FIRE COMMAND 1C

Approved and Adopted by the
Office of State Fire Marshal

Recommended for adoption by the
Statewide Training and Education Advisory
Committee and the
State Board of Fire Services

STUDENT SUPPLEMENT

July 2004

FIRE COMMAND 1C

I-ZONE FIRE FIGHTING FOR COMPANY OFFICERS

STUDENT SUPPLEMENT

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TABLE OF CONTENTS

State Fire Training

Mission Statement

The mission of State Fire Training is to enable the California fire service to safely protect life and property through education, training, and certification.

California Fire Service Training and Education System

The California Fire Service Training and Education System (CFSTES) was established to provide a single statewide focus for fire service training in California. CFSTES is a composite of all the elements that contribute to the development, delivery, and administration of training for the California Fire Service. The authority for the central coordination of this effort is vested in the Training Division of the California State Fire Marshal's Office with oversight provided by the State Board of Fire Services.

The role of CFSTES is one of facilitating, coordinating, and assisting in the development and implementation of standards and certification for the California fire service. CFSTES manages the California Fire Academy System by providing standardized curriculum and tests; accredited courses leading to certification; approved standardized training programs for local and regional delivery; administering the certification system; and publishing Career Development Guides, Instructors Guides, Student Manuals, Student Supplements, and other related support materials.

This system is as successful and effective as the people involved in it are. It is a fire service system developed by the fire service, for the fire service... and we believe it is the best one in the country.

Acknowledgments

The State Fire Training Curriculum Development Division coordinated the development of the material contained in this guide. Before its publication, the Statewide Training and Education Advisory Committee (STEAC) and the State Board of Fire Services (SBFS) approved this guide. This guide is appropriate for fire service personnel and for personnel in related occupations that are pursuing State Fire Training certification.

Ruben Grijalva Director of CDF	**Ruben Grijalva** State Fire Marshal
Kate Dargan Assistant State Fire Marshal	**Mike Richwine** Chief, State Fire Training

Special acknowledgement and thanks are extended to the following members of CDF/State Fire Training Curriculum Development Division for their diligent efforts and contributions that made the final publication of this document possible.

Alicia Hamilton Fire Service Training Specialist	**Kim Moore** Office Assistant

The material contained in this document was compiled and organized through the cooperative effort of numerous professionals within, and associated with, the California fire service. We gratefully acknowledge these individuals who served as principal developers for this document.

Dennis Childress, Team Leader Orange County Fire Authority
Vince Hobbs Hayward Fire Department
Kent Norton Vista Fire Department
Mike Paulette CDF - Riverside Unit (Retired)
Phill Queen Hayward Fire Department (Retired)
John Wagner Sacramento Metropolitan Fire District

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"We gratefully acknowledge the hard work and accomplishments of those before us who built the solid foundation on which this program continues to grow."

Course Outline

Course Objectives: To provide the student with…

a) Information on the three elements of wildland fire behavior including fuel, weather, and topography.
b) The elements of ICS as it relates to I-Zone fire fighting, including an Incident Action Plan.
c) Information on the duties and responsibilities of the strike team company officer.
d) Information on the communications process as it relates to I-Zone fire fighting.
e) The fundamental elements of size-up as they relate to I-Zone fire fighting and key components of a report on conditions.
f) Information on I-Zone fire fighting resources and their capabilities.
g) An understanding of fire fighter safety and survival in I-Zone fire fighting.
h) A basic knowledge of evacuation as it relates to I-Zone fire fighting.
i) Procedures for structure triage and protection.
j) The opportunity to perform under simulated conditions in the classroom.

Course Content **40:00**

Unit 1: Introduction
1-1 Orientation and Administration 1:00
1-2 Authority 0:30
Unit 2: Fire Environment
2-1 Fire Behavior and Weather 2:30
2-2 Fire Prediction Systems 1:00
Unit 3: ICS
3-1 Review of the Incident Command System 1:00
3-2 Duties and Responsibilities of the Company Officer 2:00
3-3 Incident Action Plan 1:30
Unit 4: I-Zone Operation Principles
4-1 Resources 3:00
4-2 Communications 1:30
4-3 Strategy and Tactics 1:00
4-4 I-Zone Size-up 1:00
4-5 Report on Conditions 2:30
Unit 5: Safety and Survival
5-1 Introduction to Safety and Survival in the I-Zone 0:45
5-2 The Risk Management Process 1:00
5-3 Entrapment Avoidance 0:45
5-4 Last Resort Survival 1:00
5-5 Properly Refusing Risk 0:30
5-6 Fire Fighter Fatality and Near-miss Case Studies 4:30

Unit 6: I-Zone Incident Operations

Texts and References

- California Fire Assistance Agreement, OES, May 2004
- California Government Code, Section 25210.4 and 66600
- California Health and Safety Code, Division 12, Part 2.7, Section 13800
- Collapse of Decision Making on Storm King Mountain, Ted Putman, 1995 Edition
- Entrapment Avoidance, USFS, Wildland Fire Safety Office, March 2002 (PowerPoint Presentation)
- Fire Command 1C Student Supplement, SFT, 2004 Edition
- Fire Fighter Injuries And Fatalities, USFS, 2000 Edition
- Fire Officer's Handbook on Wildland Firefighting, William Teie, Deer Valley Press, 1994 Edition
- Firefighter's Handbook on Wildland Firefighting, William Teie, Deer Valley Press, 1994 Edition
- Firefighting Tactics, Lloyd Layman, NFPA, 1953 Edition
- Fireline Handbook, NWCG (NFES 0065), 2004 Edition
- ICS 200 Basic Incident Command System, NWCG, 1994 Edition
- ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition
- Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition
- Introduction to Wildland Fire Behavior S-190 Student Workbook, NWCG (NFES 1860), 1994 Edition
- Fire Operations in the Urban Interface, NWCG (NFES 2170), 1991 Edition
- National Fire Danger Rating System Users Guide, NWCG (NFES 1522), 1985 Edition
- S-130 Firefighter Training Instructor Guide, NWCG (NFES 1510), 2003 Edition
- S-330 Task Force/Strike Team Leader Instructor Guide, NWCG (NFES 1403), 1996 Edition
- S-346 Situational Unit Leader Field Reference Guide, NWCG (NFES 2549), 1999 Edition
- Strike Team Leader Manual, OES, 2002 Edition
- Thirtymile Fire report, USFS, 2002
- Wildland Firefighting, Clayton, Day, and McFadden, 1987 Edition
- www.fire.org [2004]
- www.firescope.org [2004]
- www.seawfo.noaa.gov [2004]

Calendar of Events

DAY	TOPIC	TITLE	TIME	ACTIVITY	EVALUATION
Day 1	1-1	Orientation and Administration	1:00		
	1-2	Authority	0:30	1-2-1	
	2-1	Fire Behavior and Weather	2:30	2-1-1	
	2-2	Fire Prediction Systems	1:00	2-2-1	
	3-1	ICS Review	1:00	3-1-1	
	3-2	Duties and Responsibilities of the Company Officer	2:00	3-2-1	
		Day 1 Total	**8:00**		
Day 2			1:00		**Test 1**
	3-3	The Incident Action Plan	1:30	3-3-1, 3-3-2	
	4-1	Resources	3:00	4-1-1, 4-1-2	
	4-2	Communications	1:30	4-2-1	
	4-3	Strategy and Tactics	1:00		
		Day 2 Total	**8:00**		
Day 3			1:00		**Test 2**
	4-4	I-Zone Size-up	1:00		
	4-5	Report on Conditions	2:30	4-5-1	
	5-1	Introduction to Safety and Survival	0:45		
	5-2	The Risk Management Process	1:00		
	5-3	Entrapment Avoidance	0:45		
	5-4	Last Resort Survival	1:00		
		Day 3 Total	**8:00**		
Day 4			1:00		**Test 3**
	5-5	Properly Refusing Risk	0:30		
	5-6	Fire Fighter Fatality and Near-miss Case Studies	4:30	5-6-1	
	6-1	Pre-incident Operations	2:00		
		Day 4 Total	**8:00**		
Day 5	6-2	Incident Operations	5:00	6-2-1	
	6-3	Post-incident Operations	1:00		
			2:00	Review and Certification Exam	
		Day 5 Total	**8:00**		
		Course Total	**40:00**		

Topic 1-1: Orientation and Administration

Course Development

After the October 1996 Calabasas Fire, a task force comprised of Glendale, Los Angeles County, and Los Angeles City Fire Departments developed the Calabasas Fire Report. This report contained 56 recommendations developed to enhance the California fire service's capability to battle wildland and wildland/urban interface fires, along with enhancing the level of safety of our fire fighters. The task force agreed to forward their 12 highest priority recommendations to FIRESCOPE for their review and implementation on a statewide basis.

Many of the recommendations sent to FIRESCOPE involved the area of training. The FIRESCOPE Board of Directors identified the Office of the State Fire Marshal as the responsible party for developing responses to the training-related recommendations. This has led to many changes in State Fire Training's education programs, including:

- ❒ Infusing ICS training as a prerequisite for all levels of certification.
- ❒ Adding additional wildland/urban interface training into the Fire Fighter I curriculum.
- ❒ Developing the California Incident Command Certification System (CICCS)
- ❒ Creating a wildland/urban interface fire fighting course for the structural-based company officer, now known as Fire Command 1C, I-Zone Fire Fighting for Company Officers.

While many changes and program improvements have been completed, there still remains much work to be finished such as the development of training programs that will provide adequate simulated incidents to be considered as appropriate for "trainee" time, standardization of Incident Command System training, and instructor qualification.

This course was created because of the vast number of large wildland and urban interface incidents that occur on a regular basis in California. Of more importance than the number of incidents, is that the injury rate for fire fighters is currently at an all time high.

As this course was being drafted, it was the direction of the curriculum committee to review all of State Fire Training's wildland curricula currently being taught. Fire Fighter I training will continue to carry its designated wildland curriculum and all levels above that will change in an effort to bring the California fire service to a higher level of expertise. Fire Command 1B will continue to deliver a portion of the wildland curriculum, with Fire Command 1C spending an additional 40 hours covering the aspects of I-Zone fire fighting for the company officer. Fire Command 2E will complete the training with Chief Officer level wildland curriculum.

The contents of this course are designed around the responsibilities of the company officer at a wildland/urban interface incident. Emphasis is on the development of management and decision-making practices required for the successful command.

Introduction

There are three major components to this course: the curriculum, the instructor, and you, the student.

The Curriculum

The curriculum consists of six units. Each of these units introduces the information necessary for you to lead and manage an engine company during a wildland/urban interface fire. The opportunity to employ the techniques learned through group exercises and activities is also a significant element of the course.

The Instructor

The instructor is the next component and the one who will guide you through the curriculum. It will be, in most cases, a learning experience for both of you. No instructor has seen everything or done it all; there is always room for growth. Your experiences, as well as the instructor's, are a valuable component and can be beneficial to all. Both good and bad experiences teach us lessons and we can learn from them. The class schedule has several opportunities for sharing these experiences just for this purpose.

The Student

The student is the final component. You are expected to attend all sessions from start to finish since the material builds upon itself as the course progresses and missing part of the information would jeopardize your ability to pass the class and certification exam, as well as function as a company officer for I-Zone fire fighting.

There are opportunities to develop your skills through group exercises as well as individual activities and you will be expected to contribute in all of these. You are also expected to put some out-of-class time into this course by reading the material provided and preparing for the tests, exercises, activities, and certification exam. As with most training, what you get out of it is directly related to how much effort you put in.

Course Design

- ❒ To satisfy portions of the NFPA 1021 command standards for Fire Officer I, II, and III as well as the NFPA 1051 Standard for Wildland Fire Fighter Professional Qualifications.
- ❒ To satisfy one of the educational requirements for State Fire Training's certified Fire Officer.
- ❒ To satisfy the prerequisites for the Level 2 Fire Command series offered by State Fire Training.
- ❒ To satisfy one of the certification requirements for the California Incident Command Certification System (CICCS).
- ❒ To maintain compatibility with other courses offered in State Fire Training's Fire Officer series.

Unit 1 - Introduction

This is an introduction to the course and presents an overview along with the certification requirements satisfied after your successful completion. This unit identifies the NFPA and other standards the

training complies with and sets a calendar of events. Another topic covered in Unit 1 includes the authority and responsibility for urban interface fire protection.

Unit 2 - Fire Environment

This unit explains the wildland fire behaviors that make up the operational characteristics you must work with in the I-Zone environment. It describes the differences between structural fire fighting and wildland fire fighting. In addition, it describes some of the tools the company officer may use in his or her assessment of the changes and/or dangers involved with I-Zone fire fighting.

Unit 3 - Incident Command System

This unit focuses on the Incident Command System as it relates to an I-Zone fire. It begins with information on the ICS positions and progresses through the major response procedures for a wildland incident. Since this course deals with the ICS forms used on the typical major wildland incident, the material in this unit will assist you in relating an ICS position to a form.

Unit 4 - I-Zone Operation Principles

This unit takes you from initial dispatch through completion of an assignment. There is instruction in on-scene operations on the smallest to the largest types of fires and addresses some of the newer technologies in the field. Mapping systems used in the wildland environment is also presented.

Unit 5 - Safety and Survival

Fire officer curriculum would not be complete without a section on fire fighting safety. The wildland fire entrapment is an event nobody wants any part of. It only takes place when mistakes have been made, the fire has been underestimated, or the conditions have changed before those changes were recognized. This unit will contain case studies and many of the rules and laws of safely fighting fire in the I-Zone.

Unit 6 - I-Zone Incident Operations

This unit takes the company officer through a structure protection assignment from response, to operation, and ending with post-incident responsibilities. It relates to the preparation of the structure before the fire's arrival, work on-scene during the fire's passing, and then mop-up or patrol operations after the fire has passed. Numerous safety issues will be discussed, from visibility situations to disengagement tactics and more.

Course Requirements

Fire Command 1C, I-Zone Fire Fighting for Company Officers, is a 40-hour course consisting of six units of instruction. Each unit covers a different aspect of I-Zone fire fighting.

It is highly recommended that the current (or future) company officer taking this course be very familiar with the information taught in the prerequisite courses since those premises will greatly enhance the ease with which the concepts of this course will be assimilated.

Attendance

State Fire Training policy requires every student to attend a minimum of 36 hours of this 40-hour class. If there is a problem with meeting this requirement, you should consider enrolling at another date when you can commit the time required.

Prerequisites

- ❒ Fire Command 1A
- ❒ I-200, Basic ICS

Required Textbooks

Five manuals are required for this course: 1) Fire Command 1C Student Supplement, SFT, 2004 Edition, 2) Introduction to Wildland Fire Behavior S-190 Student Workbook, NWCG (NFES 1860), 1994 Edition, 3) Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, 4) Fireline Handbook, NWCG (NFES 0065), 2004 Edition, and 5) ICS 420-1 Field Operations Guide (Pocket), FIRESCOPE, 2004 Edition.

Fire Command 1C Student Supplement

This text contains information not found in the other texts that is necessary for a complete understanding of the topic. It includes explanatory narrative and applicable activities. Appendix A includes case studies, Appendix B has a glossary of terms, and Appendix C are the blank ICS forms commonly used by the company officer. Additional appendices may be added as necessary to meet minimum course requirements.

Introduction to Wildland Fire Behavior S-190 Student Workbook

The S-190 Student Workbook covers the basic fire behavior factors that aid in the safe and effective control of wildland fires. Since this information was only recently included in State Fire Training's Fire Fighter I curriculum, it is currently required for this class. In the future, S-190 may become an additional prerequisite for this course.

Incident Response Pocket Guide

The Incident Response Pocket Guide is a pocket-sized guide with checklists and information commonly used during initial attack or extended field operations. The 2004 version includes:

- ❒ Revised briefing format
- ❒ Enhanced explanation for the safety zone guidelines
- ❒ Updated information on lightning safety
- ❒ LCES checklist
- ❒ Wildland/urban interface watch out situations
- ❒ Structure assessment checklist
- ❒ Structure protection checklist
- ❒ After-action review

- ❒ New references
  - Operational leadership guide
  - Extended attack transition analysis
  - Direct/indirect strategy advantages
  - How to properly refuse risk
  - Last resort survival checklist

Fireline Handbook

The Fireline Handbook is produced by the National Wildfire Coordinating Group and covers wildland fire fighting management for larger incidents. Some topics included are:

- ❒ Fire fighter safety
- ❒ Initial attack
- ❒ Extended attack
- ❒ Large fire management teams
- ❒ Transfer of command
- ❒ Urban interface
- ❒ Common responsibilities
- ❒ Command and operations
- ❒ Air operations
- ❒ Planning and logistics
- ❒ Finance/administrations
- ❒ Fire investigation

Field Operations Guide

The Field Operations Guide (FOG) is produced by FIRESCOPE in California and covers all of the components of the Incident Command System. It is designed for very large incidents from wildland to high-rise, hazardous materials, and more. Changes to the 2004 version include:

- ❒ Added Unified Command as a new Chapter 6
- ❒ Separated Swiftwater/Flood Search and Rescue from the US&R chapter and included as a new Chapter 16
- ❒ Changed Chapter 18 title to, Firefighter Incident Safety and Accountability Guidelines

Periodic Tests

Periodic tests will be administered during the course and are designed to evaluate your progress. They also provide a good review of the curriculum just completed and can help prepare you for the certification exam.

Case Studies

The course is also designed to test your understanding of the concepts being forwarded in each unit by offering a series of simulation events. Every student's participation is necessary in order for the group to progress through the material.

Student Evaluation

Activities

- ❒ All activities must be successfully completed

Written Tests

- ❒ All periodic written tests must be successfully completed with a minimum score of 80%
- ❒ After each test, a review will be conducted and then the tests returned to the instructor
- ❒ You may ***not*** keep a copy of the test

Certification Exam

To be eligible to take the certification exam, you must pass the periodic tests with an 80% minimum, complete all assignments and activities, and meet the minimum attendance requirement. The certification exam requires a minimum 70% passing rate and consists of 50 multiple-choice items.

Student Profile

Name: _____

Department: _____

Numbers of Years in the Fire Service: _____ Rank: _____

Present Assignment:

Past Assignments:

_____

_____

_____

_____

ICS Qualifications:

_____

_____

_____

_____

Class Expectations:

_____

_____

_____

_____

Topic 1-2: Authority

Student information for this topic can also be found in the ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapter 6.

Leadership Principles

Three basic leadership principles include authority, responsibility, and accountability. We get the authority to do something through laws, federal, state, or municipal. We may also get authority from city charters and agreements. Once you have the authority to do something, you need to be responsible in getting it done, and then hold yourself and the personnel you supervise accountable for the results.

Levels of Responsibility

There are three main levels of fire protection responsibility: federal, state, and local. Federal lands are referred to as Federal Responsibility Areas (FRA); state lands are referred to as State Responsibility Areas (SRA); and local lands are referred to as Local Responsibility Areas (LRA).

Federal Responsibility Area

Forty-seven percent of California is federal land. The U.S. Forest Service (Department of Agriculture) has statutory responsibility for wildland fires on national forestland. The National Park Service, Bureau of Land Management, Bureau of Reclamation, and the Bureau of Indian Affairs are all under the Department of Interior and have statutory responsibility for wildland fires within their boundaries. Military bases, as a part of the Department of Defense, have responsibility for wildland fires on all federal military bases, including the U.S. Corp of Engineers.

State Responsibility Area

State land makes up 33% of California. The responsibility for combating wildland fires on timber, and brush, and grass-covered watershed land specifically designated as State Responsibility Area (SRA) belongs to the California Department of Forestry and Fire Protection (CDF).

Direct Protection Area

Wildland fires on adjacent lands managed by state and federal agencies present a communal threat. State and federal agencies recognized a need to assist each other when fires occur on these territories. These lands are commonly referred to as Direct Protection Areas (DPA) and are described as an area delineated by boundaries regardless of statutory responsibility. The protection is assumed by administrative units of either the federal agencies or the state. The agency with the direct protection responsibility, known as the protecting agency, assumes both fire suppression and fiscal responsibilities.

Local Responsibility Area

Cities, counties, and fire protection districts are responsible for wildland fires on lands not designated FRA or SRA. These areas are designated Local Responsibility Areas (LRA). In some areas of the state,

cities, counties, and fire protection districts contract with CDF for fire services. Some counties have agreements with the state to assume responsibility for fire protection on all SRA in the county. The counties currently under agreement for fire protection include Kern, Los Angeles, Marin, Santa Barbara, Orange, and Ventura counties.

Agreements and Responsibilities

Once you are given the authority, you will need to be responsible to meet the intent of the law. Responsibility determines who is financially liable for emergencies and who can set goals, policy, and limitations. In areas of multiple jurisdictions, unified command needs to be established before discussing responsibilities and setting incident objectives.

California Fire Assistance Agreement

During times of severe wildland fire conditions, forest agencies may need the assistance of local government apparatus to provide structural protection or supplement their respective agency-controlled resources to aid in the suppression effort. The California Fire Assistance Agreement is the instrument that endorses this cooperation. The agreement makes the California Office of Emergency Services (OES) and/or various local government jurisdictions' emergency apparatus, in the spirit of cooperation, available for dispatch and use through the State Fire and Rescue Mutual Aid System to the forest agencies. Reimbursement begins 12 hours after the initial dispatch and is retroactive to the time of the initial dispatch. If the duration of the assignment is less than 12 hours, there is no reimbursement. An order and request number is required for reimbursement.

The forest agencies that are a signature to the agreement are the U.S. Forest Service, California Department of Forestry and Fire Protection, Bureau of Land Management, National Park Service and the U.S. Fish and Wildlife Service. The State of California Governor's Office of Emergency Services (OES) is also a signature of the agreement and is responsible for the systematic mobilization, organization, and operation of necessary fire and rescue resources of the state in mitigating the effects of disasters and to ensure that the responding agencies understand the terms and conditions of the agreement applicable to their response. OES handles reimbursements for local agency resources to state and federal wildfires.

