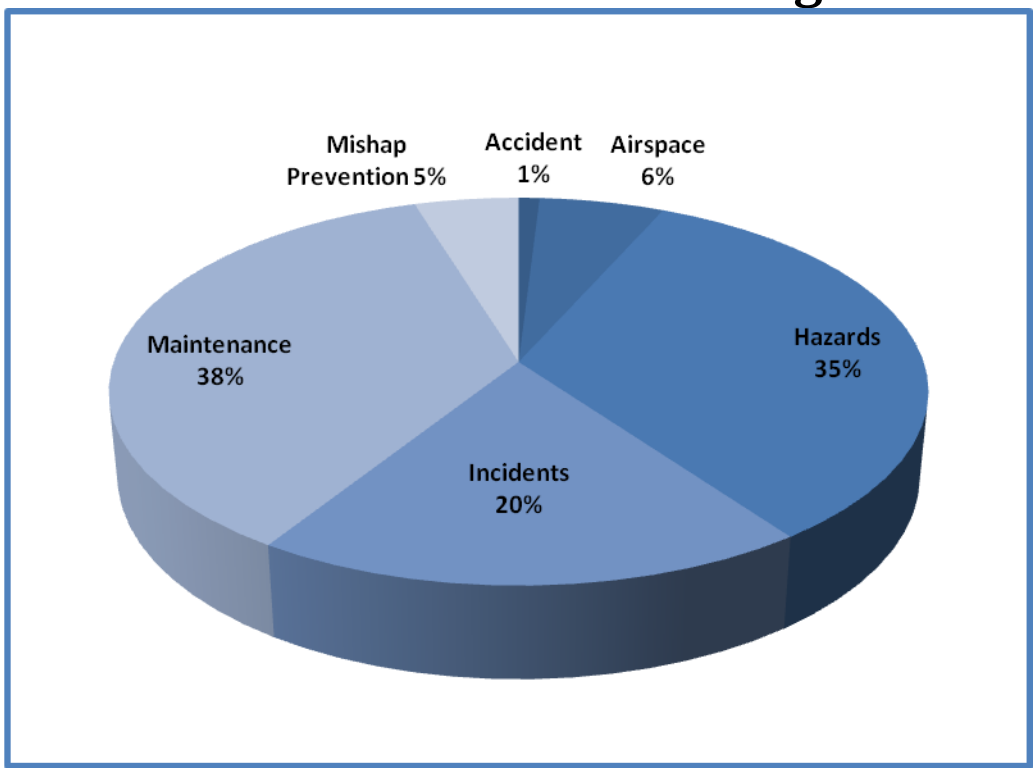


The SAFENET submission process is used by wildland firefighting agencies for reporting and resolving incidents relating to firefighter safety.
There were 111 SAFENETS submitted in 2009.

Total SAFENETs Filed



2009 SAFECOM – Contributing Factors



SAFECOMs are for reporting aviation mishaps
16,155 Safecoms Submitted

These are the new sections of the 2010 version of the IRPG.

IRPG SECTIONS

Inside front cover ..... Size-Up Report
White ..... Table of Contents and Other References
Green ..... Operational Engagement
Gold ..... Specific Hazards
Yellow ..... All Hazard Response
Red (Pink) ..... First Aid
Blue ..... Aviation
White ..... Other References
Inside back cover ..... Briefing Checklist
Back cover ..... Standard Firefighting Orders and Watch Out Situations

2010 Incident Response Pocket Guide Revision Summary

This 2010 edition of the Incident Response Pocket Guide reflects feedback from the first national comprehensive review of this publication since it was initially put into service in 1999. To denote this, the cover color has been changed to orange. There are a number of changes and corrections from the previous 2006 edition. This page provides a summary of notable changes and may be removed if desired.

New References

Preface
Specific Hazards Section (gold pages)
Roadside Response Safety
Oil and Gas Site Safety
All Hazard Incident Response
Heat-Related Injuries
Fire Danger Pocket Card
Fire Behavior Hauling Chart
Probability of Ignition Charts
Fireline Location
Working with Heavy Equipment
Engine and Water Tender Typing
Mark 3 Pump Information
Reporting Fire Chemical Introductions

Deleted References

Sample Patient History (2006 edition page 36)
Start Patient Triage (2006 edition page 40)
Flight Manager (2006 edition page 47)
PPE for Flight (2006 edition page 50)
Effective Use of SEATs (2006 edition pages 62-63)
USFS Visual Signal Code (2006 edition page 66)
Line Production Rates (2006 edition pages 88-90)
Dozer Use Hand Signals (2006 edition page 91)
Radio Frequencies and Contact Lists (2006 edition pages 100-102)

Existing References with Significant Changes

Wildland Urban Interface Firefighting
Hazard Tree Safety
HazMat Isolation Distances
Helicopter Passenger Briefing and PPE
Working with Airtankers
Procedural Felling Operations
Water Handling Information
Minimum Impact Suppression Tactics

Existing References Moved

After Action Review (green section to front section)
Direct/Indirect Attack (green section to white section)
Power Line Safety (green section to gold section)
Thunderstorm Safety (white section to gold section)
Hazard Tree Safety (white section to gold section)

Module 2 – The Fires of 1910

Overview

Objective: Students will view a documentary of the fires of 1910 and develop an understanding of where fire management began.

Purpose: Reviewing the history of fire management will help us understand where our business comes from and help us decide where we want it to go.

Method: Students will watch a video and participate in a group discussion.

Content: The Fires of 1910, featuring Stephen Pyne, and Timothy Egan

1910 Timeline

Your facilitator may choose to use the following timeline as discussion points.

1901 - Theodore Roosevelt becomes the U.S. President.

1904 - The Yale School of Forestry graduates the nation's first foresters.

1905 - The inaugural year of the Forest Service. Gifford Pinchot is appointed to Chief Forester.

1908 - Ranger Ed Pulaski is hired by the Forest Service in Wallace, Idaho at the age of 38. Roosevelt declines re-election. William H. Taft becomes President.

1910 - Before the Blowup

- Taft fires Pinchot for insubordination.
- In August, President orders over 1800 soldiers to assist with firefighting efforts in the Northern Rockies bringing the total amount of firefighters to 10,000.
- August 17th, *The Missoulian*, reports the town of Wallace, Idaho made a desperate attempt to create rainfall by igniting dynamite for sixty straight hours, but with no success.

- The Blowup

-August 20th, 1910 - The wind begins to blow several hundred fires located throughout the region, into five or six massive fires. Hurricane force winds of over seventy miles per hour, roared throughout the mountains, blowing through firelines and towns. Marshall law is declared by the mayor of Wallace.

-Evacuation trains loaded with thousands of scared people from the towns located along the tracks, went through flames and over burning bridges while escaping to Missoula, MT and Spokane, WA.

- After the Blowup

- The fires make the news worldwide. Ash from the fire was deposited across the Atlantic.
- Rain and snow fell effectively ending the fire season.
- Public sentiment shifted towards the Forest Service.
- Congress commits millions of dollars to help with forest rehabilitation and future fire suppression efforts.
- Individual firefighter compensation had to be applied directly to Congress.

Fatalities

(list does not include all fatalities from fire)

-Ed Pulaski's crew on Placer Creek - 6 firefighters + 2 horses
- John Bell's crew at Beauchamp homestead – 10 firefighters
- Debbitt's crew at Setzer Creek - 28 firefighters
- James Danielson's crew at Steven's Peak - 1 firefighter
- S.M. Taylor's crew at the Bullion Mine - 8 firefighters
- William Rock's crew at Setzer Creek - 1 firefighter
- Lee Hollingshead crew on the West Fork of Big Creek -18 firefighters + 5 horses

Ranger Ed Pulaski never received any compensation for his injuries that plagued him for the rest of his life. He did later win an essay contest with his account of the fires titled "Surrounded by Forest Fires". He used the prize money for more medical treatments. Pulaski retired after over twenty years with the Forest Service.

His legacy lives on through the tool he developed, the Pulaski, which firefighters across the nation continue to swing every fire season.

Recommended Reading

"The Big Burn"
by
Timothy Egan

"Year of the Fires: The Story of the Great Fires of 1910"
by
Stephen J. Pyne

Special thanks to
Stephen Pyne
And
Timothy Egan
for their efforts towards the production of this module.

Module 3 – Is Your LCES Adequate

Overview

Objective: Given the video, students will make realistic considerations regarding the adequacy of LCES taking into consideration fire behavior and changing conditions.

Purpose: Provide an opportunity to examine the original intent of the LCES and how fire behavior and changing conditions should be taken into consideration when implementing LCES.

Method: Students will watch a video featuring Brad Mayhew and participate in Tactical Decision Game.

Content: Is Your LCES Adequate, featuring Brad Mayhew

Tactical Decision Game Scenario: Part I

It is late July and you are in Western Montana on the Kootenai National Forest. You are the Engine Boss/ICT5 on a Type 4 Engine (12). You have two firefighters on your crew, one of which is a rookie and the other has 3 solid years of fire experience. Your engine has responded to a smoke report in the Steep Creek area. This fire is a lightning start and is burning in a thick lodgepole stand, with heavy blow down and steep slopes. The fire is located just 400 yards above the road on a southwest aspect and the hike into it takes about twenty minutes. There is an old helispot several hundred yards above the fire. At 1500, when you arrived on scene of the fire, you called dispatch with your size-up based on the following conditions:

Conditions at 1500

Temperature and RH……..…85° and 20%

Wind Speed and Direction…...Calm

Sky……..Partly Sunny, 30% cloud cover

Slope……45°

Flame lengths……..1 foot

Fire Size…….…1/4 acre

Assignment #1

Your assignment is to establish adequate LCES for the current conditions before beginning work on the fire. Take 3 minutes to develop your plan of action and prepare instructions to your crew.

Lookout(s) _____

_____

Communication: _____

_____

Escape Route(s)_____

_____

Safety Zone(s)_____

_____

Tactical Decision Game Scenario: Part 2

Now it is 1800 and you have stepped back from your fire to reassess the current conditions. You have a helicopter on scene that has dropped off 3 additional firefighters. The following is what you observe.

Conditions at 1800

Temperature and RH ……..…92° and 11%

Wind Speed and Direction…...Light, upslope, 8-10 SW

Sky……..Thunderstorms

Slope……45°

Flame lengths……..3 foot

Fire Size……..…1/2 acre with 20x20 spot

Assignment #2

Your assignment is to reassess your LCES and determine if each element is still adequate. Decide which elements need changed and communicate these changes to the resources on scene.

Lookout(s) _____

_____

Communication: _____

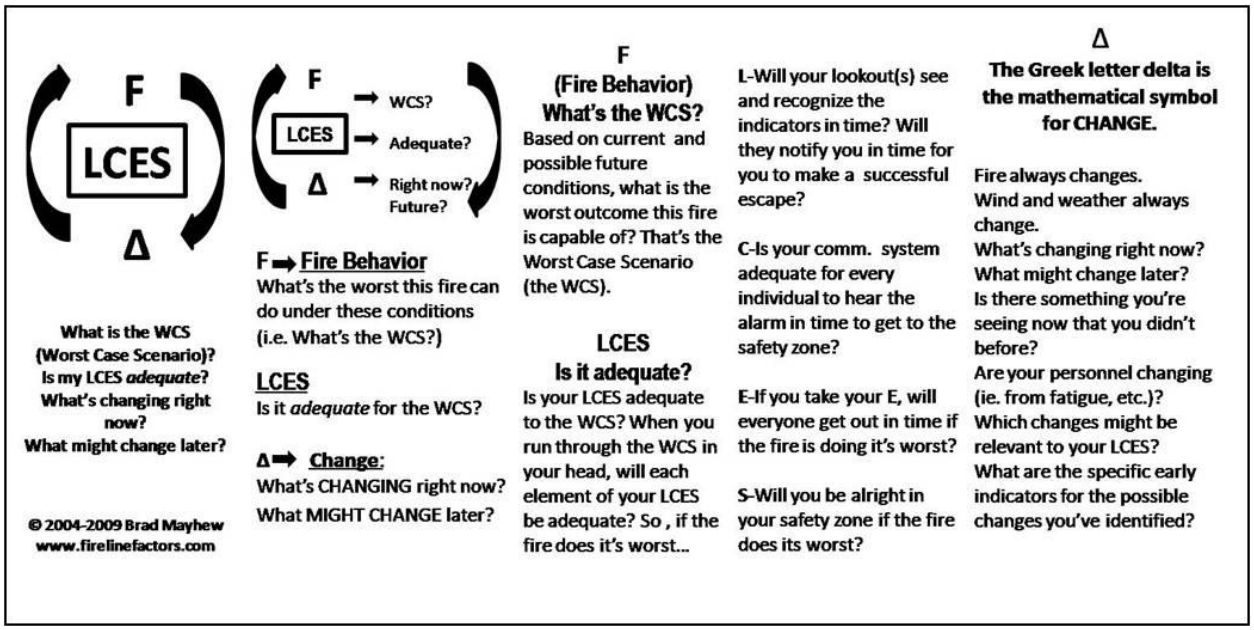
_____

Escape Route(s)_____

_____

Safety Zone(s)_____

_____



"LCES doesn't make any sense if it's not based on fire behavior and changing conditions."

~ Brad Mayhew; Instructor for Fireline Factors

Special thanks to
Brad Mayhew
from
Fireline Factors
for his efforts towards the production of this module.

"LCES"

Original Document
By
Paul Gleason
Former Zig Zag Hotshot Superintendent
June, 1991

LCES stands for lookout(s), communication(s), escape routes and safety zone(s). These are the same items stressed in the FIRE ORDERS and "Watchout" Situations. I prefer to look at them from a "systems" point of view, that is, as being interconnected and dependent on each other. It is not only important to evaluate each one of these items individually but also together they must be evaluated as a system. For example, the best safety zone is of no value if your escape route does not offer you timely access when needed.

A key concept - the LCES system is identified to each firefighter prior to when it must be used. **The nature of wildland fire suppression dictates continuously evaluating and, when necessary, re-establishing LCES as time and fire growth progress.** I want to take a minute and briefly review each component and its interconnection with the others.

Lookout(s) or scouts (roving lookouts) need to be in a position where both the objective hazard and the firefighter (s) can be seen. Lookouts must be trained to observe the wildland fire environment and to recognize and anticipate wildland fire behavior changes. Each situation determines the number of lookouts that are needed. Because of terrain, cover and fire size one lookout is normally not sufficient. The whole idea is when the objective hazard becomes a danger the lookout relays the information to the firefighter so they can reposition to the safety zone. **Actually, each firefighter has the authority to warn others when they notice an objective hazard which becomes a threat to safety.**

Communications(s) is the vehicle which delivers the message to the firefighters, alerting of the approaching hazard. As is stated in current training, communications must be prompt and clear. Radios are limited and at some point the warning is delivered by word of mouth. Although more difficult, it is important to maintain promptness and clearness when communication is by word of mouth.

Incident intelligence (regarding wildland fire environment, fire behavior and suppression operations) both to and from Incident Management (i.e. Command & General Staff) is of utmost importance. But I don't view this type of communication a normal component of the LCES system. Entrapment occurs on a fairly site-specific level. Incident intelligence is really used to alert of hazards (e.g.. "Watchout" situations) or to select strategical operations. LCES is primarily a Division function: responsibility should be here.

Escape Routes are the path the firefighter takes from their current locations, exposed to the danger, to an area free from danger. Notice that escape routes is used instead of escape route(s). Unlike the other components, there always must be more than one escape route available to the firefighter. Battlement Creek 1976 is a good example of why another route is needed between the firefighter's location and a safety zone.

Escape routes are probably the most elusive component of LCES. Their effectiveness changes continuously. As the firefighter works along the fire perimeter, fatigue and spatial separation increases the time required to reach the safety zone. The most common escape route (or part of an escape route) is the fireline. On indirect or parallel fireline, situations become compounded. Unless safety zones have been identified ahead, as well as behind, firefighters retreat may not be possible.

Safety Zone(s) are locations where the threatened firefighter may find refuge from the danger. Unfortunately shelter deployment sites have been incorrectly called safety zones. Safety zones should be conceptualized and planned as a location where no shelter is needed. This does not intend for the firefighter to hesitate to deploy their shelter if needed, just if a shelter is deployed the location is not a tree safety zone. **Fireline intensity and safety zone topographic location determine safety zone effectiveness.**

Again, a key concept - the LCES system is identified prior to when it must be used. That is lookouts must be posted with communications to each firefighter, and a minimum of two escape routes form the firefighter's work location to a safety zone (not a shelter deployment site) every time the firefighter is working around an objective hazard.