Mutual Aid

It is in the best interest of federal, state, and local government agencies to cooperate to achieve objectives of common interest and concern. The concept of a functionally integrated fire protection system, involving federal, state, and local government resources, is the most effective method of delivering fire protection where life, property, and natural resource values are at risk. There is an array of agreements at various levels of government and between agencies that allow for and provide assistance during times of emergencies. These agreements may provide assistance in the form of mutual aid, where assistance is free of charge (nonreimbursable, generally a short duration assignment) or assistance by hire where the assistance will be paid for (reimbursed) by the user. Local agreements are voluntary agreements between two or more local entities that describe the initial responses to incidents occurring within adjoining areas or in areas of close proximity. The agreements will determine whether the responses are mutual aid, or assistance by hire.

Other Responsible Parties

Landowners and Residents

Landowners and residents must comply with state and local statutes relative to I-Zone incidents. It is important to have an active prevention program in your area to educate the public on activities that will meet their statutory responsibilities and make their property fire safe.

Agency Specific

The fire-fighting agency has the responsibility of fire fighter safety and efficiency. Training is a way to maximize safety and efficiency. Some things you need to establish are I-Zone drills, maintenance of qualifications, tools, and equipment. Recognition the inevitability of an interface fire requiring interagency cooperation and training will make for safer and more efficient interagency operations.

Fire Fighters

The ultimate responsibility for fire fighters is your personal safety and the safety of others. You will need to maintain your physical fitness, certifications, training, equipment, and apparatus. Knowledge of your department policies and procedures will assist you when setting up unified command. Ultimately once, you have been given the authority and responsibility you need to hold yourself and the people you supervise accountable. You will also need to make notifications to affected and threatened agencies and jurisdictions.

INDIVIDUAL ACTIVITY 1-2-1

TITLE:	Understanding the California Fire Services User's Guide for Disasters
TIME FRAME:	Homework
MATERIALS NEEDED:	• California Fire Services User's Guide for Disasters, ICS 900, FIRESCOPE, 1998 Edition (following pages) • Pen or pencil
INTRODUCTION:	This activity provides you the opportunity to understand agreements for cooperation and disaster declarations and how they relate to I-Zone incidents.
DIRECTIONS:	1. Review the California Fire Services User's Guide for Disasters. 2. Be prepared to discuss this information with the class.

CALIFORNIA FIRE SERVICES USER'S GUIDE TO DISASTER DECLARATIONS AND AGREEMENTS FOR COOPERATION

KEY TERMS

- ❑ Mutual Aid
- ❑ Assistance By Hire
- ❑ Local Agreements
- ❑ Cooperative Fire Protection Agreement (4 Party Agreement)
- ❑ Direct Protection Area (DPA)
- ❑ Cooperative Agreement For Local Government Fire Suppression Assistance (5 Party Agreement)

INTENT

This document is designed to familiarize the fire agencies statewide with various means of sending and receiving aid to wildland fire incidents and some examples of how reimbursement may or may not occur. This is not intended to define the only means by which this may occur or to set policy on these issues.

DISASTER DECLARATIONS

There are several levels of disaster declarations and each level presents different possibilities of response, fiscal responsibilities, and reimbursements (if any).

Local Declaration. A local disaster can be declared by the local governing body, such as but not limited to the Mayor, City Council, and County Board of Supervisors. A local declaration will suspend the rules with respect to bidding of short-term contracts for services required to assist in mitigating the emergency and provide temporary relief from the California Environmental Quality Act (CEQA) and other items as specified in your local ordinances. Should this be the highest level of declaration, there is no reimbursement from the next level of government.

Gubernatorial Declaration. Prior to the Governor of the State declaring a disaster, the local government must show evidence that local resources are expended and that the capabilities of the resources will not provide timely relief. Declarations from the Governor may provide qualifying State funds to local governments and assisting agencies for overtime and mileage cost directly attributable to the responses. At this level of declaration, the State may reimburse 75% of the eligible costs and other expenses; the remaining 25% is the fiscal responsibility of the local government.

Presidential Declaration. Prior to a Presidential Declaration of Disaster, being issued the same basic criteria must be met by the State. A Presidential Declaration may provide qualifying Federal funds to State and local governments. The funds may provide a wide variety of relief, depending on the extent and types of disaster. At this level of declaration, the Federal Government may reimburse 75% of costs associated with overtime, mileage, and other expenses directly attributable to responses. The State is responsible for reimbursing 75% of the remaining 25% (18.75%) and the local government is responsible for the remaining 6.25%.

Agreements for Cooperation

It's in the best interest of both State, Federal, and local government agencies to cooperate to achieve objectives of common interest and concern. The concept of a functionally integrated fire protection system, involving

Federal, State, and local government resources, is the most effective method of delivering fire protection where life, property, and natural resource values are at risk.

There is an array of agreements at various levels of governments and between agencies that allow for and provide assistance during times of emergencies. These agreements may provide assistance in the form of ***MUTUAL AID***, where assistance is rendered free of charge (non-reimbursable, generally a short duration assignment) or ***ASSISTANCE BY HIRE*** where the assistance will be paid for (reimbursed) by the user.

LOCAL AGREEMENTS are voluntary agreements between two or more local entities that describe the initial responses to incidents occurring within adjoining areas or in areas of close proximity. The agreements will determine whether the responses are mutual aid, or assistance by hire.

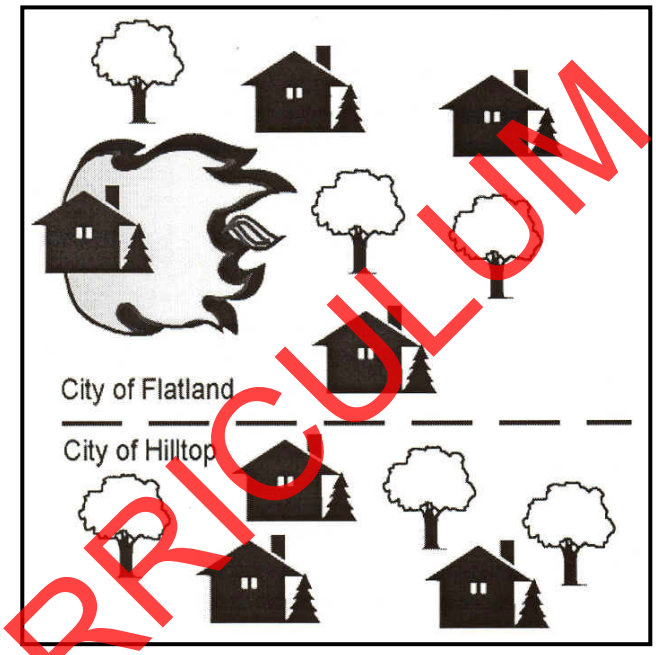
The ***COOPERATIVE FIRE PROTECTION AGREEMENT***, referred to as the ***4 PARTY AGREEMENT***, is an agreement between the California Department of Forestry and Fire Protection, U.S. Forest Service, Bureau of Land Management and the National Park Service (collectively known as Forest Agencies). The Forest Agencies acknowledge that differences exist between agency missions, but that each will represent the other agency's interests and must possess the recognition, knowledge, and understanding of each other's mission objectives, authorities, and policies. Wildland fires on intermingled or adjacent lands, managed by State and Federal Agencies, present a threat to the lands of the other. State and Federal Agencies have recognized a need to assist each other on suppression of wildland fires on lands adjacent to each other. These lands are commonly referred to as ***DIRECT PROTECTION AREA (DPA)***. Basically, DPA is described as an area delineated by boundaries regardless of statutory responsibility and the protection is assumed by administrative units of either the Federal Agencies or the State. The agency with the direct protection responsibility, known as the Protecting Agency, has assumed both fire suppression and fiscal responsibilities as agreed.

However, at times of severe wildland fire conditions the Forest Agencies may have a need of local government apparatus to provide structural protection or to supplement their respective agency-controlled resources to aid in the suppression effort. The ***COOPERATIVE AGREEMENT FOR LOCAL GOVERNMENT FIRE SUPPRESSION ASSISTANCE***, referred to as the ***5 PARTY AGREEMENT***, is the instrument that endorses this cooperation. The agreement makes California Office of Emergency Services and/or various local government jurisdictions emergency apparatus, in the spirit of cooperation, available for dispatch and use through the STATE FIRE & RESCUE MUTUAL AID SYSTEM, to the Forest Agencies. Reimbursement begins 12 hours after the initial dispatch and is retroactive to the time of the initial dispatch. If the duration of the assignment is less that 12 hours, there is no reimbursement.

In other words, the 5 PARTY AGREEMENT allows the Forest Agencies to tap into the pool of available resources through the STATE FIRE & RESCUE MUTUAL AID SYSTEM. In the truest of terms Forest Agencies are not signatory to the STATE FIRE & RESCUE MUTUAL AID SYSTEM, and do not actively participate by providing resources but are frequent users of the systems.

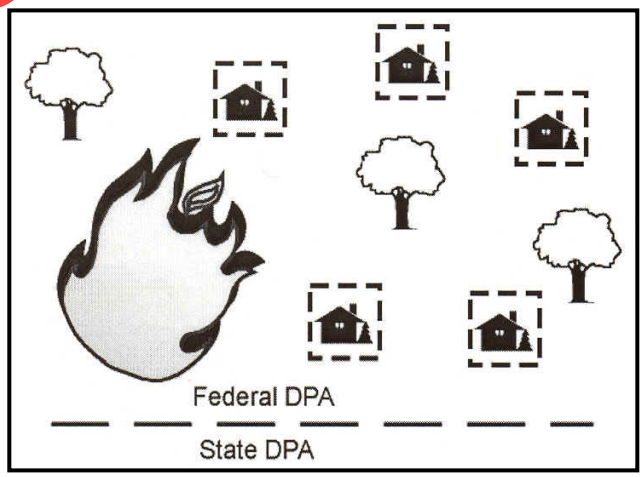
THE FOLLOWING SIX SCENARIOS DO NOT SET PRECEDENT.
Each real incident will have its own unique decisions.

❶ The Cities of Hilltop and Flatland are adjacent neighbors. A structure fire in Flatland, close to the boundary with Hilltop, has spread into the surrounding wildlands of the city LRA. ***The location of the incident is covered by a local Voluntary Mutual Aid Agreement developed by both cities during joint emergency operations planning.*** Both cities respond with significant fire fighting resources to deal with the threat. There is no involvement from wildland (forest) agencies. Eventually the wildland fire is successfully controlled before actually burning into Hilltop's jurisdiction. The City of Hilltop incurred unbudgeted expenditures associated with their response to assist their neighbor. This expense happened in spite of the fact that Hilltop did not suffer any loss within their area. ***The City of Hilltop was not reimbursed for these unplanned costs.***



Mutual Aid at the local government level occurs daily throughout the State. This process is designed to provide assistance from one neighboring jurisdiction to another, related to numerous fire service activities. The premise is that no community has the resources sufficient to cope with all emergencies for which potential exists. In the spirit of cooperation, Hilltop assisted Flatland without reimbursement. Next time it may be the other way around.

❷ The scattered houses are on SRA land totally within the Federal DPA. The Federal agency (FED) has wildland fire protection responsibility for all federal lands, private lands in this area are SRA. The county fire department (CTY) has structure protection responsibility in this area. The fire is managed by a Unified Command with county fire department concerns being met by participating as a member of this Unified Command. The IC's jointly agreed to order five (5) strike teams of engines for structure protection through the Unified Ordering Point to assist in perimeter control. The strike teams come under the 5 Party Agreement. The strike teams are reimbursed under this agreement by the federal agency that ordered them. Any County fire department resources responding as part of these strike teams are not reimbursed.



Example of the request for 5 strike teams would be Incident #FED-12345, Request FED-E-10 through FED-E-14 for 1 each S/T Engine Type 1 or Type 2 per request number.

❸ Sunshine City is an incorporated city with its own fire department (SSC). The structures located outside the city are protected by the county (CTY), but are on SRA lands within the federal DPA. The fire is managed as a Unified Command between the federal agency, county fire, and the city. The joint decisions was for the federal agency to order one strike team of engines to protect the structures in close proximity to the wildland fire and assist with perimeter control and the city to order 10 strike teams of engines to protect the city. The federal order is through the 5 Party Agreement, and the city order is under State Master Mutual Aid Agreement. The one

strike team is reimbursed by the federal agency and the 10 strike teams are furnished at no cost to the city. The county resources that assist in the effort will not be compensated by the Federal agency.

Example of the federal request for 1 strike team would be Incident #FED-12345, Request FED-E-10 for 1 each S/T Engine Type 1 or Type 2 per request number.

Example of the city request for 10 strike teams would be Incident #FED-12345, Request SSC-E-11 through SSC-E-20 for 1 each S/T Engine Type 1 or Type 2.

(In this scenario, it is important to recognize that it is a Unified command and it was a joint decision for the city to order the engines to protect the city through State Master Mutual Aid.)

❹ CDF has six (6) contract counties (LAC, KRN, ORC, VNC, SBC, & MRN) to provide wildland fire protection for State responsibility lands in their counties.

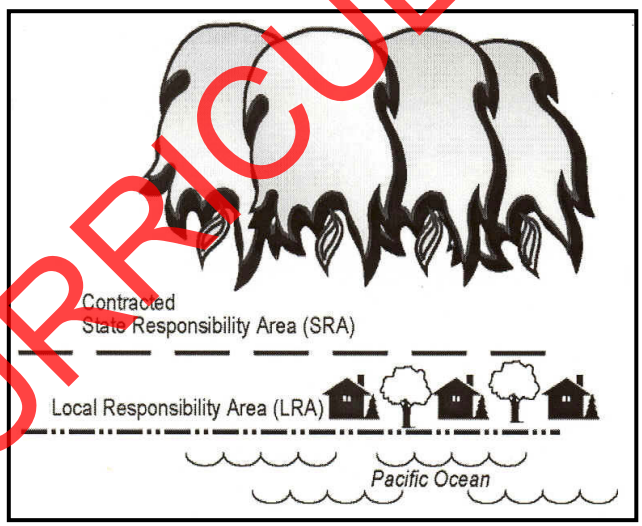
A fire is burning SRA land in Los Angeles County (LAC) and an area of LRA needs protection. The CDF Agency Representative and the Incident Commander have negotiated that 5 strike teams of engines will be ordered under Master Mutual Aid and 5 strike teams of engines ordered under the 5 Party Agreement.

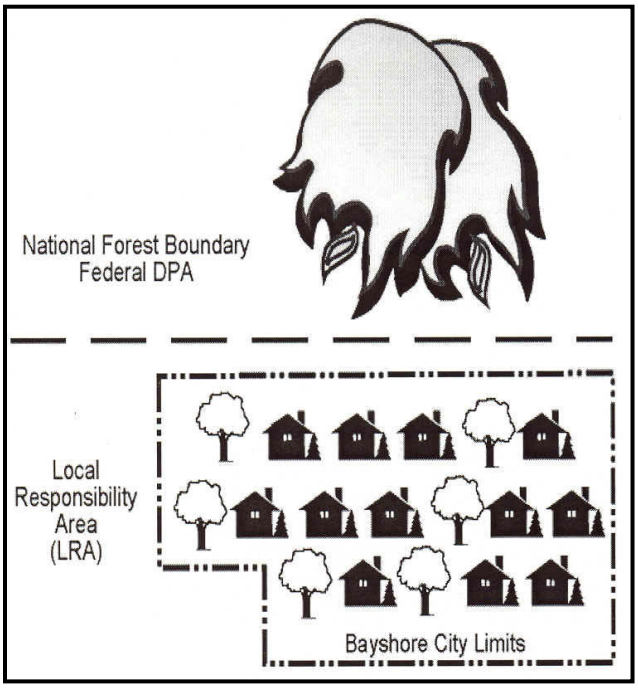
Example of the request for 5 strike teams of engines, Master Mutual Aid, is Incident #LAC-1234, Request LRA-E-1 through LRA-E-5 for 1 each S/T Engine Type 1 or Type 2 per request number.

Example of the request for 5 strike teams of engines, 5 Party Agreement, is Incident #LAC-1234, Request SRA-E-6 through SRA-E-10 for 1 each S/T Engine Type 1 or Type 2 per request number.

(Local government resources ordered by Forest agencies for assistance may not always be under the provisions of the 5 Party Agreement. Resources may be provided to the Forest Agencies through local Assistance by Hire or Mutual Aid agreements.)

❺ The City of Bayshore (BAF) is an incorporated city and contracts with the County for structural fire protection. The Bayshore city limits stop at the USFS Direct Protection Area (DPA) boundary. A wildland fire starts on Forest Service land protected by the Forest Service (FED). The fire spreads rapidly and is threatening the City of Bayshore. A Unified Command is established between the Forest Service and the County Fire Department (CTY). A joint decision by the Incident Commanders is made to order 10 strike teams of



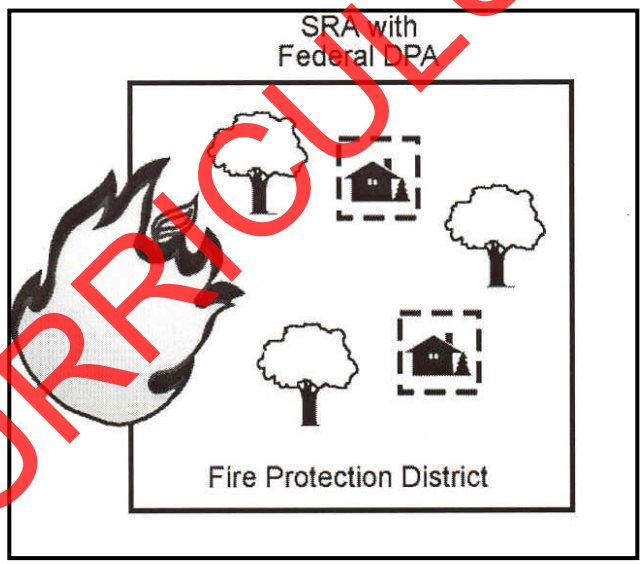


engines for structure protection through the 5 Party Agreement for perimeter control. Because of the threat and risk to the Bayshore City LRA, there is joint IC's agreement to share the cost of the 10 strike teams equally, 50%/50%.

Example of the federal request for 5 strike teams of engines would be Incident #FED-12345, Request FED-E-10 through FED-E-14 for 1 each S/T Engine Type 1 or Type 2 per request number.

Example of the county request for 5 strike teams of engines would be Incident #FED-12345, Request BAF-E-15 through BAF-E-19 for 1 each S/T Engine Type 1 or Type 2 per request number.

❻ A wildland fire is burning on SRA lands within Federal DPA. The fire is also within a Fire Protection District. Forest Agencies normally will not enter into a Unified Command with a Fire Protection District unless there is an agreement to share costs, or if there are other reasons for the Fire Protection District to enter into a Unified Command.



Incident Command has made a decision to order resources through the 5 Party Agreement consistent with Forest Agency's agreements of structure protection on SRA lands. Local agency resources ordered under the 5 Party Agreement will be reimbursed within the terms of the agreement. If the Fire Protection District chooses not to be a part of the Incident Command and they order local government resources via independent dispatch channels the costs of those resources will not be the responsibility of any agency involved in the management of the incident.

This document is <u>not</u> policy. It is each fire agency's responsibility to understand the many procedures of providing and receiving assistance. The financial obligations when involved with emergency/disaster responses are variable. If you have other questions, you should contact your agency administrators.

Topic 2-1: Fire Behavior

INDIVIDUAL ACTIVITY 2-1-1

TITLE:	S-190 Introduction to Wildland Fire Behavior Homework
TIME FRAME:	1:00 (outside of class)
MATERIALS NEEDED:	• Introduction to Wildland Fire Behavior S-190 Student Workbook, NWCG (NFES 1860), 1994 Edition (all) • Pen or pencil
INTRODUCTION:	This activity provides you the opportunity to train on the basic fire behavior factors that will aid them in the safe and effective control of wildland fires.
DIRECTIONS:	1. Complete the exercises for Unit 1 and Unit 2 on pages 21-24, 30-31, 38-40, 42, 48, and 52. 2. Turn in your homework on the morning of Day 2.

Topic 2-2: Fire Prediction Systems

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Pages A56-A58 and Appendix B and the Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 63-64.

The closer we can get to predicting the behavior of fire, the safer we will be and the more efficient we will become. In an effort to better predict the behavior of wildfires, the fire service has developed, through trial and error, a number of tools. While each of these tools is important, they are but a very small sample of the instruments used today for predicting fire behavior. No single tool should be considered the ultimate force, thereby eliminating the use of other tools. As the science of fire research progresses, we will find more and more tools available for this never-ending task of putting out our fires. There are many other tools being used by fire fighting teams the world over that may not be covered here. The following are some of the more common prediction tools used in the Western United States.

Campbell Prediction System

The Campbell Prediction System (CPS) is a system of fire prediction that was developed using the temperature of the available fuels as predictors of fire intensity. Following the time of day, the shadows on the land created by mountain ranges, and the sun's movement, this system uses fuel temperature as a guide to fire intensity. Predicting the intensity of the burn gives fire fighters the advantage of knowing when and where to set up operations. (www.dougsfire.com [2004])

BehavePlus Fire Modeling System

BehavePlus is a Windows® application to predict wildland fire behavior for fire management purposes. It is designed for use by fire and land managers who are familiar with fuels, weather, topography, wildfire situations, and associated terminology. BehavePlus uses a minimum amount of site-specific input data to predict fire behavior for a point in time and space. The BehavePlus fire modeling system replaces the 1984 DOS version of the BEHAVE fire behavior prediction and fuel modeling system. (www.fire.org [2004])

Belt Weather Kit

Most wildland fire fighters are very familiar with an item called a belt weather kit, which is a pouch that contains a variety of items for weather measurement. The kit is designed to attach to a belt around the waist and contains the following items:

- ❒ Wind meter (anemometer)
  - ■ Measures wind speed
- ❒ Sling psychrometer
  - ■ Measures temperature and relative humidity

- ❒ Water bottle
  - For use with the sling psychrometer (wet bulb readings)
- ❒ Compass
  - Wind direction readings
- ❒ Slide rule
  - Computing the relative humidity based on the readings from the sling psychrometer
- ❒ Pencil and paper
  - Recording measurements
  - Making notes and calculations

Electronic Pocket Weather Station

The electronic pocket weather station is battery operated, compact, and easily operated in the field. There are several brands of electronic weather stations to choose. The Kestrel™ brand has several models that monitor relative humidity, temperature, wind speed, dew point, altitude, barometric pressure, and heat index conversions.