Safety and tactics should not be considered as separate entities. As with any task safety and technique necessarily should be integrated. The LCES system should be automatic in any tactical operation where an objective hazard is or could be present.

LCES is just a re-focusing on the essential elements of the FIRE ORDERS. The systems view stresses the importance of the components working together. The LCES system is a result of analyzing fatalities and near misses for over 20 years of active fireline suppression duties. I believe that all firefighters should be given an interconnecting view of Lookout(s), Communications(s), Escape routes and Safety zone(s).

Module 4 - Human Factors - The Gap

Overview

Objective: Students will analyze individual experiences to better understand differing points of view, often seen as an "error" in decision making during fires.

Purpose: To provide an opportunity to see differing points of view during decision making processes.

Method: Students will watch a video and reflect upon personal experiences.

Content: Human Factors – The Gap, featuring Ivan Pupilidity; Human Performance Specialist

Human Factors Discussion Topics

Describe an incident where your perceptions of events were different than your fellow co-workers.

What are some reasons you have been reluctant to provide information to a supervisor following an incident that raised some concerns?

What are some examples of "the gap" that you've seen at your unit or while working on or in support of fires?

What are some "vague" or "not well defined" words or phrases that we use as firefighters or in support of fire?

The truth is that people create safety in a very unsafe world.

Ivan Pupilidity, Human Performance Specialist; USDA Forest Service

Special thanks to Ivan Pupilidity for his efforts toward the production of this module.

Module 5- Fit for Fire

Overview

Objective: Students will recognize and set goals for personal improvement of overall wellness.

Purpose: For students to improve upon their current wellness levels.

Method: Students will participate in a self-evaluation, watch a short video and then re-evaluate their personal exercise answers.

Content: Firefighter Fitness and Wellness, featuring Joe Domitrovich, Project Leader at Montana Technology and Development Center ; Dr. Charlie Palmer, University of Montana Assistant Professor; Department of Health and Human Performance

Firefighter Wellness Self Evaluation

Exercise #1

Write down your strengths as they apply to your current fitness, wellness and performance levels. _____
_____
_____
_____

What areas of fitness, wellness and performance levels do you think you need to work on?
_____
_____
_____
_____

*****DO NOT PROCEED UNTIL DIRECTED TO DO SO BY FACILITATOR*****

Fire Tech Tips

MTDC

USDA, Forest Service

July 2002

Feeding the Wildland Firefighter

Brian Sharkey, Project Leader; Brent Ruby, Physiologist; Carla Cox, Registered Dietician

Recent research has identified nutritional strategies that will improve the health, safety, and productivity of wildland firefighters. The right food sources, properly timed, provide energy and nutrients that help sustain work output and maintain the function of the immune system. Supplemental high-energy foods delay fatigue and enhance immune function while maintaining the firefighter's ability to think and make decisions during periods of hard work. This Tech Tip outlines simple strategies for maintaining health, safety, and performance during prolonged periods of arduous work.

Energy

Research by the University of Montana Human Performance Laboratory and the Missoula Technology and Development Center (MTDC) has demonstrated the energy demands and energy intake of wildland firefighters. In a recent field study (Ruby and others 2002), male firefighters burned an average of 4,758 kilocalories a day while they consumed only 4,068 kilocalories. The daily caloric deficit of 690 kilocalories results in a 1.25-kilogram (2.76-pound) weight loss over the course of a 14-day assignment. Female firefighters burned an average of 3,550 kilocalories per day, while consuming 3,222 kilocalories, for a daily deficit of 328 kilocalories. They lost 0.6 kilograms (1.3 pounds) of body weight in 14 days. This energy deficit could result in significant weight loss, including loss of lean body weight. When energy intake falls short of requirements, the body derives needed energy from muscle tissue. This loss of lean tissue will increase the likelihood of fatigue and could reduce the ability of a firefighter to perform arduous work.

The study by Ruby and others shows that some male firefighters may require over 6,000 kilocalories of food daily, while some females may require more than 5,000 kilocalories during a long, hard shift. The meals provided in fire camp are planned to meet the caloric demands of wildland firefighting. Computerized nutritional analysis of the meals yields a daily total of 5,800 kilocalories, but the firefighter must eat all the food provided to receive all 5,800 kilocalories. The computer analysis also indicates that most meals exceed dietary recommendations for fat and were somewhat low in nutritional carbohydrates. Complex carbohydrates (such as potatoes, corn, rice, beans, and whole-grained breads and pasta) provide energy while also supplying needed nutrients and fiber.

Dietary Recommendations

Studies of endurance athletes, soldiers, and wildland firefighters support the need for a diet that is high in carbohydrates and low in fat. Carbohydrates help maintain immune function, while too much fat may degrade the function of the immune system, increasing the risk of upper respiratory and other health problems. We recommend the performance diet for wildland firefighters and for everyone who wants to engage in vigorous physical activity (table 1).

You can approach these levels by:

Nutrient	% of Daily Calories
Carbohydrates	60
Fat	25
Protein	15

Table 1, The Performance Diet

- Increasing your intake of complex carbohydrates (potatoes, corn, rice, beans and whole-grained breads and pasta) and fruit (fresh, dried, or canned)
- Maintaining your usual level of fat, emphasizing healthy fats in nuts, seeds, and oils while minimizing saturated and hydrogenated fats.
- Consuming high-carbohydrate energy supplements during and immediately after work

Protein

Endurance and strength athletes need 1.2 to 1.6 grams of protein per kilogram of body weight daily. Fire camp meals provide this much protein. Excess protein is not recommended for firefighters because it can compromise carbohydrate intake, increase fat intake, and lead to chronic dehydration in active individuals.

Nutrients—You can get the vitamins, minerals, antioxidants, and immune-friendly foods your body needs by eating the recommended number of servings of fruits and vegetables. For the prolonged arduous work of firefighting, you should try to eat four servings of fruit and five servings of vegetables daily (one serving is about the size of your fist). An apple or orange is one serving, as is ½ cup of apricots, dried fruit, or fruit juice. Two and one-half cups of vegetables will meet the daily requirement. Select dark leaf lettuce and a variety of vegetables (such as green beans or carrots).

Energy Supplements

Solid and liquid carbohydrate supplements provide muscle energy and help keep you thinking clearly while helping to maintain or even improve immune function.

Solid Supplements

During Work—The energy bars used by endurance athletes are an excellent way to supplement energy between meals. Consuming one 250-kilocalorie bar between breakfast and lunch and one between lunch and dinner provides an additional 500 kilocalories of energy each day. Less expensive candy bars are a reasonable substitute for energy bars and have proven more palatable in taste tests. However, candy bars contain more fat than energy bars, and the chocolate in some bars tends to melt when exposed to heat.

After Work—Studies show that carbohydrate replacement (in liver and muscle) is most rapid during the 2 hours immediately after the end of the work shift. Firefighters should be provided at least 500 kilocalories of energy replacement in the 2 hours after work. Carbohydrate supplements will ensure the firefighter's ability to recover and be ready for work the following day. Liquid carbohydrate sources are absorbed faster than solid supplements; they aid rehydration and may speed recovery. Grape and cranberry juices are high in carbohydrates. Ingesting some protein (1 gram of protein per 4 grams of carbohydrates) within 2 hours after work may reduce muscle stress and accelerate replacement of muscle glycogen. Sports recovery drinks that provide this ratio of carbohydrates and protein are available in powdered form.

Combining the energy supplements consumed between meals with those taken after work yields an additional 1,000 kilocalories of energy.

Liquid Supplements

Firefighters need to consume fluids before, during, and after work to maintain hydration. Carbohydrate/electrolyte beverages (C/E or sports beverages) provide fluid, energy, and electrolytes needed during prolonged work. The sports beverage promotes increased fluid intake and helps maintain blood sugar during arduous work. The electrolytes help conserve fluid that might otherwise be lost in urine.