Figure 2-2-1: Electronic Pocket Weather Station

Fireline Handbook

This handbook should be carried in every apparatus and taken into the field. Its purpose is to answer any questions you may have on fireline operations. It begins with response, goes through operations, and then details the ICS positions and their job descriptions. It has everything from hand signals used for helicopters to conversion tables for acres/chains and more. Appendix B in the Fireline Handbook is used to predict fire characteristics in conjunction with a graph. Using inputs from the appendix, based off your current condition, you are able to get information such as rate of spread, head intensity, and flame length.

National Fire Danger Rating System

Each day during fire season, midafternoon fire weather observations are taken from a network of fire weather stations located throughout the United States. The fire weather network is comprised of over 1,000 weather stations across the United States. Fire weather observations are reported to the Weather Information Management System (WIMS). These observations are combined with the station's fuel conditions and topography information, then processed by the National Fire Danger Rating System (NFDRS) and generated into various indices and components that describe fire danger in a particular rating area. NFDRS observed indices and components are used on a daily basis as a prediction system by wildland fire managers to determine the strength and placement of fire suppression resources, establish fire suppression actions, and ensure fire fighter safety. These predictions also allow fire agencies to post the appropriate fire danger display to the public.

NFDRS Components and Indices

The weather input generated daily is processed into particular outputs giving fire personnel a way of predicting a fire's potential and characteristics. Some of the these outputs include the ignition component, spread component, and burning index.

Ignition Component (IC)

The IC is a rating of the probability that a firebrand will cause a fire requiring suppression action. Since it is expressed as a probability, it ranges on a scale of "0" to "100." An IC of "100" means that every firebrand will cause a fire requiring action if it contacts a receptive fuel.

Likewise, an IC of "0" would mean that no firebrand would cause a fire requiring suppression action under those conditions. Note the emphasis is on action. The key is whether a fire will result that requires a fire manager to make a decision. The IC is more than the probability of a fire starting; it has to have the potential to spread. There, Spread Component (SC) values are entered into the calculation of IC. If a fire will ignite and spread, some action or decision is needed.

Spread Component (SC)

The spread component is a numerical value derived from a mathematical model that integrates the effects of wind and slope with fuel bed and fuel particle properties to compute the forward rate of spread at the head of the fire. This accounts for the high variability from day-do-day.

Output is in units of feet per minute (fpm). A spread component of "31" indicates a worst-case, with a forward rate of spread of approximately 31 fpm or 3 mph.

Energy Release Component (ERC)

The ERC is the potential available energy per square foot of flaming fire at the head, expressed in BTUs per square foot. The ERC is calculated like the spread component. However, the primary difference is the ERC uses inputs from the entire fuel complex (i.e., 1-hour, 10-hour, and 1,000-hour live fuel moisture), whereas the SC is determined by finer fuels.

This component has low variability and indicates the effects of intermediate- and long-term drying trends.

Burning Index (BI)

The burning index is a number related to the contribution of fire behavior to the effort of containing a fire. The BI (difficulty to control) is derived from a combination of SC (how fast it will spread) and ERC (how much energy will be produced). In this way, it is related to flame length, which, in the fire behavior prediction system, is based on rate of spread and heat per unit area. However, because of differences in the calculation for BI and flame length, they are not the same. The BI is an index that rates fire danger related to potential flame length over a fire danger rating area.

The BI is expressed as a numeric value related to potential flame length in feet multiplied by 10. The scale is open-ended, which allows the range of numbers to adequately define fire problems, even during low to moderate fire danger. To determine flame length, divide BI by 10.

NFDRS Usage

The fire danger rating information is used by fire managers to determine staffing levels in a particular area and the appropriate tactics. These same ratings are used for prevention programs and to communicate the fire danger to the public. Other decisions made from the fire danger ratings are declaration of red flag warnings, prohibiting industrial forest activities, extending fire season, and public forest use.

Staffing Levels

Fire managers can alter their staffing levels based on the NFDRS information, resource values, agency policy, etc. These staffing levels can range from minimal response to prestaging apparatus and crews in vital areas.

Public System

The public system is an adjective class that uses "Low," "Moderate," "High," and "Extreme" fire danger classifications. The current fire danger class is usually displayed along roadways, often using Smokey Bear signs, and is updated as the fire danger rating changes.

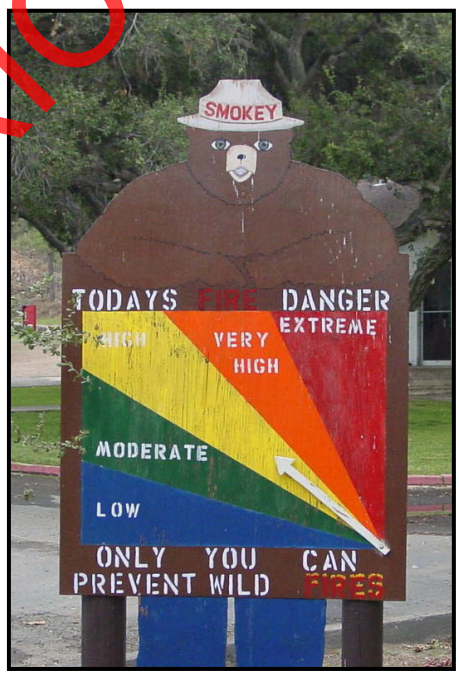


Figure 2-2-2: Public System

GROUP ACTIVITY 2-2-1

TITLE:	Weather Conditions
TIME FRAME:	0:30
MATERIALS NEEDED:	• 5 belt weather kits (one for each group) • Electronic pocket weather station • Writing board/pad with markers/erasers
INTRODUCTION:	This activity provides you the opportunity to practice obtaining weather conditions using a belt weather kit. As a company officer in charge of an engine crew at an urban interface incident, your responsibilities include being informed of fire weather and the conditions it creates. If you do not have immediate access to weather forecasts, the belt weather kit is used to obtain vital, up-to-date weather information.
DIRECTIONS:	1. Using the belt weather kit, complete the chart below. 2. Record your findings on the board/pad or activity sheet. 3. Using the electronic pocket weather station, complete the chart and compare the findings. 4. You have 15 minutes to complete this activity. 5. Be prepared to discuss your results with the class.

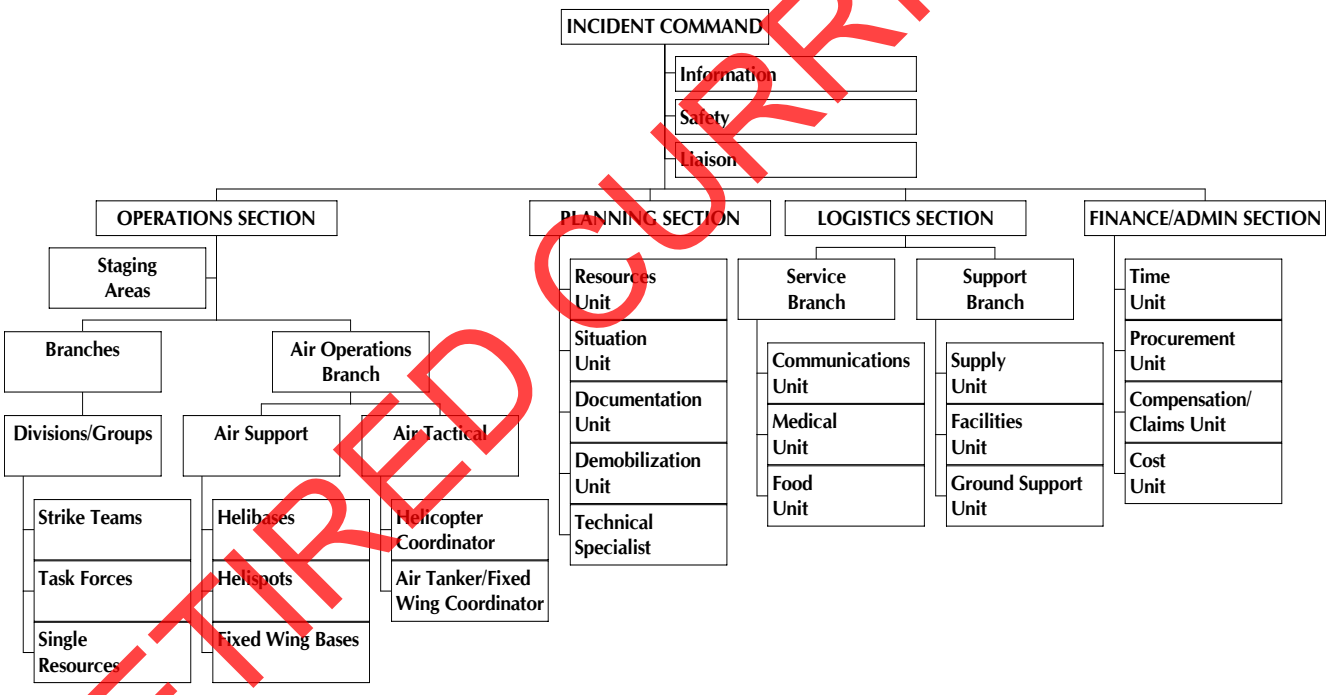
	READING 1			READING 2			READING 3		
	Date	Time	Location	Date	Time	Location	Date	Time	Location
Wind speed									
Wind direction									
Dry bulb temperature reading with sling psychrometer									
Wet bulb temperature reading with sling psychrometer									
Relative humidity with slide rule									
Relative humidity using dry and wet bulb inputs									

Topic 3-1: Review of the Incident Command System

Student information for this topic can also be found in ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapters 5, and 7-10.

The purpose of the Incident Command System (ICS) is to provide for a systematic development of a complete, functional command organization, designed to allow for single or multiple agency use, which increases the effectiveness of command and fire fighting safety.

ICS combines command strategy with organizational procedures and is designed to be applicable to all types of emergency incidents. In this unit however, the focus will primarily be on the wildland aspects of ICS.



ICS provides common terminology, resources, facilities, communications, and organizational function with a manageable span of control. The Command Staff includes the Incident Commander, and the Information, Safety, and Liaison Officers. The General Staff is made up of the Finance, Logistics, Planning, and Operations Section Chiefs.

General Staff

Operations

The Operations Section organizes all tactics to fulfill the overall strategic objectives. Company officers need to be familiar with all levels of this section and its functions. Familiarity with the following positions and levels is important:

Single Resource

A single resource can be an individual initial attack company or an overhead position ordered for an incident.

Strike Team

Another term used in the wildland/urban interface fire-fighting environment is "strike team." A strike team is a group of similar or "like" units that have a designated leader. An example of a strike team would be five Type 1 engines and a Strike Team Leader. Complete strike team information is covered in the Topic 4-1: Resources.

Task Force

A task force is any combination of resources put together for an assignment of temporary nature and includes a leader and common communications. An example of a task force that you may see on an urban interface fire is a water tender and three Type 3 engines with a leader assigned to an operational task.

Planning

The Planning Section collects, evaluates, and disseminates incident information relating to current and predicted events. This section works closely with Operations to ensure that fire fighting tactics are meeting the overall incident objectives. Several units report to the Plans Chief with vital information. The Resources Unit, for example, is responsible for ensuring that all assigned personnel and resources have checked in at the incident and for maintaining an up-to-date resource status.

Logistics

The Logistics Section is responsible for all support and service functions supporting the tactical plan. Company officers should be familiar with the areas of logistics to support their operation. Some of these areas will be discussed in the next chapter.

Finance

The Finance Section is responsible for incident associated costs. Company officers may be involved with a workers compensation issue that would be reported through this section.

Divisions

The divisions on a wildland incident begin at the anchor point or heal of the fire and rotate clockwise beginning with the letter "A" and moving through the alphabet. Division A is immediately on the left and, if the fire grows large enough, Division B is established, followed by Division C and so forth around the fire. In many situations where fire potential is large, the right flank at the heel of the fire

will begin with a "Z" or other letter near the end of the alphabet. Most of the letters in the middle of the alphabet are skipped if the fire does not grow large enough to use them. The thought here is that as the fire grows, divisions must be added; this method allows enough letters to handle that eventuality. As a result, a fire may have five divisions using the following out-of-sequence designators: Divisions A, B, C, Y, and Z before it was controlled and extinguished.

Drop Point

On wildland incidents, the fireline is typically inaccessible except at a few entry points along the line. These entry points must be identified on the incident map so everyone will know how to enter and exit that area. Each entry point is called a "drop point." Most I-Zone fires have a number of drop points identified. Each one will be identified on the incident map found in the Incident Action Plan.

For example, In Division B, there are no places to access the area except at a point just north of the Division A and Division B boundary line. On the incident map, that entry point would be listed as "Drop Point 2." Drops points are always assigned a numeric value.

Groups

Groups are functional assignments given to a particular resource. An example would be a structure protection group. This particular group may be responsible to protect structures in multiple locations and not necessarily assigned to a specific geographic area like a division.

Branches

Branches are assigned as the incident grows out of the normal operational span of control. Branches are usually set up between geographical boundaries on an urban interface fire. They can also be implemented for jurisdictional boundaries or operational function.

Air Operations

Air Ops is assigned by the Operations Chief. Establishing this component of the ICS depends primarily upon the nature of the incident and the availability of aircraft. Air Ops coordinates all airborne activities on the fireground.

GROUP ACTIVITY 3-1-1

TITLE:	ICS Review
TIME FRAME:	0:30
MATERIALS NEEDED:	• ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition • ICS card decks (shuffled, 1 per group)
INTRODUCTION:	It is important for an Incident Commander to have a thorough knowledge of ICS in order to assign tasks. Think of each incident as a card game of sorts. Each card denotes a responsibility. The more cards an IC hands out (i.e., delegates authority), the more frequently others will handle problems and responsibilities, freeing the IC to manage crucial command tasks. On a major incident, the only card an IC should control is his or her own, all other cards (tasks) should be delegated to the appropriate staff.
DIRECTIONS:	1. This is a closed-book exercise. 2. When the time begins, organize your deck of cards according to the ICS organizational structure. 3. Think of each major function of ICS as "suits" and place the cards in descending order of hierarchy. 4. You have 15 minutes to complete this activity. 5. Select a spokesperson and be prepared to discuss your chart with the class.

Topic 3-2: Duties and Responsibilities of the Company Officer

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Pages 14-17, ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapter 12 and Appendix A, and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Page 6.

Preparation for Response

Because of the number of large I-Zone incidents occurring in California in recent years, it has become necessary to move response teams around the state and a great distance from their jurisdiction. It is quite possible that a team is called to an area many miles from home and remains there for several weeks. Therefore, it would be advantageous for the company officer and crew to be prepared for an out-of-county or out-of-the-area stay.

A response team should be prepared to survive for at least 48 hours on their own. Some items that today's teams recommend packing in a travel bag and kept in a convenient location to take for quick deployment and response are described below. Pack accordingly and concisely knowing how much available room there is on your apparatus for storage.

Department Equipment

- ❒ Full personal protective equipment
- ❒ Wildland PPE
  - California Code of Regulation (CCR), Title 8. Industrial Relations, Division 1. Department of Industrial Relations, Chapter 4. Division of Industrial Safety, Subchapter 7, General Industry Safety Orders, Group 2, Safe Practices and Personal Protection, Article 10.1, Personal Protective Clothing and Equipment for Fire Fighters, §3410, Application
    - Ear and neck protection
    - Body protection
    - Hand and wrist protection
    - Foot protection
  - NFPA 1977 standard
    - Footwear
    - Gloves
    - Helmet
    - Jacket
    - Shirt
    - Trousers

- ❒ Portable radios
  - Spare batteries
  - Chargers (if available)
- ❒ Cell phone, if issued by your department, with a charger
- ❒ MREs [meal, ready to eat] or equivalent and drinks
- ❒ Toilet paper
- ❒ Sleeping bag
- ❒ Drinking water

Personal Items

- ❒ Enough clothing for at least 5 days
  - Until facilities can be obtained for washing
  - Extra sweatshirt or jacket
    - Anticipate cold weather at upper elevations
    - Winter season
- ❒ Pillow
- ❒ Toiletry items
  - Eye drops
  - Pain reliever
  - Prescribed medications
  - Hygienic items
- ❒ Insect repellant
- ❒ Matches
- ❒ Sunglasses
- ❒ Watch
- ❒ Pocketknife
- ❒ Compass
- ❒ Personal cell phone with charger
- ❒ Money for incidental items

Dispatch Information for the Company Officer

When dispatched to an I-Zone response, it is incumbent upon the company officer to obtain some critical information before responding. This information is necessary before, during, and after the incident. The California Master Mutual Aid Program requires certain communications between the agency requesting resources in an emergency and the California Office of Emergency Services.

Incident request numbers and resource numbers are generated as the resources are dispatched. These numbers are all-important, as each team responding to the incident will need to be positively identified for both tracking as well as reimbursement. It will be incumbent on the company officers and Strike Team Leader to record those numbers, as well as other dispatch information, in order to complete forms and other materials as needed at the incident and afterward. Many pieces of information are required of each responder and some pieces of information are nice to have in order to make the response easier.

Required Information

❶ Incident name

❷ Incident numbers: order number, request number, and assignment

❸ Travel route

❹ Communication frequencies (both travel and incident tac) Assignment (single resource, strike team or task force)

❺ Reporting location and expected time

❻ Resource designator

Nice-to-know Information

❒ Rendezvous point if one is necessary
- Within jurisdiction
- En route
- At the scene

❒ Specialized equipment needed for specific incident requirements

❒ Size, scope, and potential of the incident
- You could be expected to participate for anytime up to two weeks or more

❒ Telephone contact numbers
- Agency requesting response
- Strike team leader cell
- Home agency dispatch center

❒ Response mode
- Immediate versus planned need

Incident Numbers

Incident Order Number

You will receive an incident order number upon dispatch if requested by a forestry agency. If requested by local government, you may receive it after arrival. The number starts with the "ordering" state's designator (i.e., CA, AZ, NV) followed by the "ordering" unit's three-letter designator (i.e., AEU=Amador/El Dorado Unit). The last four digits are the incident number for that unit (i.e., call number 4006).

An incident order number for Placerville may look like this CA AEU 4006.

Incident Request Number

An incident request number begins with the individual department's designator (i.e., SAC, SFD) found in the Field Operations Guide, followed by a single-letter resource designator (i.e., E = Engine), and ending with the number of strike team/task force requests from the area (i.e., 003 = 3rd request).

An incident request number may look like this SAC E 003.

Resource Designator

A strike team number begins with the three-letter designator of the OES region (i.e., Sacramento = ~ XSA), followed by a four-digit preassigned number. The Sacramento area is assigned number 4150 through 4174. The first strike team out of the Sacramento area would be 4150, the second 4151, and so on. The strike team numbers conclude with single-letter resource designator (i.e., A = Type 1 engine).

A strike team number may look like this XSA 4150 A and identified as "Strike team forty-one fifty Alpha."

Rendezvous Location

The rendezvous location can be determined by the strike team leader, dispatching agency, or predetermined geographical areas. This location should be selected for the most convenient and effective site for a strike teams deployment. The location is usually based on the direction of travel, significant area for staging apparatus available, and any necessary services that might be needed.

Response and Request Levels

Upon dispatch, you will be assigned to one of three response levels. Typically, if the incident is in your own jurisdiction, you will be dispatched as initial attack and respond directly to the fire or to a staging area near the fire. When dispatched to another jurisdiction for a larger fire, your response level may be different, either "immediate need" or "planned need."

Initial Attack

You will be the first unit or among the first units on-scene and are expected to go right to work. You are the closest resource, or at least one of the closest dispatched. The California Master Mutual Aid Agreement states that an initial attack response level is used for response times of 10-15 minutes or less. This time starts when the request is received and should be considered a Code 3 response. Your team is out the door ASAP!

Immediate Need

Immediate need is a regional request. Your assistance is needed as soon as possible and your maximum response time should be 30 minutes from receipt of request. This call typically dispatches a team from your area that responds directly to the fire as opposed to a Planned Need dispatch. Whether you respond Code 2 or 3 and/or gathering at a predetermined location prior to response depends on your department's SOPs. However, the intent of an immediate need dispatch is to get the resources to the scene ***ASAP***.

Planned Need

Planned need is an out-of-county or region request taken from a pre-established list. Typically, your team will respond to a predetermined location to form up and then travel as a team to the event. All travel is usually Code 2. This type of request usually indicates your team will be used during the next operational period of the fire or as a staged resource. A planned need request is designed to have your unit on the road within 60 minutes from the receipt of the request.

FIRESCOPE Engine Request Standards

When requests are made for out-of-area resources, it must be accomplished with the expectation that the requested resources meet certain criteria. Below are some of the minimum engine request standards according to the California Master Mutual Aid Agreement. These resources are described in detail in Topic 4-1: Resources.

Type 1

- ❒ Four personnel
- ❒ Mobile radio with White 1, 2, and 3 as the minimum (with battery charger)

Type 2

- ❒ Three personnel (primary difference)

Type 3

- ❒ Three personnel
- ❒ Capable of off-road operations
- ❒ Mobile radio with White 1, 2, and 3 as the minimum (with battery charger)

Type 4

- ❒ Three personnel
- ❒ Capable of off-road operations
  - Usually four-wheel drive
- ❒ Mobile radio with White 1, 2, and 3 as a minimum (with battery charger)
- ❒ The smallest of the engine types mentioned above

Water Tender

- ❒ Dispatched as a single resource or part of a task force
- ❒ Maximum crew size of two; may have one
- ❒ Mobile radio with White 1, White 2, and White 3 as the minimum (with battery charger)

Your Strike Team Leader and Assigned Units

Find out immediately who your strike team leader is and his or her cell phone number (if available). This will allow you to contact the Strike Team Leader (STL) if any unforeseen events occur while en route to the rendezvous location. Make a note of the additional apparatus assigned to your strike team. This will give you an idea of what direction they are responding from and how long it will take for mobilization.

Travel Frequency

Your STL will provide you with the radio channel your strike team may use for communications while en route to the incident. This channel will usually be a State frequency such as White 1, White 2, or White 3.

Contact Numbers

These phone numbers provide strike teams and single resource personnel with a direct contact line for the requesting agency's dispatch center, your dispatching agency, and an area representative number. These numbers can be used to obtain up-to-date information relating to travel, check-in locations, or any unforeseen events.

Response Route

A designated route may be issued by the dispatching agency so your team can avoid road closures and any incident detours. When traveling to an incident, there may be more than one location for your team to go to when it first arrives. It is important for you and/or your STL to note these various locations, since they could be miles apart on a large incident.

Check-in

The purpose of check-in is simply one of accountability. The arrival time of each resource is recorded as well as the identity of each person and piece of equipment. This provides support documentation for reimbursement, emergency contact, and demobilization later. A copy of the form (ICS 211) is included in Appendix C. It is your responsibility to ensure proper check-in at the incident.

Division/Group/Incident Command Post

On arrival, you may check-in with a division, group, or at the Incident Command Post. You may be requested to respond directly to the line in a particular division. You will be given the location or drop point in that area to respond to and will be expected to go right to work. You should follow up with the Plans Section to ensure check-in has been initiated.

Staging Area

Check-in with the Staging Area Manager on arrival. On large incidents, staging areas will be preset so that the arriving units are all located in a single, ready-to-respond location. When in a staging area, the general rule is to be ready-to-roll within three minutes of a request.

Camp or Base

When arriving at a camp or base, you should check-in with the Status Recorder or Resource Unit Leader. Many times this is where your unit will go when arriving as a "planned need" during the next operational period.

Helibase

A helibase is located in and around the incident area, where helicopters may be parked, maintained, fueled, and loaded with retardants, personnel, or equipment. There may times when a Type 1 engine company is utilized for fire protection during fueling operations at the helibase.

Documentation

The process of responding to an out-of-county fire is demanding. It requires ongoing planning and communications in order to be successful. At the same time, proper documentation must be completed as the incident evolves. Proper reports and records at the company officer level for an out-of-county response requires, at a minimum, a unit log, emergency activity record, vehicle inventory, and incident demobilization. All forms come with a complete set of instructions.

Unit/Activity Log - ICS 214

A unit log is the daily documentation filled out by the company officer on the strike team for each operational period. The STL will collect these forms and give them to the Documentation Unit Leader for the overall report. All significant activities that occur within your company for an operational period must be noted including times, assignments, injuries, damaged apparatus and equipment, unusual events. This log is a legal document that may be referenced in the future. A copy of this form is included in Appendix C.

Emergency Activity Record - F-42

This form is available through your STL and helps ensure accurate reimbursement for the departments participating in the incident. The emergency activity record is usually completed during the demobilization process. A copy of this form is included in Appendix C.

Vehicle Inventory - F-157

It is suggested that a vehicle inventory form be carried on all responding units to a mutual aid operation. The vehicle inventory provides a record of all equipment on the unit at the start of the incident. This form is useful should any equipment be lost or broken during the incident so replacement equipment can be requested. In addition, should someone find equipment he or she believes is not apart of the engine compliment (during demobilization), it can be confirmed with this form. A copy of this form is included in Appendix C.

Incident Demobilization - ICS 212 and 221

ICS 212

This form is used to verify the road-safety status of the apparatus when it is time to return home or move to another incident. It must be signed by both the driver/operator and the inspector. This process removes liability from the incident back to the unit's agency before the unit leaves the area. A copy of this form is included in Appendix C.

ICS 221

This demobilization form is used to checkout both the apparatus and its personnel. The company officer completes the top of the form and then, through the Demobilization Unit Leader, sends it through the Logistics, Planning, and Finance/Administration Sections. Each applicable section must verify that this unit and its personnel are ready for release. Any issues found by the sections must be resolved before the unit is released. This is the last form that must be completed and approved before leaving the incident for home or another fire. A copy of this form is included in Appendix C.

Additional Services and Resources

The company officer should have a good knowledge of incident responsibilities to lead an organized operation for his or her crew. In addition to the necessary paperwork and incident information, the company officer should have a thorough working knowledge of the following ICS areas while committed to an incident:

Medical Unit

Every operation is inherently dangerous. Even the travel to and from an incident is dangerous because of unpredictable road conditions and irresponsible or reckless motorists. A part of the ICS creates a Medical Unit to manage any injury that may occur before, during, or after an incident. The first step for reporting an injury is to notify your STL who will notify his or her Division or Group Supervisor.

A Medical Plan (ICS 206) is included in the Incident Action Plan and identifies medical aid stations, transportation services, paramedic availability, hospitals, and emergency medical procedures.

Many incidents have a Medical Unit in camp for fire fighter first aid such as burns, skin irritations, cuts, abrasions, headaches, etc. These incidents may also have EMTs and paramedics to provide field basic life support (BLS) and advanced life support (ALS) procedures.

A point to be made here is that many departments sending units to out-of-the-area responses are usually removing ALS equipment and drugs and leaving them behind for different reasons, liability of loss being a major one. The Orange County Fire Authority (OCFA) learned that this might be an error the hard way. A few years ago, the OCFA lost a Fire Captain on a strike team to a heart attack. Because of that incident, the OCFA began designating one of its units on every strike team as a Paramedic Assessment Unit (PAU) providing advanced life support.

Communication Unit

The strike team company officer should be familiar with the Incident Radio Communications Plan (ICS 205). This form lists the channel, function, frequency, and assignment for each system on the

incident. If you need to "clone" a radio for proper frequencies or obtain radios for crew communications, this will be completed at the Communications Unit.

Crewmember Emergencies

If a crewmember should ever have an emergency, personal or otherwise, the protocol is to follow the chain of command. The company officer should notify the STL first, then work with him or her following the chain of command. The agency representative will also be involved in this type of situation.

Human Resources

At most of today's larger incidents, a human resources liaison is on-scene for any problems between personnel or problems affecting individual personnel. Issues such as harassment or psychological situations are meant to be resolved by this person.

Supplies

On a large incident, the need to replace equipment can occur on occasion. The function of the Supply Unit is to replace any needed or broken equipment in order to make the units as efficient as possible for their next assignment. For example, an engine that lost 400 feet of hoseline on a burnover and needs to get it replaced before going back on the line the next day would go to the Supply Unit for more.

The STL must be notified before any equipment is requested from the Supply Unit because the STL has the ultimate responsibility for that equipment. The company officer should complete a report describing the equipment loss and give it to the STL. Some of the items available from the Supply Unit are only for loan (not replacement) and cannot be taken home after the incident. When your unit is demobilized, you will not be released until you have returned any loaned equipment.

Ground Support Unit

The Ground Support Unit is under the Support Branch of the Logistics Section and is responsible for the maintenance and repair of tactical equipment, vehicle and equipment fueling, incident transportation services, and an incident traffic plan. The company officer should coordinate through the Strike Team Leader to obtain necessary resources from the Ground Support Unit.

LCES Checklist

The LCES system approach to fireline safety is an outgrowth of analyzing fireline fatalities and near-misses over a 20-year period. LCES simply focuses on the essential elements of the Standard Firefighting Orders. Its use should be automatic in fireline operations, and all fire fighters should know the LCES interconnection.

Lookouts ⌘ Communications ⌘ Escape routes ⌘ Safety zones

LCES should be established before fighting the fire: Select lookouts, set up communications, choose escape routes, and select safety zones.

LCES functions sequentially, as a self-triggering mechanism. Lookouts assess and reassess the fire environment and communicate threats to safety; fire fighters use escape routes to safety zones. All fire fighters should be alert to changes in the fire environment and have the authority to initiate communication.

LCES is built on two guidelines: 1) Before safety is threatened, each fire fighter must know the LCES system will be used, and 2) LCES must be continuously reevaluated as fire conditions change.

Lookouts

Lookouts are often better situated to notice the cumulative changes of fire behavior. Firefighting Order #5 says, "Post lookouts when there is possible danger."

Should you utilize lookouts at all times? What are you looking for when you are selecting a lookout location?

- ❒ Choose a good vantage point
  - Preferably with a good overview of the entire area where fire fighters are located
  - Include escape routes and safety zones
- ❒ Utilize aircraft, but have an alternative on the ground

What are the desired qualities, capabilities, knowledge, and responsibilities of a lookout person?

- ❒ Experienced fire fighter
- ❒ Solid knowledge of fire behavior and ability to recognized and monitor other environmental hazards
- ❒ Good communicator
  - Keeps the crew advised of fire behavior changes
  - Tracks weather trends and relays the information
  - Informs crew of work progress and updates from the latest strategy and tactical briefings
- ❒ Monitors and accounts for all individuals within his or her assigned area at all times and will notify others if breaks are needed

What is the necessary equipment for a lookout?

- ❒ Appropriate PPE
- ❒ Radio with extra batteries
- ❒ Compass
- ❒ Binoculars
- ❒ Belt weather kit
- ❒ IAP

- ❒ Map
- ❒ Food
- ❒ Water

Communications

Effective communication is a critical backbone of safe and successful operations. Know the factors that affect radio communication at the incident.

- ❒ Type of radio issued
- ❒ Net control, frequencies
- ❒ Line-of-sight restrictions
- ❒ Antenna polarization effect (direction of the antenna)
- ❒ Minimizing noise interference

How can you mitigate potential problems?

- ❒ Implement effective communication procedures
  - Be brief, clear, concise, and to-the-point
- ❒ Give a good comprehensive briefing
  - Refer to the Briefing Checklist inside the back cover of the Incident Response Pocket Guide
- ❒ Confirm that relayed information is received, acknowledged, and understood
- ❒ Keep a continuous information flow
  - Updates on weather
  - Fire behavior
  - Work progress
  - Changes in strategy/tactics
  - Arrival of additional resources
  - Solicit feedback
- ❒ Establish emergency check-in procedures
- ❒ Provide a minimum of four radios per 20-person crew

Five Communication Responsibilities for All Fire Fighters

1. Brief others
2. Debrief your actions
3. Communicate hazards to others

4. Acknowledge messages
5. Ask if you do not know

Escape Routes

An escape route is a preplanned and understood route to reach a safety zone.

What are the primary concerns in choosing an escape route?

- ❒ Select the closest, least obstructed route
- ❒ Plan for more than one escape route
- ❒ Avoid an uphill escape
- ❒ Scout and clearly mark the route for visibility
  - ■ Aids during smoky situations or night operational periods
- ❒ Determine escape time
  - ■ Consider slowest person, fatigue, and temperature factors
- ❒ Continuously reassess the situation with regard to work progress and additional resource arrivals
- ❒ Ensure all line personnel are familiar with escape routes

Safety Zones

A safety zone is a location where the threatened fire fighter can find adequate refuge from an approaching fire.

What is the difference between a safety zone and a deployment site?

The safety zone is the area where a fire fighter can survive without using a fire shelter. The deployment site is used when fire conditions are such that escape routes and safety zones have been compromised.

How do you identify a good safety zone?

- ❒ Consider the distance from the escaped fire as well as topography, winds, fire behavior, and fuels in the area
- ❒ The best locations are usually "in the black"
  - ■ Those with a minimum of, or devoid of, ground/aerial vegetation or large bodies of water
- ❒ Size is sufficient for all present resources with a minimum distance from fire of at least four times the maximum flame height
- ❒ Location is scouted and marked well for visibility at all times
- ❒ Location has been reassessed in relation to line work progress, fatigue, changes in fire behavior, and arrival of additional resources

Managing Stress

Stress is defined as the body's nonspecific response to any demand placed on it -- pleasant or unpleasant. It is what motivates us and what we find challenging and rewarding. It exists in our everyday lives and is something we seek in our leisure activities such as riding a motorcycle, jet skiing, parachuting, or any of the other recreational activity that challenges our senses. Stress is intended to be beneficial and is usually a good phenomenon. It is a normal reaction and prepares the body to cope with environmental changes.

Causes

Some common causes of stress that can be triggered on an incident include fear, anger, emergencies, exhaustion, and excessive environmental factors such as heat, cold, smoke, dirt, etc.

Distress

Stress turns into distress and becomes a bad thing when the body can no longer cope with the stress reaction and your mental and physical activities become impaired. When distress occurs, accidents and injuries are more common, and you will need to identify and correct the causes of distress. Some of the things you should look for are abdication, breakdown of communication skills, tunnel vision, and a loss of energy and focus. Some of the causes of distress are mounting problems (overload), prolonged activities, and sleep deprivation. To treat distress you will need to get some rest, accept that stress is a part of the job, and even though you might not agree with the situation, you need to accept the situation. Remember, you are human and you will make mistakes. You did not cause the situation that is creating the distress, but you are there to fix it and prevent further damage. Look at the stressful situation as a challenge requiring managerial skills and avoid dead-end decisions. Remain flexible and allow for modification, expansion, and reversal of noneffective actions. Delegate authority and responsibility to maintain your span of control and minimize the possibility of becoming overloaded and entering a distressful environment. You also need to realize that the resources and personnel you get may be inadequate and not meet normal performance objectives due to distress.

Command Presence

One of the most important skills a company officer must develop is the ability to maintain his or her composure under stress. Lives, property, and the community depend on your decisions and you will need to maintain a "command presence" during emergency operations. Some of the skills you will need to develop are self-control (remaining calm), organizing your thought process, and communicating your plan so it is understood. You will be able to do this by utilizing a combination of skills, training, and experience. It will take hard work and the opportunity to apply the skill.

Safety

You will need to comply with all applicable statutes, policies, and SOPs. Monitor personnel for distress and make critical incident stress debriefings available for significant emotional events. You can also arrange for shift changes that will enhance extended rest periods and request rehab or giving extended and regularly scheduled breaks.

Environment

Excitement will be all around you and you will need to get things turned around and organized in a reasonable amount of time. If the chaos continues, you will need to look at yourself and how you need to modify your actions to get things on track. Determine what is important, set your strategic priorities, and make sure these are known to all personnel you supervise.

Noise

Do not let noise intrude into your communications or data gathering. Separate yourself from as much noise as possible by tuning out nonessentials. When possible, leave the noise and confusion area so you will not be caught up in small details.

Sights

Watch for danger signs such as flare-ups, wind shifts, and other indicators that things are changing. Look past the smoke and flames to get an idea of the overall big picture, where the incident is going, and its ultimate potential. This will allow you to think and plan ahead so you will have personnel and resources in place when needed.

Job Aids to Manage Stress

Make it easy on yourself by utilizing checklists and the ICS 201 or other compatible form to help you keep track of resources and the decisions you have made. Writing things down will act as a reminder of things to check up on and give you a chronology of events. Utilize personnel, resources, and time to maintain your goals and objectives. Remember you cannot do it alone and work as a team to get things done efficiently and safely.

Demobilization

As the incident draws down, it becomes possible to release units back to their original cities, counties, states, or move them to other fires. An orderly process called "demobilization" (demob) will be established and a systematic release of units will take place. The demobilization process is concerned with three areas: personnel (their fatigue), apparatus (its condition), and inventory. In order to expedite demob, the company officer must be prepared with the necessary paperwork properly completed and any other details that might be necessary before release.

The Unit/Activity Log (ICS 214) must be completed and signed. It is turned in to the STL along with any other applicable forms.

All borrowed supplies must be turned back in to the Supply Unit. In some cases, an item will be kept by the unit as a replacement for an item that was lost or broken. The difference, however, between whether an item was borrowed or actually procured must be made clear. In the case of a dispute, the company officer should use his or her Vehicle Inventory form (F-157) to resolve any conflicts.

It is a good idea for the apparatus driver/operator to completely check the unit before entering the demob area. Topping off fuel, water, and other fluids is recommended; the trip home could involve another response.

A mechanic will check all fluid levels, tires, the electrical and brake systems, and chassis. Everything must be in a travel-safe condition before the unit is released. Something as simple as a brake light being out requires it to be repaired before leaving the incident.

Some units will be held back from release if, during demob, they are found not to be well rested since their last line assignment. Generally, if a unit comes right off the fireline, they will be given a rest period before sending them on their way.

GROUP ACTIVITY 3-2-1

TITLE:	Safety Zone Determination
TIME FRAME:	0:15
MATERIALS NEEDED:	• Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Pages 14-17 • Pen or pencil
INTRODUCTION:	This activity provides you the opportunity to confirm your understanding of safety zone guidelines.
DIRECTIONS:	1. Read the Lightning Complex information below. 2. Answer the questions. 3. You have 10 minutes to complete this activity. 4. Be prepared to discuss your answers with the class.

LIGHTNING COMPLEX

You are the company officer who has been assigned to build a safety zone on one of the many fires started by lightning. Your fire is 25 acres and is burning in brush, grass, and scattered with scrub oak. You have 50 fire fighters to protect and your fire has 20-foot flame heights with no slope or wind. There are fuels present that will allow the fire to burn on all sides of the safety zone.

1. How large should you make your safety zone?

_____

_____

2. If area in acres is calculated to allow for distance separation on all sides for a three-person engine crew, then how big is an acre? *Distance separation is the radius from the center of the safety zone to the nearest fuels.*

_____

_____

INDIVIDUAL ACTIVITY 3-2-2

TITLE:	Duties And Responsibilities
TIME FRAME:	0:10
MATERIALS NEEDED:	• Pen or pencil
INTRODUCTION:	This activity provides you the opportunity to understand the basic information a company officer will need to effectively participate in out-of-county assignments.
DIRECTIONS:	1. Select the one response in Column 2 that most nearly matches an item in Column 1. 2. Write the number of the item from Column 1 in the parenthesis that precedes the appropriate response in Column 2. 3. You have 5 minutes to complete this activity. 4. Be prepared to discuss your answers with the class.

COLUMN 1		COLUMN 2
1. Staging	(_____)	Unit under Logistics that obtains fuel.
2. ICS 214	(_____)	OES report for incident reimbursement.
3. F-42	(_____)	LAC E-010
4. Request number	(_____)	Daily documentation form filled out by the company officer.
5. Order number	(_____)	Ready-to-respond area within 3 minutes to respond.
6. Immediate need	(_____)	XSA 4150A
7. Strike team identifier	(_____)	Dispatched response for mutual aid in less than 30 minutes.
8. Demobilization	(_____)	CA MMU 1234
9. ICS 221	(_____)	Demobilization checkout.
10. Ground unit	(_____)	A process to identify and inspect personnel fatigue, apparatus condition, and inventory.

Topic 3-3: Incident Action Plan

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Chapter 8 and the ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Page 11-14.

The Incident Action Plan (IAP) begins in the mind of the first-in officer. It may stay a mental picture throughout an incident, or if the incident grows in size and complexity, the plan is converted from memory to paper. The IAP is then a written account detailing the strategy and tactics being utilized by the Incident Commander. A formal IAP helps ensure that all responders have access to the plan in order to mitigate the incident. Oftentimes on larger incidents, staff is requested to the incident just for the purpose of assembling the IAP, making copies, and then distributing to incident personnel. It is the duty of the company officer to be familiar with each incident's IAP.

A standard IAP contains a set number of forms designed by FIRESCOPE. The forms can be used singularly, as well as in sequence for this report. Each form is identified by a number that closely corresponds to the order of the pages in an IAP. Each of the following forms is in Appendix C.

IAP Forms

ICS 201 - Incident Briefing

The Incident Commander uses this part of the IAP in the ***initial stages*** for tracking the progression of the incident and accountability. This form has four major sections for the following information: a map sketch, a summary of current objectives and actions, an organizational chart, and a summary of resources. As the fire progresses into a prolonged incident and a formal IAP is established, the information in this section is transferred onto other forms.

ICS 202 - Objectives

This form provides personnel on the fireline with an overall incident objective for a given operational period. The ICS 202 also includes information on the weather that can be expected and any general or safety messages specific to the period. Some attachments, such as a traffic plan or assignment list, may also be included when appropriate. This form is prepared by the Planning Section Chief.

ICS 203 - Organization Assignment List

This form identifies the personnel assigned to the lead roles for the incident from the Incident Commander to Division/Group Supervisors. It provides a list of who is working for whom during a given operational period. This form is prepared by the Resources Unit.

ICS 204 - Assignment List

This form identifies the individual assignments for personnel within a particular branch and division/group for a given operational period. Some of the information the ICS 204 provides includes the names of operations personnel, the resources assigned, control assignments, special instructions, safety messages, and a division/group communication summary. This form is prepared by the Resource Unit Leader.

ICS 205 – Incident Radio Communications Plan

This form identifies all incident frequencies and their use, such as tactical, operational, and command channels. It may also include cell phones and pagers. The Communications Unit prepares this form.

ICS 206 - Medical Plan

This form identifies any established medical service available for incident personnel, such as aid stations, ambulance services, incident ambulances, hospitals, and EMTs/paramedics, along with their locations. The ICS 206 also establishes a plan for immediate treatment and transportation for sick or injured fire fighters. This form is prepared by the Medical Unit Leader.