During Work—MTDC recommends that one-third to one-half of fluid needs be met by drinking a sports beverage. Because firefighters need about 1 liter (about 1 quart) of fluid for each hour of work, they will need 4 to 6 quarts of sports beverage for a 12-hour shift. Firefighters can be given packets of dried drink mix that they can mix as needed A 3- to 5-percent carbohydrate solution (30 to 50 grams of carbohydrates per liter of water) is well tolerated during work in the heat. Four liters of water with 200 grams of carbohydrates provides 800 kilocalories of energy. The balance of fluid needs should be met by consuming water at regular intervals (about 8 ounces every 15 minutes). Drinking a sports beverage and water is the safest way to maintain hydration while providing additional carbohydrates to maintain blood glucose.

After work—To rehydrate and to replace muscle and liver carbohydrate stores, firefighters should consume about 2 quarts of a sports beverage in the 2 hours immediately after work. A higher carbohydrate concentration (10 to 15 percent) is tolerated after work, when the crew is traveling or waiting for transport. The electrolytes in the drink help retain the needed fluid. This approach ensures fluid replacement, muscle recovery, and optimal replacement of muscle carbohydrate stores (muscle glycogen).

The liquid energy consumed during and after work provides an additional 1,000 kilo-calories of energy.

Energy Summary

The energy consumed in meals, combined with solid and liquid carbohydrate supplements, provides fuel to power firefighters during long shifts and extended assignments (table 2).

Energy Source	Approximate kilocalories
Meals	**4,000**
Solid supplements	**1,000**
Liquid Supplements	**1,000**
Total energy	**more than 6,000**

Table 2 – Daily Energy Sources

Recommendations for Firefighter Nutrition

- Eat more complex carbohydrates (potatoes, corn, rice, beans and whole-grained breads and pasta).
- Eat fatty foods (steak, cheese) and added fats (margarine, mayonnaise) in moderation.
- Consume supplemental carbohydrate energy (energy or candy bars) between meals.
- Consume one-third to one-half of daily fluids in the form of a carbohydrate/electrolyte sports beverage. Carry enough powdered drink mix for 4 to 6 quarts of beverage.
- Consume solid and liquid energy supplements immediately after the end of the work shift.
- Eat four servings of fruits and five servings of vegetables daily (a serving is a fist-sized portion).
- Consider taking a daily vitamin/mineral supplement if dietary recommendations cannot be met, when environment conditions (such as smoke) are severe, or when appetite or food availability limits energy and nutrient intake.

Questions and Answers

Q. Has one sports drink been proven to be more effective than the others?

A. No. Research has not demonstrated meaningful differences among competing products. The important thing is to get fluid, carbohydrates (50 grams per liter), and electrolytes in your sports beverage.

Q. What about the so-called "energy" drinks? Are they suitable for hydration?

A: No. Most of the beverages sold as energy drinks contain more carbohydrates (80 to 120 grams per liter) than are needed during work (30 to 50 grams per liter). The high concentration of carbohydrates could slow the rate at which fluid is absorbed from the intestines. In addition, most of these products contain caffeine (a diuretic), guarana, ephedra, or other stimulants that could interfere with the body's ability to withstand heat stress.

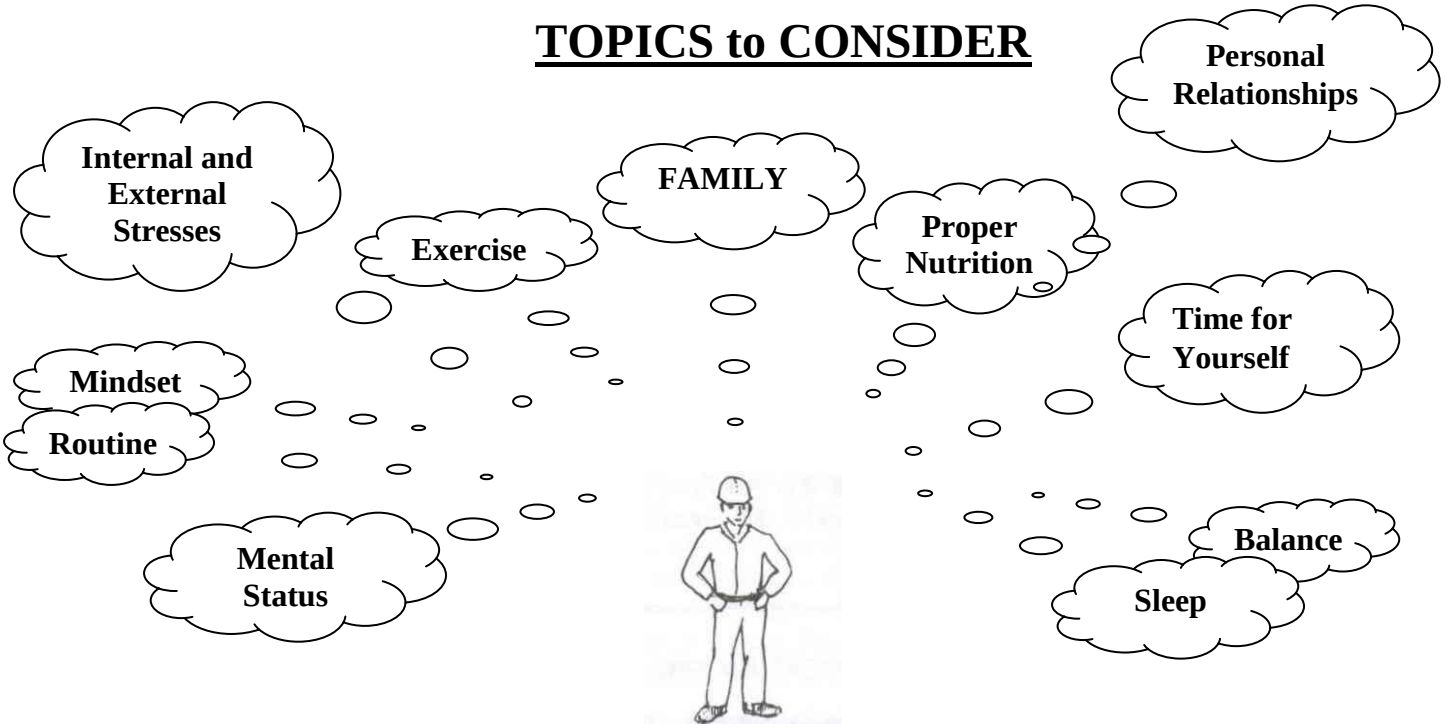
Q. Has one energy bar been proven to provide superior results?

A. No. Studies have not demonstrates differences in athletic performance or immune function, regardless of the type of carbohydrates, or the balance of carbohydrates, protein, and fat in the product.

Q. Can candy bars be used to provide solid energy supplementation?

A. Yes, but keep several points in mind. Candy bars contain more fat than energy bars. The chocolate in candy bars melts in the heat. Some candy bars contain peanuts that could trigger allergic reactions in a small number of firefighters. MTDC recommends a mix of candy and energy bars. Consume the chocolate before temperatures rise.

TOPICS to CONSIDER



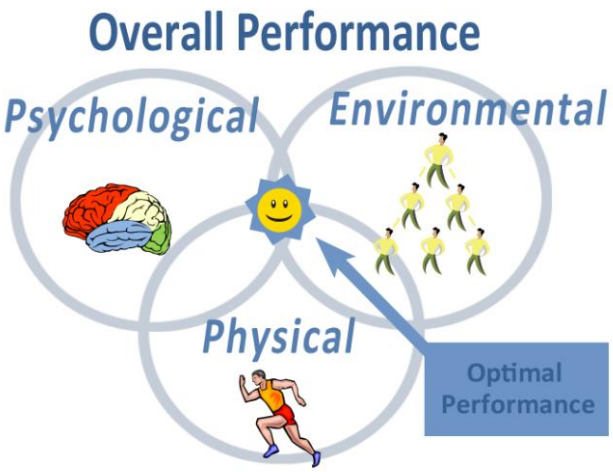
Self Evaluation Exercise #2

After watching the video, are there any additional fitness, wellness and performance levels that you can add to your list of strengths?

_____
_____
_____
_____

Did the video trigger any thoughts as to additional psychological, environmental or physical weaknesses you can work on ?

_____
_____
_____
_____



Exercise #3

From the above Self Evaluation Exercises, set 2 or 3 long term goals to work towards improving your overall performance levels. If necessary, set some short term targets to achieve those goals.