ICS 215 AG/AW - Incident Safety Analysis-Generic/Wildland

This form identifies the LCES analysis of tactical applications such as downhill fireline, midslope fireline, established anchor points, and any extreme conditions. There is also a section for other risk analysis such as hazardous materials, structure protection, and multiple aircraft.

Additional Material and Forms

There are other elements, in addition to the ICS forms, that are part of an IAP. They usually include a cover page (frequently a drawing or name of the incident with a title), any maps that are needed for different assignments, an individual safety briefing created by the scene Safety Officer, weather forecast issued by a Planning/Technical Specialist, and any incident information provided by the Information Officer.

ICS 211 – Check-in List

This form is used to sign-in personnel and equipment as they arrive at the incident. Essential information recorded on this form includes the order/request number, date/time of check-in, leader's name, total number of personnel, manifest, weight, home base, departure point, method of travel, incident assignment, and qualifications.

ICS 214 – Unit/Activity Log

This form has a personnel roster that lists each person by his or her ICS position and home base for a given operational period. All personnel assigned on the incident use the ICS 214 for daily documentation. Some of the information that should be documented includes: the personnel assigned to your crew, significant events, check-in, work assignments, apparatus damage, tool loss, and operational and logistical activities.

ICS 221 – Demobilization Checkout

This form is used during the demobilization process and may be attached to the IAP. It notifies crews of their scheduled release time and an order for this process.

ICS 225 – Incident Personnel Performance Rating

This form is filled out by the immediate supervisor and submitted to the Planning Section. The form is filled out for all ICS positions, including trainees.

INDIVIDUAL ACTIVITY 3-3-1

TITLE:	What's In A Number?
TIME FRAME:	0:10
MATERIALS NEEDED:	• Pen or pencil
INTRODUCTION:	This activity provides you the opportunity to gain a basic understanding of IAP forms and where to locate pertinent information.
DIRECTIONS:	1. Select the one response in Column 2 that most nearly matches an item in Column 1. 2. Write the number of the item from Column 1 in the parenthesis that precedes the appropriate response in Column 2. 3. You have 5 minutes to complete this activity. 4. Be prepared to discuss your answers with the class.

COLUMN 1		COLUMN 2
1. ICS 202	(____)	Tactical frequencies
2. ICS 203	(____)	Incident strategy
3. ICS 204	(____)	Incident position assignments
4. ICS 205	(____)	Division tactical assignments
5. ICS 206	(____)	Command frequencies
6. ICS 211	(____)	Safety analysis
7. ICS 214	(____)	Demobilization
8. ICS 215 AG/AW	(____)	Performance evaluation
9. ICS 221	(____)	Check-in
10. ICS 225	(____)	Medical plan

GROUP ACTIVITY 3-3-2

TITLE: IAP Review

TIME FRAME: 1:00

MATERIALS NEEDED:

- Incident information
- Blank ICS forms 202, 203, 204, 205, and 206
- Pen or pencil

INTRODUCTION: An IAP contains all necessary incident information and can act as a user's guide for your particular situation. It provides personnel assigned to an incident the relative information on the overall objectives, their assignment, where to go, how to get there, and important safety considerations.

This activity provides you the opportunity to become familiar with the components of an Incident Action Plan.

DIRECTIONS:

1. In your group, complete your assigned section(s) of an IAP based on the incident information and ICS 201 form.
2. You may interact with other groups as needed.
3. You have 30 minutes to complete this activity.
4. Be prepared to discuss your IAP section with the class.

INCIDENT INFORMATION

Name: ..... Busto Grande

Operational Period: ..... August 15 0800-0800

Weather: ..... High temperature: 105°F
..... Low temperature: 82°F
..... Maximum RH: 30%-40%
..... Minimum RH: 10%-12%
..... Wind: S@10-15 mph (am)
..... SW@15-20 mph (pm)

Fuel: ..... Light to moderate brush

Topography: ..... Elevation: 800-1,500 feet
..... Slope: 0%-40%

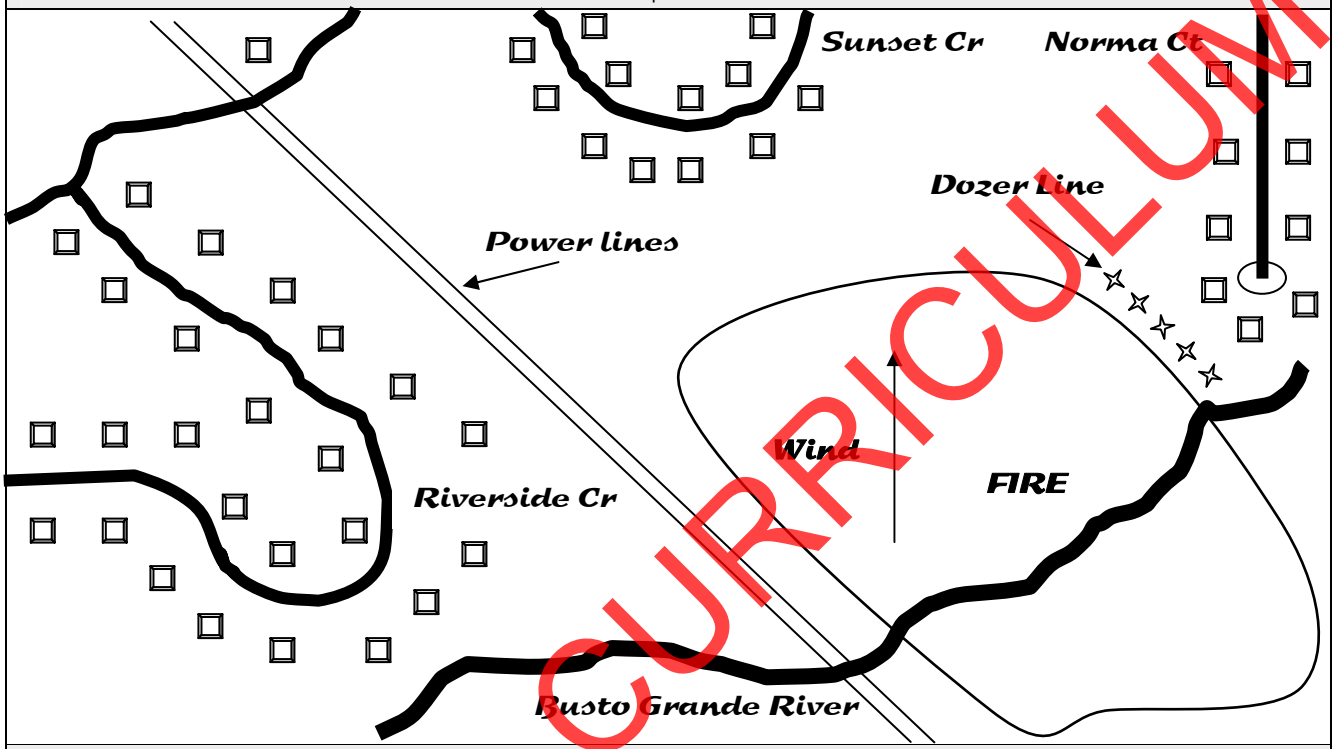
Acres: 5,000

Resources:		
..... 5	Type 1	Strike team
..... 5	Type 3	Strike team
..... 2	Type 2	Dozers
..... 2	Type 1	Air tankers
..... 3	Type 2	Water tenders
..... 4	Type 1	Hand crews
..... 2	Type 2	Helicopters
..... 1	Type 2	Management team

Structures: ..... 3 Subdivisions (50+ homes each)

INCIDENT BRIEFING	1. Incident Name	2. Date	3. Time
	Busto Grande	*8/14/2004*	*2100 hrs*

4. Map Sketch



6. Resources Summary

Resources Ordered	Resource Identification	ETA	On-scene	Location/Assignment
Type 2 dozer	4241		√	Right flank
Type 3 engines	4281		√	Left flank
"	E32		√	Norma Structure Group
"	E155		√	Right flank
"	1665		√	Sunset Structure Group
"	4262		√	Left flank
"	Strike Team 4190C	0100		
	Strike Team 9203C	0130		
	Strike Team 4191C	0200		
	Strike Team 9102C	0230		
	Strike Team 4193C	0300		
Type 1 engines	Strike Team 4280A	0100		
"	Strike Team 9206A	0130		
"	Strike Team 4282A	0200		
Type 1 engines	Strike Team 9211A	0230		
"	Strike Team 4290A	0300		

Type 1 air tankers	T101	1000	
"	T102	1000	
Type 2 helicopters	Copter 404	0900	
"	Copter 1	0900	
Type 1 hand crews	Green Valley crew 1	√	Right flank
"	Green Valley crew 2	0100	
"	Mendocino Hotshots	0500	
"	El Dorado Hotshots	0700	
Type 2 Mgt Team	Team 102	1200	
Single resource	D. Childress		Incident Command
Single resource	V. Hobbs		Planning Section Chief
Single resource	S. Muldoon		Operations Section Chief
Single resource	J. Wagner		Logistics Section Chief
Single resource	K. Norton		Finance Section Chief
Single resource	P. Queen		Safety Officer
Single resource	A. Hamilton		Liaison Officer
Ambulance	Acme Medic 17	0300	
Type 2 water tenders	WT15	√	Right flank
"	WT22	0400	
"	WT112	0600	

7. Summary of Current Actions

Protect Structures in Norma Ct, Sunset Cr and Riverside subdivisions
Contain fire on North side of Busto Grande River on right flank with dozer and hose lay
Contain fire on North side of Busto Grande River on left flank with hose lay

Actions for next operational period:
Continue to protect structures in Norma Ct, Sunset Cr
Add structure protection to Riverside subdivision
Contain fire on North side of Busto Grande River on right flank with additional resources
Contain fire on North side of Busto Grande River on left flank with additional resources
Contain fire on south side of Busto Grande River

Conditions:
The current time is midnight; the fire has grown to 5000 acres. Winds continue to force fire through type 4 fuels heading north to northeast at night. Winds will decrease slightly in the early morning, change direction, and start again. Temps have been reaching upper 90s to 100 by noon. Crews that have been ordered will be arriving. Fill out your ICS forms accordingly to meet the operational objectives for the next operational period.

Additional Info:
To simplify you have one command channel 1A, 3 tac channels 2A, 3A, and 4A and one air-to-ground (blue net). There are two local hospitals Mercy General w/a burn center 30 minutes by air. The other is Kaiser 2 hours by ground. This is loose slate rock country, with sparse poison oak and rattlesnakes. Power lines located on the left flank.

Topic 4-1: Resources

Student information for this topic can also be found in Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Pages 120-121 and Appendix A, ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Page 11-15 and Chapter 12, and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 80-82.

Assigning Resources and Their Capabilities

Before the first-in company officer can assign any resources, the capabilities of those resources must be understood. Potential resources for a wildland/urban interface incident could include hand crews, dozers, aircraft, and engines of various types, just to name a few. The ability to understand resource capabilities will greatly assist you in determining the proper strategy and tactics.

Determining Need

In determining resource need, use a four-step procedure that involves: 1) incident strategy, 2) tactics, 3) resources, and 4) assignments. As with any incident, you need to start with the incident objectives and formulate an incident strategy. Once the incident strategy has been established, follow with the proper tactics to successfully accomplish your strategy. Determine what resources are needed for each tactical task that must be accomplished, and then properly assign each resource according to their capability.

Resource Considerations

Personnel

When considering resource capabilities, take into account the personnel that accompany the resource. What is their level of training and will they meet your needs? An example would be a Type 1 hand crew with no restrictions on use, compared to a Type 2 hand crew with less training and experience that have limitations on their use.

Time Frame

Do you want a single resource, strike team, or task force? Single resources are the quickest to get since you normally get the nearest available. Strike teams are specified combinations of the same type and kind of resources, with common communications and a leader. Strike teams usually require at least one hour to be assembled. Task forces are a group of resources with common communications and a leader temporarily assembled for a specific mission. Task forces also require an hour or more to assemble.

ICS Resource Typing

When requesting resources for your incident, remember to be very specific on what type of resource you need. Do you need engines, hand crews, or dozers? What type of engine or dozer will have the capabilities to meet your needs?

The following chart is taken from FIRESCOPE's ICS 420-1 Field Operations Guide, 2004 Edition and illustrates engine strike team types and their minimum standards. NWCG's Fireline Handbook also

provides reference charts with minimum standards for each type of resource. The FOG and Fireline Handbook have several differences in minimum standards for various resources. Activity 4-1-1 will give you the opportunity to explore a few of those differences.

ENGINE STRIKE TEAM TYPES AND MINIMUM STANDARDS

			MINIMUM EQUIPMENT STANDARDS							*MINIMUM PERSONNEL*		
KIND	**Strike Team Types**	**Number and Type**	**Pump Capacity**	**Water Capacity**	**2½" Hose**	**1½" Hose**	**1" Hose**	**Ladder**	**Master Stream**	**Strike Team Leader**	**Per Single Resource**	**Total Personnel**
ENGINES	A	- 5 - Type 1	1000 gpm	400 gal	1200'	400'	200'	20' ext	500 gpm	1	4	21
	B	- 5 - Type 2	500 gpm	400 gal	1000'	500'	300'	20' ext	n/a	1	3	16
	C	- 5 - Type 3	120 gpm	300 gal	n/a	1000'	800'	n/a	n/a	1	3	16
	D	- 5 - Type 4	50 gpm	200 gal	n/a	300'	800'	n/a	n/a	1	3	16

Capabilities and Considerations

Type 1 Engines

Type 1 engines are designed to have the greatest overall capabilities, along with the largest pump and tank capacities. Type 1 engines are not generally intended for off-road use; there are a few exceptions to this, but they are rare.

Using the FOG chart for minimum engine standards, a Type 1 engine is staffed with four personnel and is the heaviest and least maneuverable of the engines.

Figure 4-1-1: Type 1 Engine

Type 2 Engines

The Type 2 engine is a close cousin to the Type 1. Again, referring to the FOG, a Type 2 engine is staffed with three personnel and has less pumping capabilities than a Type 1.

Figure 4-1-2: Type 2 Engine

Type 3 Engines

Type 3 engines are designed to be the workhorse of wildland/urban interface fires. They are more maneuverable than Type 1 or 2 engines and can be either two- or four-wheel drive. Type 3 engines are staffed with at least three personnel and have a large complement of 1½" hoseline.

Here are a few considerations to remember when working with Type 3 engines.

- ❒ Assign 3 engines with 9-10 personnel to an extended hose lay
  - Hose lays in excess of 600 feet should be considered an extended hose lay
- ❒ An accepted standard used to estimate the time needed to place an extended hose lay in-service is 4-5 minutes per 100 feet of hoseline
  - This takes into account for broken hose, returning to the engine for more hose, variations in slope and fuel, and crew fatigue

Figure 4-1-3: Type 3 Engine

- ❒ Allow for enough engines or water tenders with sufficient travel and refill time to maintain a constant water supply
  - Studies have shown it takes an engine 3 minutes per mile to travel a good road, 6 minutes for a poor road, and approximately 15 minutes to refill
- ❒ Type 3 engines can mobile pump at a rate of 100 feet per minute, depending on terrain
- ❒ Select the pumping engine based on tank capacity and pressure capability
  - Head pressure can be critical in wildland hose lays; relay pumping might be required
- ❒ Type 3 engines are better suited for off-road driving

Type 4 Engines

Sometimes called "patrols," Type 4 engines are the lightest and most maneuverable of the four types of engines mentioned here. Type 4 engines are staffed with 3 personnel and have the smallest pump and tank capacity. They are generally the least desirable engine type to use for structure protection.

Figure 4-1-4: Type 4 Engine

Hand Crews

Several guidelines have been developed to assist with estimating the number and kind of hand crews that will be needed to successfully complete a given task. The Hand Crew Supervisor can be a great asset in determining objectives and tasks for hand crews. Some of the tasks hand crews can perform include:

- ❒ Construction of fireline
  - Burning out fuels to secure fireline
- ❒ Removing vegetation and other flammables from around structures
- ❒ Laying and supporting hose lays
  - Carrying, picking up, rolling hose
  - Clearing vegetation

Figure 4-1-5: Type 1 Hand Crew

Fire crews are a great source of labor and can perform a lot of work in a very short period of time. They should be used for labor-intensive activities. Again, refer to the FOG and Fireline Handbook for hand crew production rates.

Activity 4-1-2 will give you the opportunity to become familiar with hand crew production rates and reference tables.

Figure 4-1-6: Dozer

Dozer Capabilities

How can you determine the amount of line a particular dozer can construct? What are you basing your decision on when ordering dozers? Are you considering important aspects of dozer safety? Are you providing for dozer servicing and support?

In an attempt to answer the question of how much line a dozer can construct, dozer tests have been conducted in

various areas of the state. The Fireline Handbook contains a guide for estimating amounts of single pass lines different types of dozers might be expected to cut. A single pass line occurs when the dozer clears an area down to mineral soil slightly wider than the dozer blade. Backing and turning is necessary to remove all of the vegetation from the intended fireline. Remember that these are guides only. Actual performance may be affected by time of day or operator experience.

Under most conditions, a Type 1 dozer (D7, D8) is capable of putting in more fireline faster through heavier fuel than a Type 2 dozer (D5, D6). There are a few things to consider before requesting a Type 1 dozer. Due to their size and weight, special transport permits may be required. The transports that carry a Type 1 dozer will be less maneuverable in tight terrain. These transports, when loaded, will be extremely heavy, and light roads, bridges, and railroad crossings must be taken into account when moving these machines.

Type 2 and Type 3 dozers (D4) are more typically used for rapid initial attack by fire service agencies. Fire service dozers are specifically equipped for fire duty with radios, roll cage, fire blankets, air systems, tools, and a blade type and angle that is suitable for fireline construction.

Since dozers are commonly more effective working in tandem, ICS provides for the use of a dozer strike team that includes two dozers of the same type, a Dozer Tender, and a Dozer Strike Team Leader.

As an IC, safety should always be a priority and there are several specific safety considerations when working with dozers.

- ❒ Any dozer used at night should have a swamper and must be equipped with lights
- ❒ Slope limitations should always be considered
- ❒ Over extended periods, operator fatigue becomes an important factor
- ❒ Hand crews and engine companies should not be assigned to work in areas where rocks and debris dislodged by the dozers might roll their way
- ❒ Dozer operators that are not fire service personnel should be thoroughly briefed on their assignment and supervised by qualified fire service personnel
- ❒ The operator must have safety gear issued
- ❒ Be aware of adverse damage claims that can result from dozer access and operations

Performance Standard Guidelines

Performance standards will change over the duration of the event and the type of topography. Use the following as general guidelines only.

Engines

- ❒ Progressive hose lay
  - 100 feet per 5 minutes
- ❒ Mobile pumping
  - 100 feet per minute

Crews

- ❒ 9-foot line width, 225 feet per hour
- ❒ 6-foot line width, 450 feet per hour
- ❒ 3-foot line width, 900 feet per hour

Dozers

- ❒ 1,000 yards per hour

Water Tenders

In the interface environment, there could be a variety of available water sources; anything from ponds to wells and areas with fire hydrants may be found. When close and reliable water sources are not an option, water tenders will be needed to support ongoing operations. Water tenders are also typed according to their capabilities with minimum standards. A Type 1 water tender will have the greatest water and pump capacity. Because of that, a Type 1 will also be the heaviest and least maneuverable.

Figure 4-1-7: Type 2 Water Tender

While developing a plan, keep in mind the weight and maneuverability of the water tenders that have been requested. With long response time, local road and bridge weight limits, and extensive turnaround times for shuttling water, requesting smaller, more maneuverable water tenders (Type 2) may be the best option. Again, the FOG and Fireline Handbook provide charts detailing water tender types and minimum standards.

What's in a Name

When dealing with resource ordering, correct terminology is critical, especially when ordering water tenders. The terms "tender" and "tanker" are commonly exchanged. Remember that a "tanker" flies (aircraft) and a "tender" drives (truck).

Air Tankers

The FOG and Fireline Handbook detail the ICS typing of helicopters and air tankers based on their capabilities. The most common type of air tanker that is available throughout the state from CDF is a Type 2, usually an S-2.

CDF has headquartered these air tankers throughout the state to provide for an approximant 20-minute response time to most location in California.

Figure 4-1-8: CDF S-2 Air Tanker

Air Tanker Tactics

Most air tankers have the ability to deliver their loads in several different combinations using three main tactics: direct attack, indirect attack, and protection drops. Each has a different set of circumstances that can only be effectively evaluated by the crew on-scene. The IC and the Air Tactical Group Supervisor must work as a team to obtain the most effective use of fire fighting aircraft. They must continuously evaluate the need for further airdrops.

Under the most critical fire conditions, the number of air tankers that can be used effectively will provide for one drop every five minutes, using whatever type of aircraft is available.

On fast moving fires with a broad front, the most profitable use of air tankers will probably be through attacking the active flanks. Without successful ground holding action, any contribution on a hot front may be wasted, while the same retarding effort on the flanks can result in a secured piece of line. If a fast moving head is narrow enough, several drops may be adequate to stop the forward progress of the fire. Air tanker drops used midslope can be effective, but only if the frequency of the drops can overcome the fire's rate of spread, preventing the fire from outflanking the retardant line.

The effectiveness of air tankers increases as the following conditions are approached:

- ❒ Grass or light brush fuels predominate
- ❒ Wind speed decreases
- ❒ Topography becomes less steep
- ❒ The time of day passes midafternoon
- ❒ The distance to the airbase decreases within the ideal maximum 20-minute initial attack response time

Figure 4-1-9: Type 1 Air Tanker

During critical periods of firing operations, an orbiting air tanker may be desirable to furnish immediate action on spot fires.

If there are a series of separate fire starts occurring almost simultaneously in the same general area, air tankers can normally be most effective on the small and isolated fires first.

Air Tanker Limitations

It should be recognized that certain conditions might seriously limit the use of air tankers.

- ❒ Winds
  - Effectiveness is sharply reduced in winds over 20 mph
  - High, shifting winds over 40 mph and turbulent air may restrict or ground air tankers
- ❒ Topography
  - Early morning and late afternoon periods, when deep shadows are produced on certain aspects of topography, make it difficult for pilots to see fire targets or ground obstructions
- ❒ Drop heights
  - Standard drop for air tankers is about 125 feet above the vegetation
  - Drops should never be made at altitudes of less than 75 feet
- ❒ Smoke
  - Dense smoke may make air tanker operations both hazardous and ineffective on all or part of the fire
- ❒ Timber
  - Tall dense timber and snags may require air tankers to make drops higher than desirable and may intercept most of the retardant before it reaches the fire
- ❒ Power lines
  - May interfere with aircraft usage
- ❒ Night availability
  - Air tankers cannot be used at night and shut-off time is 30 minutes before sunset
- ❒ Turnaround time
  - Remember that the turnaround time for air tankers is the time it takes for the air tanker to return to base, load, and return to the incident

Figure 4-1-10: Low Drop

Directing Air Drops

When requesting an aircraft to drop on a specific location, remember to give a good target description such as "right flank," "across the head of the fire," or a landmark like a road or an isolated rock outcropping. Avoid using compass directions, unless you have a compass.

Diverting Air Tankers

A universal policy states that air tankers are most effective on initial attack fires and aircraft can be diverted from your incident to a new fire start. If you recognize that there are critical problems (safety of personnel, structures, or other high value exposures) and you have an urgent need for continued air support, then you can request a "No Diversion." This would hold the aircraft assigned to your incident so that they would not be reassigned to a new fire. The request for a "No Diversion" would be channeled through your local ECC. When the critical need for air support has passed, the IC should immediately advise the ECC, so the aircraft are available for diversion. This procedure should be used for critical emergencies only. A fast moving fire is not, in itself, enough justification to request "No Diversion."

Figure 4-1-11: CDF Type 2 Helicopter

Helicopters

Helicopters are one of the most versatile tools on a wildland incident. They can be used in a tactical role with water or foam drops, assisting directly with fire suppression. As with air tankers, the most common type of helicopter on initial attack will be a CDF Type 2 helicopter with a helitack hand crew, which work very well in tandem with the helicopter making the drop.

Helicopters can provide a great overall summary of the incident with mapping and recon. They can direct ground resources to difficult access areas, transport personnel and equipment to remote areas, and act as an air ambulance for fireline personnel.


Figure 4-1-12: Helitack Crew


Figure 4-1-13: Helitanker

As with air tankers, helicopters are typed by their size and capabilities. A Type 1 helicopter is the largest, and a Type 4 the smallest. Refer to the Fireline Handbook for a complete breakdown of helicopter typing and capabilities for each type.

Helicopter Limitations

- ❒ Payloads
  - The hotter it gets and the higher in elevation, the less they can carry
- ❒ High winds
  - Cannot be used during periods of high winds
  - Will be discontinued when winds reach 30 mph over the peaks and ridges
- ❒ Night availability
  - Limited to flights from lighted field to lighted field

Air Tactical Group Supervisor

While dealing with air tankers and helicopters, do not forget the all-important third player in the air war, the Air Tactical Group Supervisor. This single aircraft will hold a prominent place in the strategy and tactics for your incident. When you request air tankers to your incident, an Air Tactical Group Supervisor will, in general, automatically be dispatched if one is available. This single resource can be one of your best resources on a wildland/urban interface incident.

Figure 4-1-14: Air Tactical Group Supervisor

The Air Tactical Group Supervisor acts as the air traffic controller for all incident-assigned aircraft. The Air Tactical Group Supervisor will be your "eyes in the sky," offering you the best overall view of the incident and assisting you with strategy and tactics when using air tankers.

Incident Management Teams

Incident Management Teams (IMT), sometimes called Incident Command Teams (ICT), consist of highly trained and certified individuals as well as trainees. As a team, they provide incident management skills for any type of disaster regardless of location. Each team includes members with the experience and skills to fill the responsibilities of the various ICS positions, such as the incident command, planning, finance, logistic, safety, and air operations functions to name a few.

As with most resources, an IMT is also typed according to its capabilities. A Type 1 IMT represents the highest level of incident management expertise in the nation. A Type 1 IMT is staffed to be fully functional in all sections of ICS and to provide initial logistical support for two operational periods. Type 1 teams have expertise to manage complex air operations and can expand to support numerous divisions and groups for extended periods.

A Type 2 IMT is staffed to manage incidents that exceed the capability of the local jurisdiction, but have not become so complex as to require a Type 1 team. Type 2 teams can be expanded to manage several divisions or groups, but have limited capability to manage complex air operations.

Maps, Compasses, and Global Positioning Systems

Company officers responding to an I-Zone fire must have a basic understanding of maps, compasses, and global positioning systems (GPS). These tools are invaluable for getting to and from your assignment, finding water sources, and navigating the terrain. They can also be used to locate landing zones for helicopters, direct crews to spot fires, and locate safety zones and escape routes.

Maps

Maps have long been an integral element in incident support. From urban incidents to wildland operations, maps take on an even greater significance when considering the growing population and rapid changes to our environment. In order to plan and respond to an I-Zone incident, an understanding of maps becomes essential for making intelligent decisions.

Classification

Planimetric

Planimetric literally means "in one plane" or flat. They are the most common maps and the ones we are most accustomed to seeing. Planimetric maps present only the horizontal positions of an area's geographic features, identifying locations without displaying the contours of the land. Features usually shown on a planimetric map include boundaries, rivers, roads, railways, and populated places (cities and towns). These maps are the typical road maps, area maps, and schematic maps that most fire departments carry in their vehicles and apparatus.

Topographic

Topographic maps, often shortened to "topo" maps, were developed from aerial and ground surveys and are very extensive as to information and scaling. They represent the land as it appears in three dimensions, as if the observer was looking at eye-level across the landscape. The United States Geological Survey (USGS) over many years has produced the topographic maps that are the most widely used. Some of the natural features depicted on a topo map include mountains, valleys, plains, lakes, rivers, and vegetation. Topo maps also identify selected artificial features such as roads, boundaries, transmission lines, and major buildings.

Topo maps are often referred to as "quadrangles" or "quads." They may also be called "contour" maps because they represent the shape and elevation of the land. A contour, by definition, is an imaginary line on the ground where every point is at the same height above sea level. Topo maps display contour lines to depict the shape and elevation of the land, a feature not shown on other types of maps. Every

fifth line, known as an index contour line, is heavier than the others are. Follow one of the heavier lines and you will find a number on it. This number indicates that every point along that line is that many feet above sea level of the nearest ocean.

Contour lines that are close together indicate steep terrain, while lines far apart indicate flat terrain. The closer the contour lines are spaced, the steeper the terrain. Concentric contour lines that form complete closed paths represent hills and mountains. Elevations can also be located on the contour lines; and degree of slopes computed.

The distance in height between one contour line and the next is called the contour interval. The contour interval varies from map to map and is determined by the scale of the map. On a great number of topographic maps, the contour interval is 100 feet. On a map of a rather level area, the contour interval may be as little as 20 feet, or on a map of a mountainous region, the interval may be 500 feet or more.

Contour lines can be a bit confusing in the beginning, but you will soon look at each hill and mountain in terms of contour lines. Before long, you will be able to tell if you are looking at a gentle slope, a steep incline, or even a cliff.

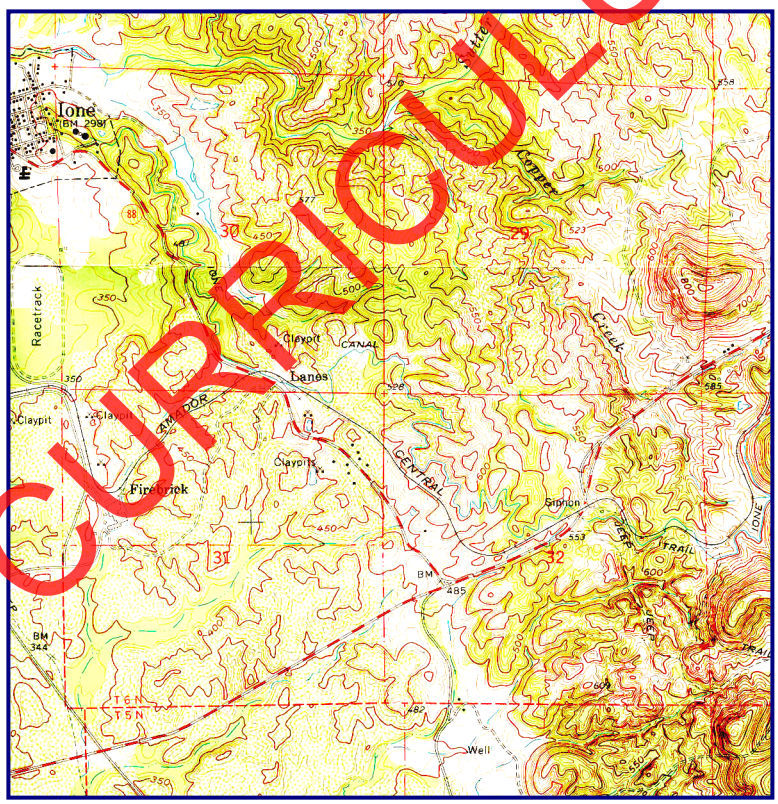


Figure 4-1-15: Topographic Map

Orthophoto

An orthophoto map depicts terrain and other features by color-enhanced aerial photographs of the land. Some orthophoto maps are overlaid with contour lines and other features commonly associated with topographic maps. These maps are corrected to scale and are the same size as USGS maps.

Reading Maps and the Map Legend

To be able to use maps, you must know how to read them. In order to read a map, you need to understand its symbols, colors, and scale. A map's legend displays the information you need to understand these things.

Symbols

The legend has a list of symbols used on a map, indicated by a sample symbol with an explanation showing what feature that symbol depicts. Each symbol should appear in the legend exactly as it looks on the map. These symbols are not random marks. On the contrary, the people who developed them

have made every effort to have them look like the things that they represent as far as relative size, shape, and color.

Symbols can let you scan a map rapidly for important information. You can quickly find pertinent locations such as campgrounds, toxic waste handlers, fire stations, interstate highways, hospitals, airports, schools, shopping centers, or cities with a population over 10,000. When you look at a map, you will find that each feature on the map has a location, some shape, and a symbol that represents one or more of its characteristics.

Map symbols are not standardized and may differ from map to map. However, you can find some symbols the same on every map. To find out what a map symbol stands for, look at the legend.

The Fireline Handbook and FOG provide many of the ICS color-coded symbols that should be used during an incident. These ICS map symbols are not commonly used by the public. The interpretation and drafting of maps with ICS map symbology is required for those working on an I-Zone incident.

STAND

All maps should "STAND" alone. What this means is that every map should have, at a minimum, the following five items somewhere on the map.

Scale: Show the scale on all maps using a bar graph scale, or state "Not to Scale."

Title: Show the map's title along with its use. For example, "Coonskin Fire, IAP Map"

Author: Place the name or initials of the person who made the map.

North Arrow: All maps must have a north arrow, even if it is obvious which direction is north. If possible, also include the local declination.

Date and time: There may be several date and time groups displayed on the map. One may be showing when the information was gathered, and another the operational period during which the map will be used.

Maps are made for many different purposes, so their scale can differ. The greater the area a map covers, the smaller the scale. The smaller the area covered with more detail shown, the larger the scale. A map that only covers fifty square miles would be a large-scale map.

The Fireline Handbook provides the conversion factors for some of the most common scales used on fire service maps.

Orientation

It is a common practice for maps to be oriented with north at the top of the map. Most maps have an arrow pointing to the north. Once that orientation is determined, it is then understood east is right, west is left, and south is below.

Compass

The compass is an instrument that indicates magnetic north. The compass needle consists of a strip of magnetized steel

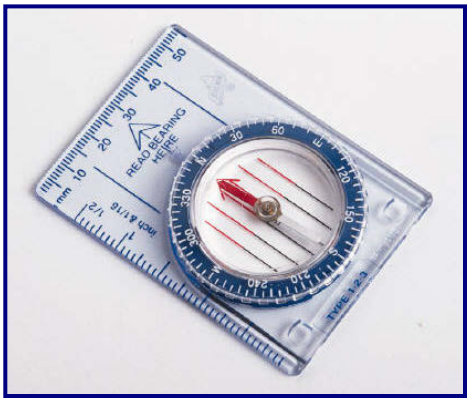


Figure 4-1-16: Compass

balanced on a pinpoint and free to swing in any direction. One end of the needle, usually marked by an arrow or luminous dot painted red, is the north-pointing end. When the compass is laid flat or held horizontally, the arrow or red end of the needle will always point to magnetic north.

Using Your Compass

Imagine yourself in the center of a circle that has been divided into 360 equal parts or degrees, enabling you to measure any direction. In map reading, this is the azimuth. The degrees of an azimuth circle are numbered in a clockwise direction, with the zero point being north, east at 90 degrees, south at 180 degrees, west at 270 degrees, and back to north at 360 or 0 degrees. To determine which direction is north, set 360 degrees on the 360-dial in line with the direction-of-travel arrow and the index line. Hold the compass and turn your body until the magnetic needle lines up with the direction of the travel arrow. The direction you are facing is magnetic north.

Orient a Map with a Compass

- ❒ Find your approximate location on the map
- ❒ Select two prominent landmarks visible to you and shown on the map
- ❒ Turn the map until the map landmarks are in proper relationship to the actual landmarks
- ❒ The map is now generally oriented to the true north

This technique is referred to as terrain association - associating the map to fit the terrain

Global Positioning System

Global positioning system (GPS) is a radio-navigation system consisting of 24 satellites and ground support. GPS provides users with accurate information about their position and velocity, as well as the time and elevation, anywhere in the world and in all weather conditions. There are a number of manufacturers that produce GPS units, from small hand-held models to the larger mobile-mounted units.

GPS gives fire service personnel the ability to accurately pinpoint a specific location. A fire perimeter can be mapped accurately or a helispot location can be easily marked with a latitude/longitude. In the I-Zone, structure location, water sources, and hazards can be marked using GPS and then this information should be passed on to the Situation Unit Leader (SITL). The SITL will transfer this information onto the incident maps for the next operational period.

GROUP ACTIVITY 4-1-1

TITLE:	Engine Typing
TIME FRAME:	0:15
MATERIALS NEEDED:	• Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Page A-40 • ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapter 12 • Writing board/pad with markers/erasers
INTRODUCTION:	This activity provides the students the opportunity to become familiar with ICS resource typing and references.
DIRECTIONS:	1. Locate the charts for engine typing and kind in each of the above-mentioned manuals. 2. Compare and contrast the differences between the two books' minimum standards for engines. 3. You have 10 minutes to complete this activity. 4. Be prepared to discuss your findings with the class.

GROUP ACTIVITY 4-1-2

TITLE:	Production Rates
TIME FRAME:	0:15
MATERIALS NEEDED:	• Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Pages A-30 through A-35 • Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 80-81 • Writing board/pad with markers/erasers
INTRODUCTION:	This activity provides you the opportunity to become familiar with production rates and reference tables for hand crews and dozers.
DIRECTIONS:	1. Locate the production tables for hand crews in each of the above-mentioned manuals. 2. Find the production rates for the following: 3. You have 10 minutes to complete this activity. 4. Be prepared to discuss your findings with the class.

1. Type 1 hand crew working in brush.

_____

2. Type 1 hand crew working in short grass.

_____

3. Type 1 hand crew working in tall grass.

_____

4. Type 2 dozer working in Fuel Model 5 (brush) going upslope on a 41%-55% slope.

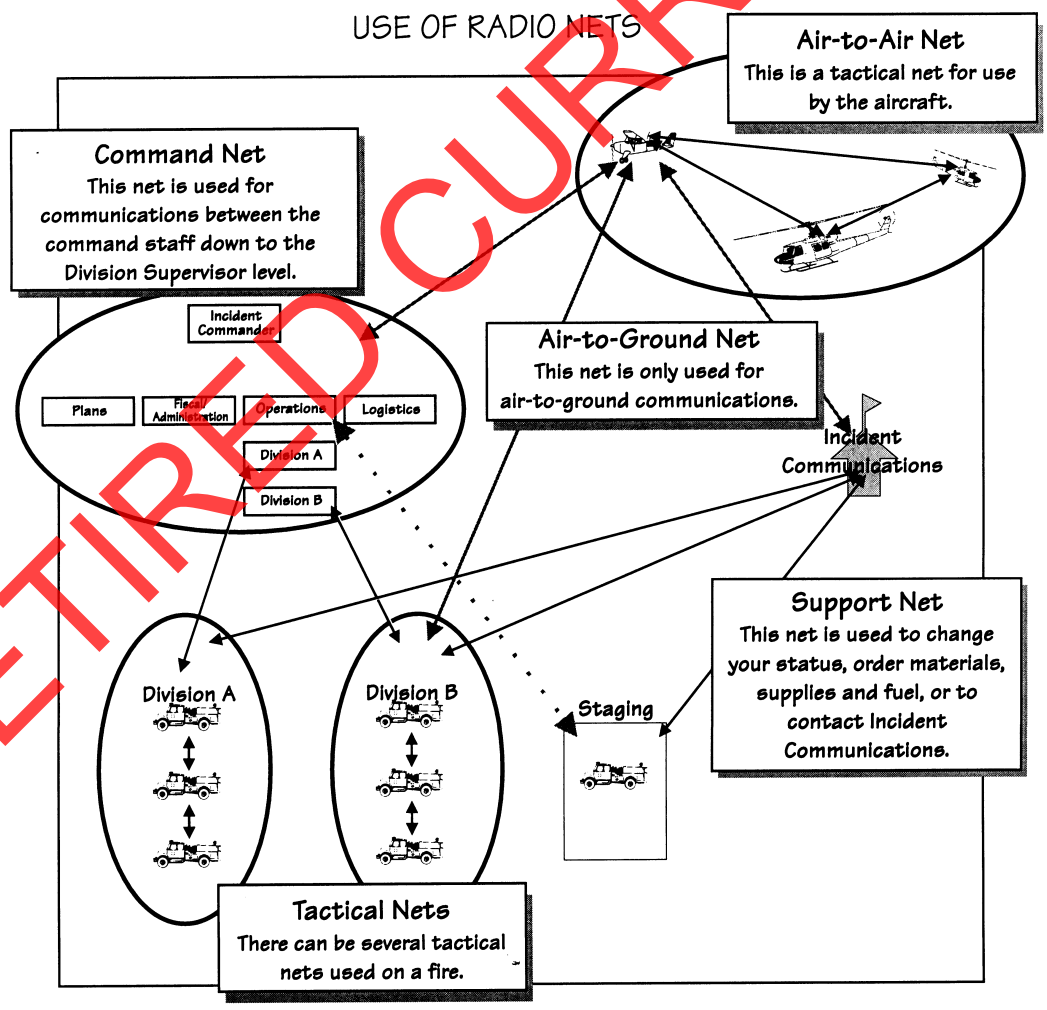
_____

Topic 4-2: Communications

Student information for this topic can be found in the ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Appendix A and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Page viii.

Use of Radio Nets

On larger fires or other disasters, many radio frequencies are utilized. It is imperative that you know not only the frequency you are assigned, but also the other frequencies that are going to be used. Knowing how to use your equipment and the frequencies for your incident can mean the difference between a successful operation and a confusing, dangerous operation. See the figure below from Firefighter's Handbook on Wildland Firefighting by William Teie.



Five Radio Nets

Command

The command net is used to communicate between the various Command and General Staff positions down to the Division/Group Supervisor level. This is an exclusive channel for command and control communications. It is not for general tactical operations.

Tactical

The ability for division resources to communicate with each other and the supervisory staff is critical to the success and safety of the operation. Tactical nets are used for tactical communications at the division or branch level. "Tac nets" may be established around agencies, geographical areas, or specific functions. On large operations, there will be several tactical nets assigned. Their specific radio frequencies will be listed in the Incident Action Plan on the bottom of each Division Assignment List.

Support

The support net is established for handling status changes, requests for support needs, and communications that are not tactical or command functions. Use the support net to communicate to Incident Communications about changes in status, such as "out-of-service mechanical" or "in incident base, off shift." If you need fuel, water, or food, you would use the support net.

Air-to-air

The air-to-air net is the net used for tactical air operations. It is the net used by the air tanker and helicopter pilots to communicate among themselves and with the Air Tactical Group Supervisor. This net should never be used by ground forces. The only exception may be the communications between a helitack crew and its helicopter.

Air-to-ground

The air-to-ground net is used by the command structure to communicate with the incident's Air Operation Group. It is an exclusive net for air-to-ground communications only. This net is critical during major fire operations where several tactical nets are in use. It is impossible for the Air Tactical Group Supervisor to monitor every "tac net." If ground forces need air support, they can switch to a specific air-to-ground frequency and request assistance.

> The radio communications system will often be overloaded.
> Use cellular phones to communicate or, better yet, talk face-to-face.

The following is an example of an ICS 205 Incident Radio Communications Plan form showing the different assigned functions and associated frequencies for the incident. This form becomes part of the Incident Action Plan for the time period covered. It is used as the basis for each unit's specific frequency assignment.