_____

_____

_____

_____

"When we're at the top of our game physically, psychologically, and environmentally, we are capable of performing optimally, but that's really hard to get to."

~ Dr. Charlie Palmer, University of Montana Assistant Professor; Department of Health and Human Performance

Special thanks to
Charlie Palmer and Joe Domitrovich
for their efforts towards
the production of this module.

Module 6- Weather and Wind Warnings

Overview

Objectives: Students will be able to:

1. List five visual indicators preceding a wind event

2. Describe how situational awareness and safety are interconnected with weather observations and weather forecasts.

Purpose: To emphasize that firefighters must assume personal responsibility for safety through attentiveness to predicted wind events and changing conditions.

Method: Students will watch a video and participate in a group exercise.

Content: Weather, featuring Heath Hockenberry, National Fire Weather Program Manager

Wind and Cloud Indicators

Instructions

The following are some pictures of cloud formations. For Assignment #1, below each picture, describe what future weather patterns the clouds could indicate. In addition, predict the type of fire behavior that could be expected from the possible resulting wind event from each cloud formation. Answer the question for Assignment #2 if suggested by your facilitator.

EXAMPLE

Indicates cool air aloft, possibility instability, could lead to active fire behavior

ASSIGNMENT #1

_____
_____

_____
_____

_____
_____

_____
_____

_____
_____

_____
_____

ASSIGNMENT #2

Cloud formations are very good indicators for predicting changes in weather and wind. What other types of indicators can you notice while in the field that would precede a wind event?

_____
_____
_____
_____

"You should have a 90% idea about the weather from daily weather briefings, issued warnings and watches, IAP's etc., but that 10% has to be filled in by your training, and your situational awareness of the surrounding area."

~ Heath Hockenberry, National Weather Service; National Fire Weather Program Manager

Special thanks to Heath Hockenberry for his extra efforts in the production of this module.

Module 7- The Fire Triangle

Overview

Objective: Students will be able to list the details of the three components of the fire triangle as they relate to a fire scenario.

Purpose: To review the basics of the fire behavior and the fire triangle.

Method: Students will watch a video and participate in an analysis of the fire triangle components of a fire scenario.

Content: Fire Behavior featuring Tami Parkinson

The Fire Triangle

SMITH MEADOWS FIRE SCENARIO

Weather

- **Wind (direction, speed, etc):** _____
- **Temperature/Relative Humidity:** _____
- **Precipitation:** _____
- **Atmospheric Stability:** _____

Topography

- **Slope/Aspect:** _____
- **Valley/Ridge/Draw/Other:** _____

Fuels

- **Loading:** _____
- **Size and Shape:**_____
- **Arrangement:** _____
- **Moistures:** _____

Were you able to identify all the components of the Fire Behavior Triangle? If not, how would you gather the missing information?

_____
_____
_____
_____

Which of the three parts (Weather/Topography/Fuel), would be the most challenging to address while making a tactical decision on this fire? Why?

_____
_____
_____
_____

WEASEL RIDGE FIRE SCENARIO

Weather

- **Wind (direction, speed, etc):** _____
- **Temperature/Relative Humidity:** _____
- **Precipitation:** _____
- **Atmospheric Stability:** _____

Topography

- **Slope/Aspect:** _____
- **Valley/Ridge/Draw/Other:** _____

Fuels

- **Loading:** _____
- **Size and Shape:**_____
- **Arrangement:** _____
- **Moistures:** _____

Were you able to identify all the components of the Fire Behavior Triangle? If not, how would you gather the missing information?

_____
_____
_____
_____

Which of the three parts (Weather/Topography/Fuel), would be the most challenging to address while making a tactical decision on this fire? Why?

_____
_____
_____
_____

Fire Triangle

Fire Behavior Triangle

"The purpose of this module is to basically emphasize for each and every firefighter that they are fire behavior specialists out on the ground."

~ Tami Parkinson, AFMO Boise National Forest

Special thanks to Tami Parkinson of the Boise National Forest for her efforts towards the production of this module.

Module 8- Helicopter Operations

Overview

Objective: Students will be able to identify four ways they can make air-to-ground communication clearer, more concise, and faster, thus minimizing accident risk for firefighters and aviation resources.

Purpose: Preparing students to communicate in a way that maximizes the efficiency of helicopter operations.

Method: Students will watch a video and participate in a communications exercise.

Content: Helicopter Operations, featuring Cathy Barta and John Quackenbush

Communications Exercise

Introduction

John is a new firefighter and this is his first time calling in bucket drops. He's very excited for this mission, but needs some advice and help about clear, concise communications. Rewrite the following paragraph as if you were John contacting a non-local helicopter pilot for the first time for bucketwork. Eliminate all the "unnecessary information," and keep the communication as short and concise as possible.

Communication

"Hey pilot on November Two Nine Five Mike, I am the guy standing down here with my crew on the top of the fire with the pink, uh, flagging on the top of my tool, it's a combi tool and I'm going to be your dude on the ground and my name is John Tucker so you can talk to me when we are communicating. You're at my twelve o'clock. Well, it's more like 1 o'clock now since you're moving around a little. I need you to get us some water on this hot spot, I mean, uh, stumphole and it's right here next to me, so if that bucket's full now, let's just put her on this stumphole and that would help us out a lot. I can put an orange panel down if that'll help. Do you see me? I'm on channel 2. I gotcha at my 6 o'clock now."

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

The more you can limit exposure (to helicopters), the safer you can perform your firefighting duties.

~ Cathy Barta, Lewistown MT BLM; Helicopter Crew Supervisor

Special thanks to
Cathy Barta
of the
Lewistown, Montana BLM
and
John Quackenbush
of the
Boise, Idaho BLM
for their efforts towards the production of this module.

Module 9- Troubleshooting the Amazing Mark III Pump

Overview

Objective: Students will be able to identify and discuss the three main components of the module: set up, operation, and maintenance of Mark III pumps.

Purpose: To maximize the efficiency of Mark III pumps and avoid problems that require time-consuming troubleshooting.

Method: Students will watch a video and participate in an exercise.

Content: Mark III Pump Troubleshooting, featuring Thom Taylor and Mark Noyes

Mark III Pump True/False Exercise

Instructions

Decide if each of the following statements is True or False and write at "T" or "F" in the blank provided.

Assignment

T/F	Statement
	It's okay to run Mark III's without water.
	Correct Mark III fuel mixtures depends on the region you're working in.
	It's okay to prime the pump head with a bucket or another container if there is no hand primer available.
	Mark III pumps need one squirt of grease about every 8 hours.
	It is necessary to choke an already warm engine when restarting.

	It is not necessary to let the pump warm up before moving throttle to the run position.
	It is a good idea to let engine idle for one to two minutes before shutting down.
	The yellow cut out switch is important for stopping the engine and preventing damage should over speeding occur.
	A wet sparkplug might indicate a flooded engine.
	The connection between the suction hose and the pump can be "hand-tight" for the pump to work properly.
	General rule of thumb, let the pump warm up for at least 2 minutes before going to full throttle
	Most Mark III kits do not come with earplugs.
	Disconnecting the fuel line is part of the deflooding procedure.
	A copper gasket and plug seals the bottom of the crankcase.
	One proper procedure for shutting down a Mark III pump is to throttle-down, disconnect the fuel line and let the pump die on its own.

"Is this a pump problem or an operator problem?"

Mark Noyes, Forestry Technician

Special thanks to
Thom Taylor of the Mt. Baker-Snoqualmie NF
and
Mark Noyes of the Wallowa-Whitman NF
for their efforts towards the production of this module.

Extra Note: The 2010 IRPG has added a new section referencing the troubleshooting of Mark III pumps on page 93.

#1. PROPER PLACEMENT OF PUMP

1.1

- Find flat ground or create flat ground (Fig. 1.1)
- Keep suction lift as low as possible.
- Stake down berm if necessary to prevent creep/maintain pump position.
- Place high pressure pump, fuel line and fuel tank in containment berm.
- Gas absorbent pads should be replaced when needed.
- Utilize the garbage bags provided in the kit for disposal.

* If oily sheen appears on water in the containment berm, place absorbent pad in berm for 10 minutes, put pads in garbage bag and throw away, then empty berm 300 feet away from water source.

** If a spill occurs or gas enters the stream or pond, notify your supervisor immediately. Spill containment kits are available at district office and ICPs. The resource advisor must be notified immediately.