Page 1 of 1	1. INCIDENT NAME/NUMBER	2. DATE/TIME PREPARED	3. OPERATIONAL PERIOD DATE/TIME
Incident Radio Communications Plan ICS I-205a	97-CA-NEU-000204 Slow Rise	01/07/97 03:01	01/07/97 07:00 – 19:00

4. COMMAND/AIR TO GROUND/SUPPORT FREQUENCY ASSIGNMENTS

5. FUNCTION	6. RADIO NET IDENTIFICATION NAME	TX FREQUENCY	RX FREQUENCY	7. TONE	8. REMARKS
Air to Grd	Air Ops	170.000	170.000		USFS AIR/GRD CH14
Command	Command RPTR	170.450	170.450		USFS CMD 2 RPT CH8
Command	Command T/A	168.100	168.100		USFS COMMAND 2 CH7
Support	Div A & B	168.050	168.050		USFS TAC-1 CH1
Support	Div C & D	168.200	168.200		USFS TAC-2 CH2
Support	Div E & F	173.9625	173.9625		USFS TAC-5 CH5
Support	Inter-Dept	154.280	154.280		USFS White 1 CH6
Support	Interagency Coord	156.075	156.075		Calcord CH13
Support	Logs, Kit, Sup, Etc.	168.600	168.600		USFS TAC-3 CH3

9. DIVISION/GROUP ASSIGNMENTS	10. TACTICAL ASSIGNMENT			11. COMMAND NET	12. SUPPORT NET	13. AIR TO GROUND NET
14. DIVISION/GROUP NAME	TX FREQUENCY	RX FREQUENCY	TONE			
Div A 1	168.050	168.050		Command T/A	Div A & B	Air Ops
Div B 1	168.050	168.050		Command T/A	Div A & B	Air Ops
Div C 1	168.200	168.200		Command T/A	Div C & D	Air Ops
Div D 1	168.200	168.200		Command T/A	Div C & D	Air Ops
Div E 2	173.9625	173.9625		Command T/A	Div E & F	Air Ops
Div F 2	173.9625	173.9625		Command T/A	Div E & F	Air Ops

15. REMARKS

Please listen before you talk.

Make sure you are on your assigned channel.

Pick up new batteries at the start of your shift.

Be sure to turn in your assigned HT at the end of each shift and your phone at the completion of the incident. YOU ARE RESPONSIBLE.

Improving Fire Fighter Communications

Several recent incidents involving fire fighter fatalities demonstrate that, despite technological advances in two-way radio communications, important information is not always adequately communicated on the fireground or emergency scene. Inadequate communication has a definite

negative impact on the safety of emergency personnel and may contribute to injuries or deaths of fire fighters, rescue workers, and civilians.

Inadequate fireground communication is repeatedly cited as a contributing factor in many of the incidents reported through the United States Fire Administration Major Fires Investigation Project. This fact, coupled with the limited availability of research on this topic, prompted the United States Fire Administration (USFA) to study some of the potential causes of communication breakdown and to provide recommendations that will help departments improve their operational communications. This report titled "Report 089 of the Major Fires Investigation Project" conducted by Varley Campbell and Associates, Inc./TriData Corporation under contract EMW-94-C-4423 to the United States Fire Administration, Federal Emergency Management Agency, is available from the USFA website at www.usfa.fema.gov.

While the findings contained in this special report are primarily oriented toward the municipal fire service, its relevance to other fire fighters and emergency responders is worth studying. With respect to communicating in high-stress environments, numerous parallels exist across public safety and related disciplines. Some of the ideas presented here are drawn from the experiences of wildland fire fighters, airline flight crews, and military personnel.

KEY ISSUES	
Issues	**Comments**
Unsuitable equipment	The chief communication problem reported by fire fighters and company officers is the difficulty with communicating from inside a fire when using full personal protective equipment, including SCBA. The majority of portable radios currently used by fire departments are ill suited for the task.
Portable radios needed for all fire fighters	Despite some technical limitations, portable radios are a proven lifesaver during an emergency incident. They should be considered a critical item of personal protective equipment akin to SCBA. Ideally, every fire fighter working in a hostile environment should have a portable radio with an emergency distress feature.
Little attention paid to human factors	There is a shortage of available literature pertaining to the impact of human factors on effective fireground communication. Furthermore, while fire departments devote substantial time to manipulative skill training, relatively little training is provided to help fire fighters develop stress-tempered communication skills.
Importance of active listening	All fire fighters on an emergency incident should actively monitor their radios for important information at all times, not just when specifically queried. Communications should be emphasized as an essential part of the fire fighter function as a tactical team, not just operating as individual entities.
Standard message formats and language	Fire departments can enhance fireground communication by creating standard message formats and keywords used consistently. Plain English is usually preferred over codes, especially when transmitting a complex message.

KEY ISSUES	
Issues	**Comments**
Tiered message priority	Keywords to prompt immediate action can be tiered based on their priority. For example, "Emergency Traffic" signals a life-or-death situation, while "Urgent" may be used to signify a potentially serious problem. Such message headers prompt the crew's listening priorities and radio discipline.
Attention to cultural factors	When necessary, fire fighters are not usually reluctant to circumvent the chain of command to report critical safety issues. There may be greater hesitation to communicate problems in completing an assigned task. However, this is usually due to a lack of situational awareness, and not a fear of reprisal from other members. Studies on fire fighter communications show that sometimes the culture of bravery in the fire service is reflected in a reluctance to communicate quickly enough when help is needed. Repeated situations where this occurs should be closely examined by the fire officer.

Incident Summaries

Many fire departments conduct formal internal reviews of their major incidents to enhance their training for better practices. However, the USFA examines major incidents to ascertain "lessons learned" that can be communicated to the nation's fire safety community. Summaries of communications-related lessons learned at a variety of incidents are summarized below to help identify commonalties and trends in the experiences of fire departments.

Structure Related

Wood Truss Roof Collapse Claims Two Fire Fighters *Memphis, TN (USFA Technical Report Series)*

Two fire fighters operating an interior attack line were killed at this fire after a church roof collapsed.

"Communications was also a problem, contributing to the lack of organization at the scene, since the Incident Commander was unable to communicate with company officers on the tactical radio channel."

Indianapolis Athletic Club Fire *Indianapolis, IN (USFA Technical Report Series)*

Two fire fighters were killed on the third floor of a nine-story, mixed-use building during a fire.

"New radio equipment and lack of familiarity with its operation may have contributed to delays in acknowledging and processing requests for additional companies."

"Radio discipline is important."

"His most serious injuries were a direct result of having to compromise his personal safety in order to send a distress signal. While the push-to-talk switches could be operated with minor difficulty with a gloved hand, the emergency or distress button is virtually impossible to operate in the same manner."

Four Fire Fighters Die in Seattle Warehouse Fire *Seattle, WA (USFA Technical Report Series)*

Four fire fighters were killed in a collapse at an arson fire in a warehouse.

"The interior attack crews on the upper level did not report that very little fire had been found inside the building and that all flames appeared to have been knocked down. The crews on the lower level did not report that they had found a large area that was fully involved in fire. The discrepancy between these reports would have alerted the Incident Commander to reevaluate the attack plan."

Two Fire Fighters Die in Auto Parts Store Fire *Chesapeake, VA (USFA Technical Report Series)*

Two fire fighters were killed after a roof collapse in a retail auto parts store.

Poor communications was one of the problems that investigators determined contributed to the fire fighters' deaths. According to the report, "The fireground operations were conducted on the same radio channel as the routine dispatch and transfer of additional units, hampering the fireground communications during the early stages of the incident." The Chesapeake Fire Department recently upgraded their communications equipment and "added additional portable radios to each piece of apparatus" to shore up their communications interoperability.

I-Zone Related

Calabasas Fire Entrapment *Calabasas, CA (After-incident Report by Los Angeles County Consortium)*

Three engines, GLN E-24, LFD E-10, and LFD E-17 were entrapped in the Malibu Bowl area of Los Angeles County while setting up for structure protection. Eight fire fighters were burned or suffered smoke inhalation because of the entrapment. Several communication failures and problems lead to this entrapment. Please refer to Appendix A, Case Study 1: Calabasas Fire for specific information.

South Canyon Fire *Glenwood Springs, Colorado*

Out of 49 fire fighters on the mountain, 14 fire fighters died from a major blowup with 35 fire fighters surviving. A failure to communicate the danger to those that perished was but one of the causes. The fire fighters involved were from a BLM/Forest Service Crew, Helitack Crew, Hot Shot Crew, and Smoke Jumpers. Please refer to Appendix A, Case Study 9: South Canyon Fire for specific information.

Arkansas Fire *Camp Road, Arkansas*

A Forest Ranger II operating a JD 450 with a V-blade in front and a plow in the rear was part of a four-dozer-wide operation. While working near the head of the fire, the weather changed with a wind increase and the lead dozer was unable to communicate with the other dozers due to radio failure. The Forest Ranger II operating the fourth dozer was severely burned, but lived for seven weeks in the hospital before he died from burn complications.

Types of Communication Problems

Communication problems commonly encountered by fire fighters are broadly divided into two categories. The first category includes those problems related primarily to mechanical/technical issues such as unsuitable equipment, radio malfunction, limited system capacity, or atmospheric interference. The second category of problems is somewhat broader and includes the critical human factors necessary for effective communications. While the research literature dealing with fire service communication overall is sparse, more has been written about the technical aspects of the issue than about the human factors. This special chapter addresses both, with particular emphasis on the critical human factors involved in improving fire fighter communications.

Mechanical/Technical Issues

There are varieties of technical problems that can and do appear on the fireground. Some of the most dominant ones are unsuitable equipment, equipment failure, inadequate system capacity, and interference.

Unsuitable Equipment

The problems here lie most in ergonomics and durability. The trend toward miniaturization is a good thing while other qualities are sacrificed, which are not a good thing. A small radio in a gloved hand trying to set new frequencies during battle tends to be a problem. The small view screens are not easily seen in smoke or night conditions. In addition, not many radios in use today are water resistant, which causes problems on the fireground.

Equipment Failure

Modern public safety radio communications systems are complex and highly technical. They may require multiple fixed antenna sites or repeaters. When a unit leaves their own radio net system, they may be out of communication with units from other areas. Batteries are often unique to a particular radio. This can create a problem because, after a few days of use, a radio may be out-of-service if the Supply Unit did not stock its particular type of battery.

In another instance of equipment failure, the Orange County Fire Authority recently discovered that their 800 MHz radios were ineffective inside fire shelters (see Safety Bulletin in Topic 5-5: Last Resort Survival).

Inadequate System Capacity

Many times the sheer volume of radio traffic will bury the system, causing radio failure. Too much demand on a system not designed for heavy use is devastating. Many radio systems do not have numerous channels from which to choose, thereby limiting use. In these cases, dedicating channels to different parts of the operation becomes important.

Interference

Atmospheric, environmental, and electronic interference may hamper effective communication at the incident and can take the form of "skipping" created by solar disturbances and atmosphere fluctuations. Geographic features such as hills, tunnels, and valleys also will interfere with transmissions. Electronic interference from lighting, siren use, and other equipment will occur on occasion.

Human Factors

Although the technical aspects of fire service radio communications receive a good deal of attention in the literature, less attention is paid to the human factors affecting communication among fire fighters and rescue personnel on the incident. In some cases the distinction between technical and human factors is difficult to make, however, it seems clear that human factors are critically important for ensuring safe and effective fireground communications. Quality communication skills and procedures will help promote safety even in the face of technical difficulties.

Radio Discipline

Radio discipline is vital for effective communication among fire fighters, dispatchers, and other emergency personnel. As mentioned previously, a lack of radio discipline can overwhelm even robust communication systems, which still have finite capacities. Systems with inadequate capacities can become quickly overwhelmed even during routine incidents, seriously compromising fire fighter safety. Allowing unlimited transmissions may create a situation where vital messages cannot be heard due to the number of less important transmissions being broadcast. By contrast, restricting radio traffic to only "vital" messages may prevent important information from being broadcast. The challenge, therefore, is achieving a balance to ensure that all potentially important information is broadcast, but not at the expense of emergency transmissions or "Emergency Traffic" calls from interior crews.

There are several things fire fighters can do to help improve radio discipline. An obvious way is to ***not*** use radios for communicating when face-to-face dialogue is a better and available choice. Some examples of this would be 1) when the sender and receiver are located a short distance from one another, 2) when conferring about strategic or tactical options, or 3) when a complex, vital message such as a change in strategy from offensive to defensive must be conveyed. Face-to-face communication is generally more effective than radio communication anyway, since both sender and receiver have the added benefit of using nonverbal cues to help convey ideas or understanding (e.g., eye contact, physical contact, body language). Distractions are also reduced and people can ask questions or identify problems more readily during one-on-one dialogue. Command officers can use runners to deliver and obtain information from remote units. Using a runner has the potential added benefit of providing another view of the situation to the Incident Commander.

Radio communication skills are critical for effectively conveying information at the incident scene. One of the most critical of these skills is being a good listener. Although it is often difficult to listen to radio traffic while performing fireground tasks, it is an important skill to develop. By doing so, fire fighters can avoid rebroadcasting nonurgent messages that have already been transmitted and maintain awareness of the overall situation. Listening skills also help fire fighters recognize when potentially urgent information has ***not*** been broadcast and ensure that urgent messages are effectively communicated to the company officer or Incident Commander.

Good speaking skills are also vitally important for effective communication. Messages need to be transmitted using a logical format, at the appropriate volume, with good enunciation, and at a moderate pace. Most fire fighters are familiar with the frustration of trying to understand someone either screaming or whispering into the radio, or an individual who speaks very fast or too slowly. Before transmitting a message, fire fighters should collect their thoughts and format the message in their head.

Messages should be clearly stated without distracters such as "um" or "uh." Messages that are clear, direct, and to the point minimize unnecessary radio traffic and help prevent urgent messages from being delayed or unintentionally overridden.

The best way to develop good listening and speaking skills is through training and continued practice during multi-company operational drills or simulations. It may also be helpful for command or training officers to use tapes of actual incidents or drills to analyze procedures and reinforce the importance of these skills. This can be done privately, allowing radio users to hear themselves and providing vital feedback for improvement.

Another significant way to improve radio discipline is for the fire department to create SOPs describing standard message formats and distinguishing routine messages, urgent messages, and "Emergency Traffic" messages. In addition, standard terms should be defined for use during radio communication to help eliminate potential confusion and promote brevity during message transmission.

Chain of Command

Traditionally, fire department communications have been predominantly one way. Emphasis is placed on "giving orders," "following orders," and "sending" messages. This is perhaps related to the traditional emphasis on unity of command and span of control as the primary means of maintaining order on the fireground. Although there is little room for extensive conversation on the emergency scene, the emphasis on maintaining the chain of command has created a potential communications problem. Fire fighters may be reluctant to circumvent the chain of command and risk being considered insubordinate.

However, fire fighters seem to have minimal reluctance to communicate directly with chief officers when obvious safety issues or unsafe conditions are involved. A more common problem, expressed by some command officers, is that fire fighters report information to the wrong person because they are unaware of changes that were made to tactical assignments. When such misrouting occurs, it is important that the message recipient first relays the message to the appropriate person, and then advises the sender of the proper reporting pattern.

Reporting a Problem

In some departments, the culture of "heroism" attaches a stigma to calling for reinforcements. Where a flawed concept of bravery exists, fire fighters often delay requests for help as long as possible to avoid being stigmatized. The potentially negative effects of this practice are obvious, as fire fighters are trained to stay ahead of the fire at all times. Size-up is a continual process and requests for assistance should be transmitted as soon as a situation indicates help may be needed. Delay risks the possibility that reinforcements will arrive too late to influence the outcome of the situation. This has potentially negative consequences for both citizens, whose lives and property may be lost, and fire fighters, who may be forced to work for an extended duration without relief. Therefore, company- and command-level officers are encouraged to call for additional resources as soon as possible. Indeed, additional resources are automatically dispatched upon the report of a "working" or "campaign" fire to help ensure adequate resources.

Depending on the capacity of the communications system and the adequacy of available radio channels, some public safety agencies may designate specific radio frequencies as "Talk Around Channels." Such channels have no repeating capability, thereby limiting their transmitting range usually to a quarter mile or less. This allows emergency personnel to communicate freely with each other without fear of overloading the entire communication system. Incident Commanders can monitor the designated "Talk Around Channel" while remaining on a general fireground channel. The primary channel frequency has message repeating capability. This kind of radio configuration allows the Incident Commanders the flexibility to simultaneously monitor both the fireground activities and the communications dispatcher without switching channels. In addition, because of the limited range of the "Talk Around Channel" capability, emergency personnel must direct all communications and request through the Incident Commander.

A related issue is the tendency for fire fighters not to report problems they may be having in completing an assignment such as forcing entry, procuring a water supply, or searching the fire floor. Fire fighters sometimes are reluctant to report difficulties for fear of being judged as slow, incompetent, or unaggressive, all of which are contradictory to fire department cultural values. While this may occur on occasion, the prevailing view is that fire fighters operating inside a fire environment often lack the situational awareness to understand exactly how much time is passing or to be cognizant of activities around them.

To improve fireground communication, fire departments should actively promote a culture in which it is acceptable to ask for help, clarify messages, and report problems. While following the chain of command is important operationally, it should be culturally acceptable to circumvent the chain for critical messages, when necessary.

Summary of Recommendations

- ❒ Ideally, all fire fighters should be individually equipped with portable radios
  1. A better portable radio, suitable for and designed around use in the structural fire fighting environment, is a priority need for the fire services
- ❒ More training should be conducted to develop effective fire fighter communication skills
  2. These skills should receive a greater emphasis in training priorities
- ❒ Policies and procedures should be developed
  3. Standard message format
  4. Important/urgent messages versus routine messages
  5. Emergency traffic
  6. Operations conducted on multiple channels
  7. Roles and responsibilities of those involved in the communications process at every level
  8. Regular situation reporting

- ❒ Radio discipline, while important, must achieve a balance between limiting nonessential radio traffic and ensuring that potentially important information is regularly broadcast
- ❒ The effectiveness of any incident management system depends on effective communication between fire fighters, company officers, and the Incident Commander
- ❒ All fire fighters should practice actively listening to radio traffic for information that may affect the performance of their assignments
- ❒ Senior fire officers have a role to instill a department culture that encourages fire fighters to request assistance and communicate operational problems
  9. Rather than supporting a mentality that rewards excessive risk taking, senior officers should emphasize that calling for help at the first sign of problems, is the expected action for safe emergency operations
- ❒ Fire fighters can reduce interference factors
  10. Turning down the volume on portable radios
  11. Shielding microphones
  12. Turning off sirens before transmitting when possible
  13. Maximizing face-to-face communications
- ❒ More attention and research should be directed toward identifying barriers to effective communication and proactively preventing communication problems before an incident

GROUP ACTIVITY 4-2-1

TITLE:	Common Communication Problems
TIME FRAME:	0:30
MATERIALS NEEDED:	• Writing board/pad with markers/erasers
INTRODUCTION:	This activity provides you the opportunity to realize the commonalities of communication systems in your area.
DIRECTIONS:	1. In your assigned group, discuss your experience with the communication system(s) used by your department and identify the common problems. 2. Record the most common problems. 3. You have 15 minutes to complete this activity. 4. Select a spokesperson and be prepared to discuss your answers with the class.

Topic 4-3: Strategy and Tactics

Student information for this topic can also be found in Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Chapters 2 and 3.

For urban interface incident operations to occur, decisions and plans must be made on two functions: strategy and tactics. It is important for the first-in company officer to understand and perform both of these functions.

Strategy

Strategy is a thinking activity involving the art of devising a plan to identify major goals and prioritize objectives. It is based on three factors:

❶ Size-up

❷ Strategic priorities

❸ Mode of attack

Size-up and strategic priorities are strategic considerations. The mode of attack is a tactical application and will be discussed later in the tactical component of this topic.

Size-up

Before any strategic objective can be identified, the all-important process of size-up must take place. Size-up is the evaluation of an incident to determine a course of action. I-Zone size-up can be found in Topic 4-4.

Strategic Priorities

Strategic priorities are the order in which you assign what is needed on the incident and are based on the threat to life and property (including personal safety), confinement of the incident, etc. Assigning priorities is a subjective process influenced by your own experience, knowledge, perceptions, and common sense. Fire fighters utilize RECEO for structure fires. Wildland fire fighters use a similar system for strategic priorities in an I-Zone incident.

Wildland/Urban Interface Strategic Priorities (RECCMPR)

- ❒ Rescue
- ❒ Exposure
  - ■ Property that may be endangered by a fire burning in another structure or by a wildfire
- ❒ Containment
  - ■ Completion of a control line around a fire and any associated spot fires that can reasonably be expected to stop the fire's spread

- ❒ Control
  - Completed control line around a fire that can reasonably be expected to hold under foreseeable conditions
- ❒ Mop-up
  - Extinguishing or removing burning material near control lines to make a fire area safe
- ❒ Patrol
  - To travel over a given route to prevent, detect, and suppress fires
- ❒ Rehab
  - The activities necessary to repair damage or disturbance caused by suppression activity

Wildland Fire Strategy Situations

Wildland fire strategy situations can be compared to first, second, or third alarms for structure fires. There are three wildland strategy situation. [1]

❶ Initial Attack

A fire that is controlled by the first dispatched forces without need for major reinforcements and within the first burning period. Initial attack involves one division of fireline perimeter. A burning period begins when the fire starts and ends at 10 a.m. the following day.

❷ Extended Attack

A fire on which the first attack forces will be substantially augmented by additional numbers of personnel and equipment, but is controlled during the first burning period and usually involves two divisions of fireline perimeter. The transition from initial attack to extended attack usually occurs with a briefing between the Initial Attack IC to the Chief Officer who has been dispatched with the substantial augmentation of personnel and equipment. The usual information transferred is the ICS 201 Incident Briefing and ICS 214 Unit Log. Other agency specific documents may also be involved.

❸ Major Fire

A fire that burns into the second burning period or requires extensive control forces. At least one base is established. The transition from extended attack to a major fire involves a detailed transition checklist and a Type 1 or Type 2 Incident Management Team usually assumes command.

Tactics

Tactics are the applied action based upon strategy. I-Zone fire fighting tactics are applied in different ways using different resources such as engines, dozers, hand crews, and aircraft (both fixed wing and rotary).