2. FUEL MIX (Note: Alaska provides pre-mixed fuel.)

Manufactures' recommendation is 24:1. Mix according to regional standard. Indicate fuel mixture on tag and attach to pump-adapted can. (Fig 2.1)

2.1

- Mix procedure: Pour approximately one gallon of straight gas into pump-adapted can.
- Add appropriate amount of 2 cycle oil to gas then shake can vigorously
- Add remainder of straight gas then shake can again.

MAKE SURE ALL FUEL IS MIXED PROPERLY BEFORE USING HIGH PRESSURE PUMP

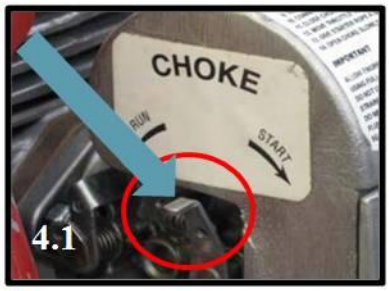
3. SET UP

- Connect suction hose and foot valve (suction side connections should be wrench-tight).
- Place foot valve at least one foot under water. Do not place foot valve directly on sandy or muddy (stream/lake) beds.

3.1

- Prime the pump head by either using hand primer or by filling with pail. Fill to the brim of prime port and wrench tighten cap.
- Attach hose curl (pigtail) to discharge side of pump. Attach check and bleeder valve to hose curl. (Fig.3.1)
- Utilize 1" port on check & bleeder valve to recirculate water back to the water source.
- Attach fuel line to pump adapted can. Proceed with hose lay.

#4. START UP



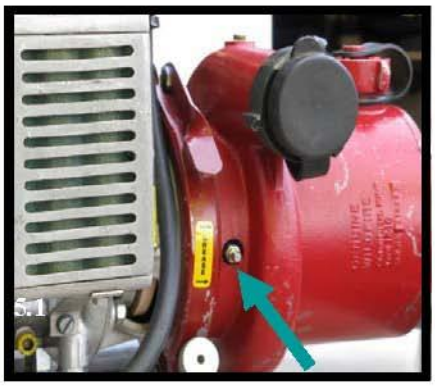
- **Move choke lever to start position. (Fig.4.1)**
- **Move throttle lever to start/warm up position. (Fig.4.2)**
- **Open air vent in fuel tank. (Fig. 4.3)**

CAUTION ENGINE FLOODING HAZARD ALERT!

- Slowly pump fuel bulb, carburetor is primed when fuel mixture can be seen in clear fuel line just touching bottom of carburetor. (Fig.4.4)
- If pump is equipped with an on/off switch, ensure switch is turned on.
- On Mark III pump unit, ensure yellow reset button is pushed in. (Fig 4.5)
- Pull starter rope with short quick pulls until engine 'pops' (typically 2 to 4 pulls).
- Immediately set choke lever to run position. 1 to 3 more pulls should start engine. (Fig. 4.6)
- Consecutive pulls of starter with choke in start position after engine 'pops' will result in flooded engine.

5. OPERATION

- Allow engine 2 minutes to warm up at start/warm up position before moving throttle to run.
- Do not run pump without water.

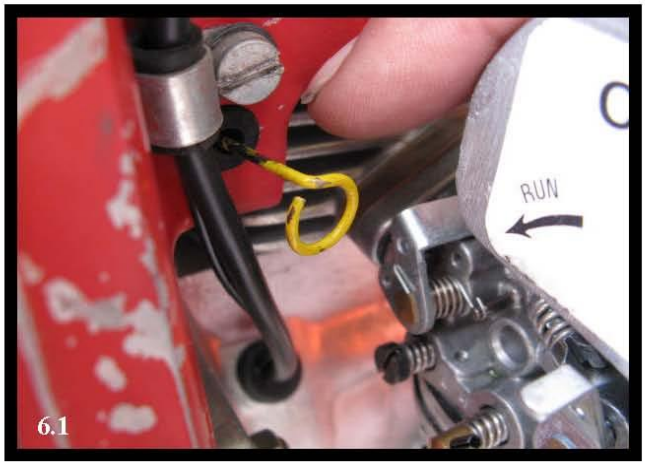


- Important: To avoid cavitation, water must be flowing through the pump head. Crack nozzle or open check & bleeder valve.
- To extend the life of the engine, run engine at full throttle only when necessary.
- Grease pump head with one squirt of grease once a shift (or every 8 hours) at grease/zerk fitting. (Fig 5.1)
- Shut down procedure: Allow engine to idle for one minute. Remove fuel line from fuel tank at end of shift. Either allow engine to run out of gas, or shut engine off. Flush surfactants (foam) and drain pump after final use.

#6. HIGH PRESSURE PUMP TROUBLE SHOOTING

MOTOR PROTECTION

The Mark 3 pump unit is equipped with a yellow automatic "cut-out" switch that will stop the engine and prevent damage should over speeding occur. (Fig. 6.1)



6.1

Conditions that could cause the unit to shut down include:

- Pump not fully primed
- Leaking suction hose connections
- Defective suction hose
- Loose pump priming cap
- Foot valve leaking or not completely submerged under water (1 foot minimum)
- Air locks in the suction hose.

Do NOT attempt to restart the engine until the problem has been located and corrected.

Always ensure Yellow Reset Rod is pushed in before attempting to restart an engine that has stopped suddenly!

IGNITION CHECKS

- If there is a need to check the ignition spark, **do not** remove the spark plug wire while cranking or running the engine. This may increase the electrical load in the coil enough to short out the windings.
- To check the spark, remove the spark plug from the engine. Attach the spark plug to the plug wire, ground the plug body to the cylinder head (Fig 6.2) then crank the engine.
- A spark across the normal spark plug gap (.020") will not damage the ignition coil. A wet spark plug tip would indicate a flooded engine. (see ENGINE FLOODING)

6.2

ENGINE FLOODING

Flooding refers to an accumulation of excess fuel in the crankcase and cylinder, usually due to excessive use of choke. When the engine is in a flooded condition, an over-rich air-fuel mixture is induced into the cylinder. This mixture does not ignite readily and usually fouls the spark plug.

WARNING: FIRE/EXPLOSION HAZARD
STAY CLEAR OF FUEL/VAPORS BEING EXPELLED FROM ENGINE
NO SMOKING OR OPEN FLAME

To resolve:

1. Remove fuel supply line from engine. (Fig. 6.3)
2. Remove spark plug and rest plug on top of the cylinder head with spark plug wire attached.(Fig.6.4)
3. Remove crankcase drain plug and copper gasket from engine block to drain the excess fuel. (Fig 6.5)
4. With choke and throttle in full open (Run/Run) position, pull starter rope several times until fuel is exhausted. (Fig. 6.6)
5. Reinstall crankcase plug with copper gasket attached. (Fig. 6.7)
6. Reinstall clean or new spark plug. (Fig. 6.8)

6.3

6.4

6.5

6.6

6.7

6.8

To start engine after de-flooding:

- Keep throttle and choke open in Run/Run position.
- When engine starts, move throttle lever to idle as engine runs smoothly.
- NOTE: engine will die due to lack of fuel.
- Now reconnect fuel supply line and restart engine.

Module 10- 2004 Module: Downhill Line Construction

Overview

Objective: Given a fire scenario, students will determine tactical decisions relating to a downhill line construction assignment.

Purpose: To provide an opportunity to analyze a decision making process from a real life fire scenario.

Method: Students will watch a video featuring the Loop Fire Incident and participate in two exercises.

Content: Downhill Line Construction; Loop Fire Incident, featuring Gordon King

Tactical Decision Making

Scenario

The fire was reported in a canyon near the boundary of the Angeles National Forest just outside the city of San Fernando. King and his assistant led their crew to Point B in the photo. The objective was to tie in the line at Point D. The fire's edge fell off the ridge to the west into the "chimney" canyon and then down to the bottom of the deep canyon to the west. They held the crew at a small bench below this point until King decided if it was possible to cold trail the fire down into the "chimney" canyon. King could see the County tractors and crews working an indirect dozer line eastward toward the lower end of the "deep" canyon immediately west of the "chimney" canyon and believed he could tie in with them at Point D.

***Date/Time*:** **November, 1, 1966; 0600 hours**

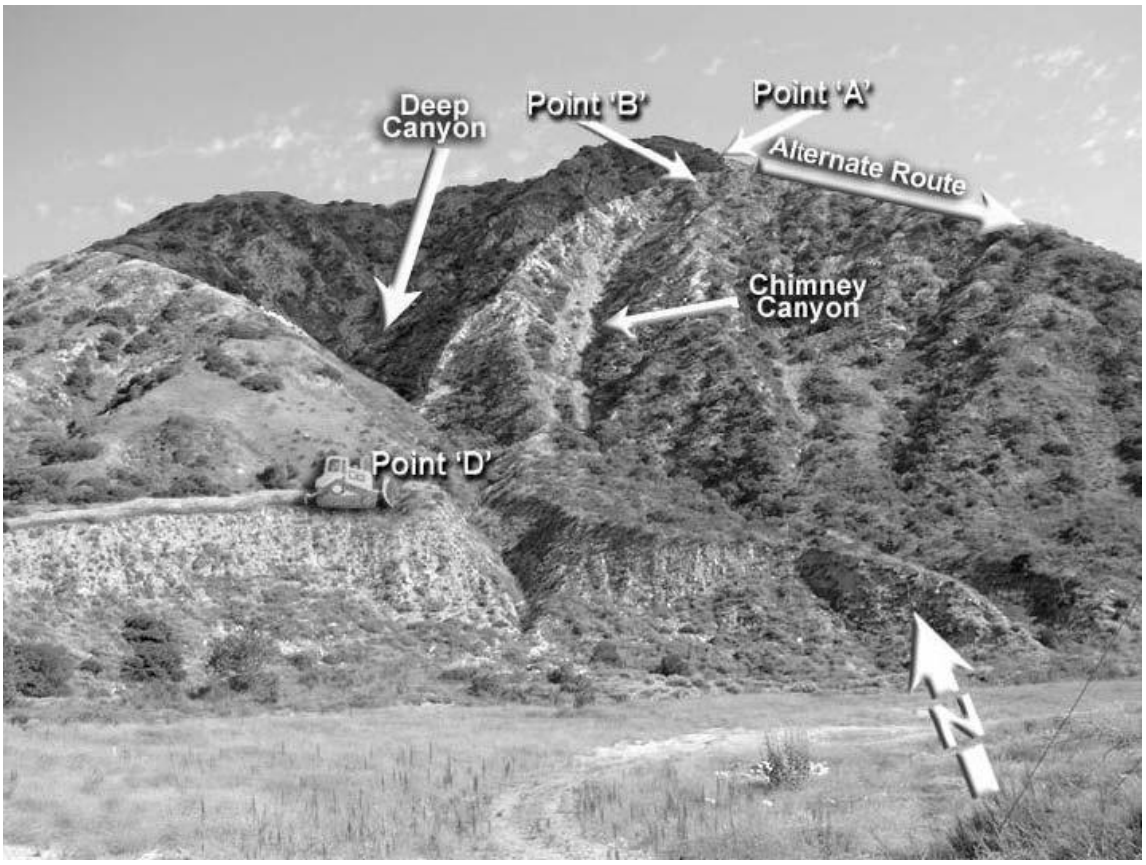
***Safety Concerns*:** **Above normal fire danger, periods of Santa Ana winds, steep terrain, and loose rocks**

***Tactical Assignment*:** **Stop eastward spread of fire; cold trail the fire edge if possible**

***Fuel Type*:** **Chamise, sage, and sumac**

***Weather Forecast*:** **Temperature, 90ºF; RH, 12%; winds, NE at 10-15 mph**

***Resources Available*:** **Los Angeles (LA) County Fire Department engines and hand crew, LA County dozer, and three hotshot crews**



Assignment #1

List the items that are in favor of cold trailing down the "chimney" canyon.

_____

_____

List the items that are not in favor of cold trailing down the "chimney" canyon.

_____

_____

Describe what decision you would make at this point. Identify what information you were given that influenced your decision.

_____

_____

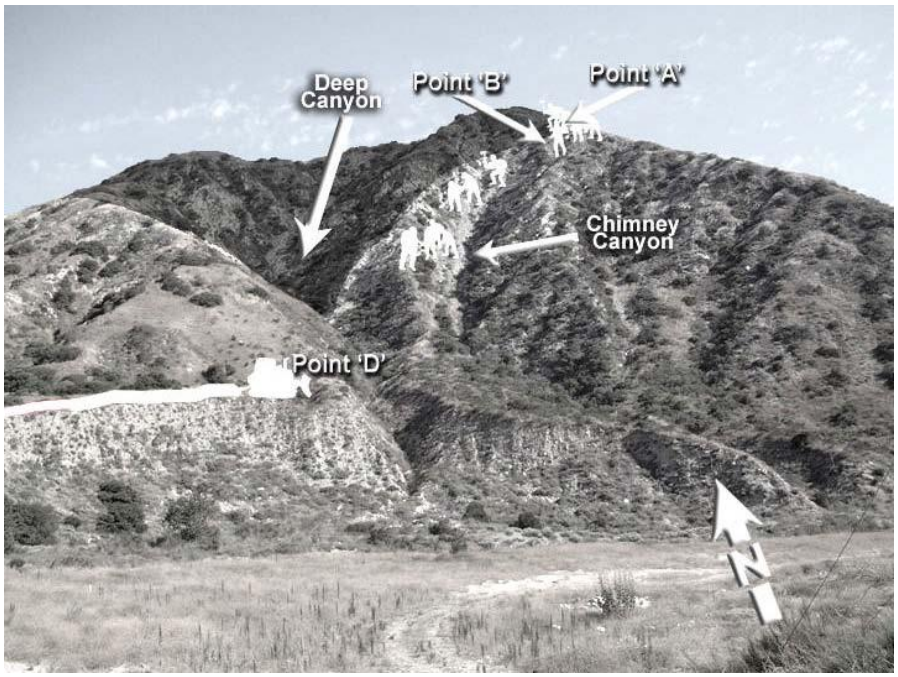
_____

Additional Information

(Refer to Scenario for Currrent Information)

Weather Update: **Winds, NE to E at 30 mph with gusts up to 50**

The distance between the dozer line close to the edge of the fire on the lower part of "deep" canyon and the edge near the "diamond" is approximately 500 feet. Of the 500 feet, 300 feet had a natural opening from 3 to 10 feet wide. The remaining distance at the lower end included some 200 feet of light brush cover. Fireline could be constructed; the El Cariso crew probably had the capacity to cut the 200 feet of line in 10 to 15 minutes. The behavior of the fire at 1530 was observed by Superintendent King from the "diamond," the Division Boss from the ridge above, the County crews from the lower west side of the "deep" canyon, and the County Liaison Officer from the road below. The fire was in a static situation with hot spots on the west side and near the bottom of "deep" canyon about 150 feet from the dozer line. The prevailing winds were out of the northeast but the leeside winds on the fireline were blowing from the southeast favoring closing the gap between the edges of the fire.



Assignment #2

List the alternative courses of action that were available to King as he sized up the situation at the "diamond." NOTE: Feel free to use the Downhill Checklist in your IRPG even though they were not available to Superintendent King at the time. _____

_____

_____

List the fire behavior factors and any other key items for making any decisions (but not necessarily known to King) at this point.

_____

_____

Identify and justify the course of action you would take at this point.

_____

_____

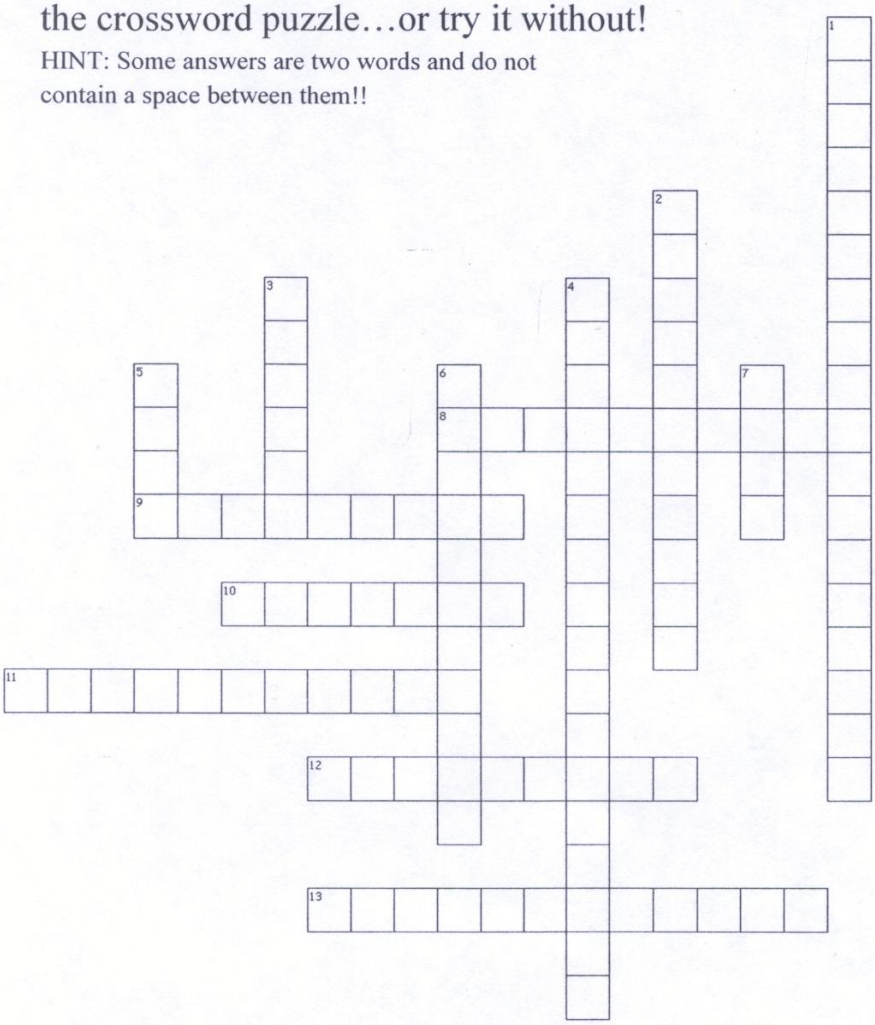
"I wasn't prepared for what happened because I wasn't in the mode."

~ Gordon King, El Cariso Hotshot Crew Superintendent (1966)

2010 IRPG Crossword

Familiarize yourself to the new 2010 IRPG by referencing it to complete the crossword puzzle…or try it without!

HINT: Some answers are two words and do not contain a space between them!!



Across

8. page # of Mark III troubleshooting
9. Multi-Casualty Triage System, priority red
10. International Phoenetic Letter F
11. Hazard Tree Safety (third bullet)
12. page number of oil/gas site safety
13. Haines Index 4

Down

1. purpose of SAFECOM system
2. page # of Fireline Location
3. cover color
4. first consideration of line location
5. Keetch Byrum Drought Index acronym
6. loss of 1' draft per ____ feet in elevation
7. new color section

Conclusion/ Fire Shelter

Overview

Objectives: Students will:

1. Review and discuss last resort survival including escape and shelter deployment site selection.

2. Conduct "hands-on" fire shelter inspections and deployments.

Purpose: To meet the 2010 Interagency Standards for Fire and Fire Aviation Operations or the Wildland Fire and Aviation Program Management and Operations Guide

- Complete the 2010 Fire Refresher Evaluation form on page 45 and turn in to your facilitator. Your feedback is helpful for the development of future refresher programs.

- If you have crew videos, season summaries, or other training materials you would like to be considered for inclusion in future refresher training programs, please include your contact information in the refresher comment form.

<u>Fire Shelter Inspection / Deployment Practice</u>

Following the guidance of the facilitator, review the process of visually inspecting a fire shelter and demonstrate the proper technique for deploying a fire shelter.

For up-to-date fire shelter information, publications, and training be sure and visit the new Fire Shelter System website at:
http://www.nifc.gov/fire_equipment/fire_shelter.html

Want More Information?

The following is a list of websites for further reference. Some of them were used for building the Fire Refresher, and others provide additional information to supplement the individual modules.

Module 1) Introduction

- Safety and Health Working Team Reports
  - http://www.nwcg.gov/teams/shwt/safetygram2.htm
- Annual Wildland Fire Statistics
  - http://www.nifc.gov/fire_info/fire_stats.htm
- SAFENET Main Page
  - http://safenet.nifc.gov/safenet.nsf/SNmain?OpenFrameSet

Module 2) The Fires of 1910

- 1910 Commemoration Information Site
  - http://www.fs.fed.us/r1/projects/1910-centennial/home.html

Module 3) Is Your LCES Adequate

- Brad Mayhew's LCES pocketcard and Fireline Factors website
  - http://www.firelinefactors.com/id30.html
- Fire Leadership Tactical Decision Game References
  - http://www.fireleadership.gov/toolbox/TDG_Library/tdgsreferences.htm
- Wildland Fire Leadership Development Program - Leadership Toolbox (provides resources to assist with instruction using video, sand tables, other methods):
  - http://www.fireleadership.gov/toolbox/toolbox.html

Module 5) Fit for Fire

- Firefighter Fitness Training Program
  - http://www.nifc.gov/FireFit/index.htm
- Publication: Eating for Health and Performance: The Wildland Firefighter
  - http://fsweb.mtdc.wo.fs.fed.us/php/library_card.php?p_num=0651%202833
- Publication: Feeding the Wildland Firefighter
  - http://fsweb.mtdc.wo.fs.fed.us/php/library_card.php?p_num=0251%202323

Module 6) The Fire Triangle

- Current National Forecast Fire Danger Map:
  - http://www.fs.fed.us/land/wfas/fd_cls_f.gif

- Missoula Fire Sciences Laboratory: Fire Behavior and Fire Danger Software
  - http://firemodels.fire.org/

Module 7) Weather and Wind Warnings

- National Weather Service - Fire Weather Home Page
  - http://fire.boi.noaa.gov/

- National Wildfire Coordinating Group list of fire weather web sites:
  - http://www.nwcg.gov/teams/wfewt/biblio/weather1.html

- National Interagency Coordination Center - Predictive Services Weather Page
  - http://www.nifc.gov/nicc/predictive/weather/weather.htm

Module 8) Aviation Communication

- Interagency Helicopter Operations Guide (IHOG), Chapter 4 - Flight Following, Resource, Tracking, and Communications:
  - http://www.nifc.gov/ihog/chapters/2006chapter04.pdf

Other

- Annual Wildland Fire Safety Refresher Training - Archives:
  - http://www.nifc.gov/wfstar/archives.html

- Annual Wildland Fire Safety Refresher Training Video
  - http://www.nifc.gov/wfstar/hottopics/refresh_video.html

2010 Fire Refresher Student Evaluation

Circle the amount of stars for each DVD and exercise portion according to its usefulness for you in the field.

5 ☆☆☆☆☆…….Will be very useful
4 ☆☆☆☆……..….Will probably be useful
3 ☆☆☆……....Undecided
2 ☆☆…….…. Will probably not be useful
1 ☆…….…. Will definitely not be useful

Module 2	**The Fires of 1910**	**DVD portion** ☆☆☆☆☆	**Discussion** ☆☆☆☆☆
Module 3	**Is Your LCES Adequate**	**DVD portion** ☆☆☆☆☆	**TDG Exercise** ☆☆☆☆☆
Module 4	**Human Factors – The Gap**	**DVD portion** ☆☆☆☆☆	**Exercise** ☆☆☆☆☆
Module 5	**Fit for Fire**	**DVD portion** ☆☆☆☆☆	**Self Eval Exercise** ☆☆☆☆☆
Module 6	**Weather and Wind Warnings**	**DVD portion** ☆☆☆☆☆	**Indicators Exercise** ☆☆☆☆☆
Module 7	**The Fire Triangle**	**DVD portion** ☆☆☆☆☆	**Exercise** ☆☆☆☆☆
Module 8	**Helicopter Operations**	**DVD portion** ☆☆☆☆☆	**Commo Exercise** ☆☆☆☆☆
Module 9	**Troubleshooting the Amazing Mark III**	**DVD portion** ☆☆☆☆☆	**Exercise** ☆☆☆☆☆
Module 10	**Downhill Line Construction**	**DVD portion** ☆☆☆☆☆	**Exercise** ☆☆☆☆☆

How many seasons have you been fighting fire? _____
What are your highest redcard qualifications? _____
Additional Comments_____
_____
_____
_____