[1] Wildland Firefighting, Clayton, Day, and McFadden, 1987 Edition

Mode of Attack

There are different modes of attack for wildland/urban interface fires: offensive/direct, defensive/indirect, or a combination of both.

Direct Attack

Direct attack is any action applied directly to the burning fuel such as wetting, smothering or chemically quenching, or physically separating the burning fuel from the unburned fuel. There are several approaches to performing a direct attack on an I-Zone incident. They are called flanking, pincer, tandem, and envelopment.

Flanking Action

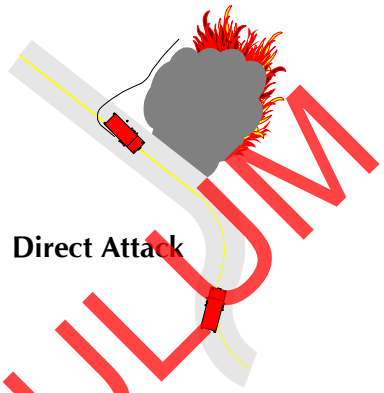
A flanking action is the most common direct attack and starts simply at an anchor point and progresses along one or both flanks of the fire. The fire is contained and extinguished as forward progress is made. You must make sure the fire is contained before moving forward so the fire does not slop-over. Most of the resources are assigned to one flank depending on the fire's intensity, natural or fabricated firebreaks, or type of resource. This type of attack is typically used when resources are limited or access to other areas of the fire is difficult.

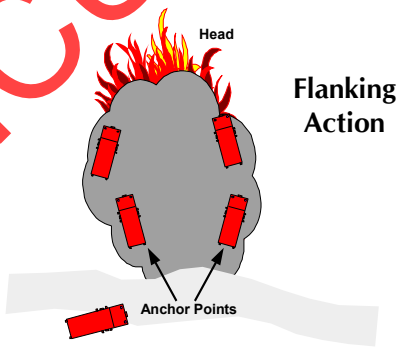
Pincer Attack

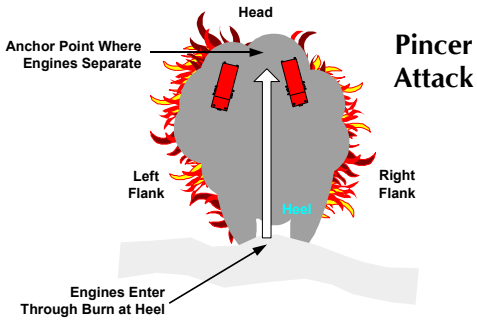
This form of direct attack involves units working in a coordinated attack. The pincer attack can be performed on any size fire, but is most effective on small fires. This action is primarily used with engines on fast-moving fires, although using dozers can also be very effective. Engines, crews, dozers, aircraft, or any combination of resources attack along both flanks of the fire with the intention of eventually encircling or pinching off the head of the fire.

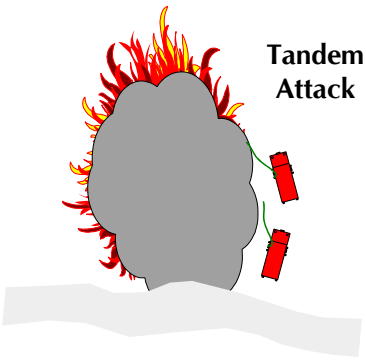
Tandem Attack

Tandem attack is another form of direct attack and involves units working in tandem. After one unit ties in to the other unit, they leap frog ahead in tandem. For this type of attack to be successful, all units must work in concert with good communication and teamwork.









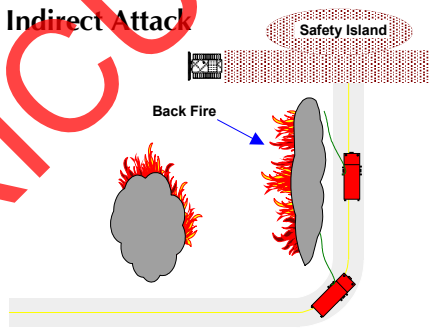
Envelopment Action

An envelopment action is a direct attack on the fire from different points at various locations, all occurring at the same time. Anchor points are established with mandatory LCES considerations. The risk management process should be enacted and close communication with adjoining resources is important in order to work effectively as a team. This action is normally used on large fires, but is also very successful on small ones. The envelopment action is very effective when protecting structures in an I-Zone fire.

Envelopment Action

Indirect Attack

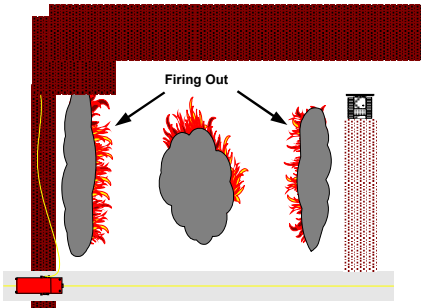
Indirect attack is a method of suppression in which the control line is located away from the fire's active edge. This form of attack is generally performed on a fast-spreading or high-intensity fire and uses fabricated or natural barriers and a constructed fireline. The intervening fuel is then burned out or the main fire is allowed to burn up to the fabricated or natural barrier depending on fire conditions.



Indirect Attack

Parallel Attack

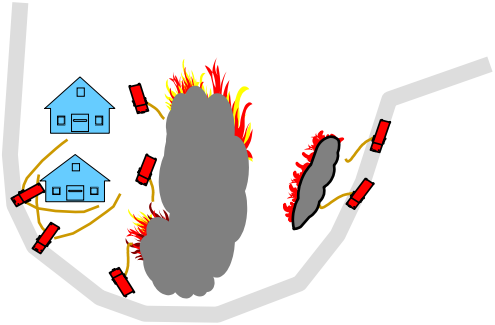
This form of indirect attack is primarily used by hand crews and dozers and works best on relatively light fuels and small fires. Some advantages of the parallel attack are that the crews work out of the heat and smoke and on shortened control lines. There is less chance of slop-over because the attack takes advantage of fabricated or natural barriers. A disadvantage is the need to burnout unburned fuel between the crew and fire. Burning out should be coordinated with adjoining resources with good control lines in place to meet the weather conditions.



Parallel Attack

Combination Attack

A combination mode of attack would include any combination of offensive and defensive actions. During I-Zone operations, a combination attack is commonly used for structure protection (defensive) and perimeter control (offensive).


Combination Attack

Topic 4-4: I-Zone Size-up

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Page A-59.

To properly attack any fire, the initial attack company officer must make a mental evaluation of the situation. This evaluation is what current and future control action is based on. The ability to make a good size-up and then act on it can make the difference between whether the fire is contained with initial attack resources or requires additional alarms. The following size-up process is tailored for use in the urban interface environment.

The first-in company officer will make observations and evaluate the factors as they become available and make decisions on current and probable future conditions. This process will also serve as a basis for his or her unit's actions and those of other resources required to handle the incident. The process itself is a continuous evaluation of many different components that occur throughout the incident.

The size-up process should start before your unit is dispatched to the incident. This process should start as soon as the company officer arrives at the station and is ready for duty. He or she should be aware of and be familiar with the following:

❶ Weather conditions/patterns

❷ General fire behavior in the response area

❸ Topography of the local area

❹ Artificial or natural barriers

❺ Skill, training, and condition of initial attack crew and resources

Report of Alarm Received

After the initial fire report is received, a second and more specific size-up can begin by the supervisor or company officer. This would include the following:

❒ Time of day
- Temperature
- Relative humidity
- Wind

❒ Location/topography
- Important for fire history in area
- Type of fire

- ❒ En route to incident
  - Smoke column
  - Availability of other resources
  - Road restrictions/traffic
- ❒ At first sight of the fire
  - Topography
  - Fuel
  - Fire behavior
  - Size

Arrival at Fire

Upon arrival on-scene, the company officer should evaluate seven basic size-up considerations as part of the wildland/urban interface fire size-up process.

- ❒ Fire history – what has the fire done?
  - How far has the fire traveled between the start time and the time you arrived at scene?
    - Can be very useful in determining what type of attack method you will use
      - Direct hose lay
      - Mobile attack
      - Indirect
- ❒ What is burning?
  - The actual fuel carrying the fire
- ❒ Life hazards
  - Resources needed for evacuation
  - Resources needed for protection in place
- ❒ Resource situation
  - Arrival time of incoming resources
  - Do you have more equipment than you need?
  - What need for additional equipment or types of equipment do you have?
- ❒ Decisions – the decisions you make must identify
  - Incident objectives (strategy)
  - Actions to be taken (tactics)
  - Resources needed

- Time frame (how long it will take)

- ❒ Potential – where will the fire be based upon current
  - Rate of spread
    - Slow (little or no spread)
    - Moderate (< 1 mph)
    - Rapid (1-3 mph)
    - Extreme (> 3 mph)
  - Fuel
  - Weather
  - Topography
  - Structures threatened
  - Life safety issues
- ❒ LCES
  - Should always be a part of the size-up process
  - Incorporate as needed your process

Developing an Action Plan

The result that comes from the size-up process is to develop and modify an action plan. An action plan is an ordered sequence of events, over a specified period, to accomplish a specific objective or objectives.

The plan sets forth the strategy, tactics, and tasks with time frames in which to accomplish the incident objective.

- ❒ The plan should be written if
  - There will be a change of shift
  - The plan is complex
- ❒ Any plan must take into consideration reflex time
  - The period of time between an action being ordered and the resource being in a position to begin that action
- ❒ Plan not for the usual, but for the potential
- ❒ Be realistic when planning
  - A hope does not equal a plan
- ❒ No strategy or tactic is entirely worthless
  - Regardless how bad they may be, you can always learn from them
- ❒ Develop an alternate action plan in the event the first one does not work

❒ Document this information on an ICS 201 form

Topic 4-5: Report on Conditions

Student information for this topic can also be found in the Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Inside Cover.

What is a Report on Conditions?

A report on conditions is a clear, concise report of existing fire and safety conditions and expected resource needs. This is usually a verbal radio report sent to the communications center by the first-in company officer or the Incident Commander. This report is given after the company officer formulates his or her initial size-up and an initial attack plan. A report on conditions benefits communications personnel, initial attack crews, resources, and the command and control organization.

It is important to remember that the report should be concise and factual. Think about what you are going to say before you say it. Practice developing and giving a report on conditions on a daily basis. By practicing, you will help alleviate any missed information that needs to be communicated. Remember, editorializing on the radio can be confusing and misunderstood by those listening.

Wildland/Urban Interface Fire Report on Conditions

The process for making an urban interface fire report on conditions is similar to a making structure fire report on conditions except the criteria used changes to meet the I-Zone conditions. The report should include the incident name, incident commander, type, status, location, jurisdiction, radio frequencies, size (including the rate of spread), fuel type, wind speed and direction, slope and aspect, access, special hazards, and resource needs.

Incident Name

- ❒ All incidents

Incident Commander

- ❒ All incidents

Incident Type

- ❒ Wildland fire
- ❒ Vehicle accident
- ❒ Hazardous materials
- ❒ Search and rescue
- ❒ I-Zone
  - ■ Structures threatened
  - ■ Evacuation

Incident Status

- ❒ Is the fire creeping, running, spotting, or crowning?
- ❒ Are there vehicles blocking the road?
- ❒ Others

Location

The fire's location should be indicated by its proximity to a road, street, or landmark that can be easily identified by those responding to the incident. Location may also include compass directions, landmarks, and even GPS information for those who have the technology. Use of flagging material or road cones may also be necessary for identifying access points for incoming units, especially those not familiar with the area.

- ❒ Use landmarks
- ❒ Legal
- ❒ Latitude and longitude

Flagging

Flagging is used to denote directional response to the fire area and is accomplished by using various colors of tape. Under normal circumstances, the tape's color identifies a specific direction. It is important to understand, however, that not all agencies use the same tape colors. Some of the more common and widely recognized forms of flagging are:

- ❒ Hot Pink
  - ■ Escape route
    - • Available with "ESCAPE ROUTE" already written on the tape
  - ■ Safety zone
- ❒ Yellow with black diagonal lines
  - ■ Danger area
- ❒ Yellow stripe hung next to a lime green strip
  - ■ Turn here

Some larger wildland agencies have their own, more involved codes other than those mentioned above.

When using flags, the best policy to ensure all those involved will recognize and understand the color-coding system you are using is to announce over the radio what color tape you are using and what it means. Remember, sometimes you have to use what you got when it's getting hot!

Jurisdiction

- ❒ Agency with jurisdiction
- ❒ Affected jurisdiction and agencies
- ❒ Threatened jurisdictions

Radio Frequencies

❒ All incidents

Incident Size

The information reported on the fire's size should include the area the fire has consumed at the present time as well as its potential for growth. The size is usually indicated in terms of a "spot" to "parts of an acre." Parts of an acre are usually described as ¼ acre, ½ acre, and ¾ acre in size. Remember, one acre is approximately equal to the size of a football field.

Rate of Spread (ROS)

The rate of spread indicates the speed of the fire's progress. The ROS is usually referenced by the following terms:

❒ Slow

- A slow or low rate of spread indicates very little spread or a spread of no consequence
- This is usually a fire with little or no wind
- Can probably pick it up with a portion of the first alarm or your engine company

❒ Moderate

- A moderate rate of spread is considered to be moving less than 1 mile per hour
- Moving at a rate where you expect to catch it with a flanking action
- The first alarm assignment will probably continue due to resource needs

❒ Rapid

- A rapid or dangerous rate of spread is considered to be moving between 1-3 miles per hour
- It is spreading faster than you can contain with a flanking action
- You will probably need to order additional equipment in order to deal with the fire's potential

❒ Extreme

- A fire moving over three miles per hour is considered to have an extreme or critical rate of spread
- Containment is not expected without significant augmentation of initial attack resources

Potential

The potential of a fire is based upon the rate of spread, weather conditions, topography, and threatened structures in the fire's path. Imminent change in topography or fuels will have a dramatic effect on your assessment. Structures or exposures will be threatened if you cannot catch the forward progress of the fire with your initial attack resources.

Fuel Type

The fuel is determined by what is burning and its density. Fuel types are classified in the following general categories:

- ❒ Light fuels
  - Grasses
- ❒ Medium fuels
  - Brush-type fuels
- ❒ Heavy fuels
  - Timber-type fuels

Wind Speed and Direction

- ❒ Above 10 mph
- ❒ Battling or shifting winds

Slope and Aspect

- ❒ Steep/% grade
- ❒ South aspect
  - Flashing fuels
  - Fuel warming

Access

- ❒ Command post
- ❒ Tactical assignment
- ❒ Staging

Special Hazards

Remember to include any safety hazards that are known to you such as downed power lines, overhead obstructions for aircraft, and nearby canyons or cliffs that would pose falling hazards. Be vigilant!

Resource Needs

Based upon the above factors, the first-in officer must decide if the initial response will be adequate or if additional resources will be needed. The need for additional units should be included and requested as soon as appropriate. This prepares the initial attack units to be expecting additional resources and initiates dispatch to perform the order requests. If no additional resources are needed, dispatch can also make that information known to the rest of the response.

Updated Report on Conditions

Remember to update your report on conditions on a regular basis and whenever changes occur. These changes may include increased rate of spread, fire intensity, weather, or additional structures being threatened.

In addition, report any "good" news in your updates. This information may cover your progress toward containment and availability of resources en route or on-scene.

INDIVIDUAL ACTIVITY 4-5-1

TITLE:	What's Going On!
TIME FRAME:	1:00
MATERIALS NEEDED:	• Slides
INTRODUCTION:	This activity provides you the opportunity to become familiar with giving a report on conditions.
DIRECTIONS:	1. View your slide. 2. Give a report of conditions based on what you see that includes: ▪ Location ▪ Jurisdiction ▪ Radio frequencies ▪ Incident size ▪ Rate of spread ▪ Potential ▪ Fuel type ▪ Wind speed and direction ▪ Slope and aspect ▪ Best access ▪ Special hazards ▪ Resource request according to your local resources 3. You have 1 minute to complete this activity. 4. Be prepared to discuss your report with the instructor.

I-ZONE REPORT ON CONDITIONS			
LOCATION		**FUEL TYPE**	
Proximity to road		Light	
Compass directions		Medium	
Landmarks		Heavy	
GPS		Other	
Access points identified		**SLOPE**	
JURISDICTION		**ASPECT**	
Affected		**ACCESS**	
Threatened		Command post	
RADIO FREQUENCIES		Tactical assignment	
Command		Staging	
Tactical		**SPECIAL HAZARDS**	
SIZE		Downed power lines	
Area consumed		Overhead obstructions for aircraft	
Potential for growth		Fall hazards, cliffs, canyons	
From a spot or acres		Other	
RATE OF SPREAD		**RESOURCE REQUEST**	
Slow or low		Based on mode of attack	
Moderate		**UPDATED REPORT ON CONDITIONS**	
Rapid or dangerous		Change in rate of spread	
Extreme or critical		Structures threatened	
POTENTIAL		Changes in fire intensity	
Life hazard		Change in weather	
Conditions at time of arrival		Good news	
Imminent change in topography or fuels		Progress toward containment	
		Available resources	

Topic 5-1: Introduction to Safety and Survival in the I-Zone

Student information for this topic can also be found in Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Inside Cover and Chapter 1 and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Page 4.

Each year several fire fighters are killed or injured while responding to, working on, or returning from an urban interface fire. Documentation and research show that there are several factors causing these fatalities or injuries and they are often repeated at every incident. It is up to you to study and understand these factors so further tragedies can be prevented. If we do not learn from our past, we are destined to repeat the same mistakes. We have the knowledge and the technology to prevent these misfortunes.

Politics and Fire Fighting

Over the years, fire fighters have bravely fought fires to save lives and property. At one point many years ago, fire companies used to argue over who got to fight the fire. Confrontations occurred when two companies arrived at the fire at the same time, each trying to out do each other. One company would try to show the other who was the best and during this time, the fire continued to burn. We have changed in the last hundred years from fistfights to the political battleground. It has been said that territory disputes have cost many lives to civilians and fire fighters alike. The fire service has made great improvements in the political and territory arena. With mutual aid and automatic aid agreements being established, the nearest apparatus will respond regardless of jurisdictional areas.

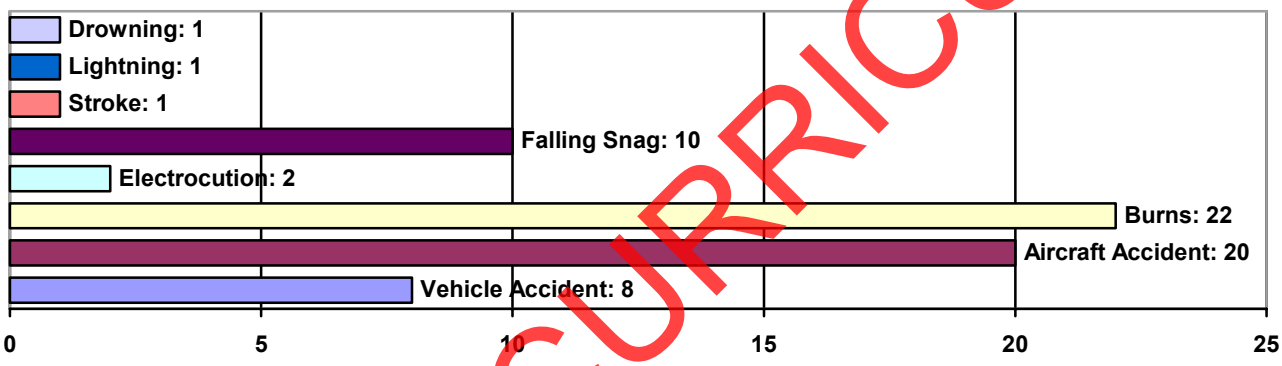
However, there is still the fear of losing power in addition to traditional complacency that cause many fires to burn out of control. The result is a loss of life and property. Recently, a lightning strike started a fire on the side of a mountain within a few miles of a town's city limits. Since the fire was outside the local fire department's jurisdiction, the fire was allowed to burn. The fire was not attacked with full force for two days and burned out of control killing several fire fighters later on in the battle. There is no doubt that a fast, aggressive attack in the early stages of the fire would have put the fire out quickly. Even after the investigation was done, there was little mention of mutual aid agreements, cross training of fire fighters or automatic aid responses as a solution to prevent such tragedies. This same scenario has been repeated many times over the years. The 1991 Tunnel Fire in Oakland, California that cost the lives of 25 people had occurred in the same area many times before.

Even though our priorities are still the same, it is becoming more difficult to safely attack urban interface fires -- the fires that have people and their houses within the fireline. If history repeats itself, as it has continued to do, we must be prepared for this new type of fire fighting. We must train and cross-train our fire fighters to fight fires in the I-Zone. Wildland fire fighters must learn fire behavior and other options available to them when structures are threatened. Structure fire fighters must learn to work within the wildland fire environment. Jurisdictional boundaries must be broken down to work in the favor of all agencies that are responsible to protect life and property.

Causes of Fire Fighter Fatalities and Injuries

There have been many studies on how fire fighters are injured or killed at fires. In wildland and I-Zone fires, there are situations and certain behaviors that are common in most fire fighter fatalities. The National Fire Protection Association (NFPA) compiled the data for the chart below showing the cause of death in wildland/urban interface fires for a single year. Eight fire fighters died in vehicle accidents, 20 died in aircraft accidents, 22 died of burns, 2 were electrocuted, 9 died of heart attacks, 10 died from falling snags, 1 from a stroke, 1 from a lighting striking near by, and 1 drowned.

The most common cause of death while fighting a wildland/urban interface fire is from burns and inhaling hot gases, followed next by aircraft accidents and falling snags.



Common Denominators

An analysis of 40 tragedy fires that occurred between 1926 and 1974 (136 deaths) found that there were several common denominators of fire behavior at these fatal and near-miss fires. Today we consider the following four common denominators of fire behavior. Most of these occurred:

❶ On relatively small fires or deceptively quiet areas of large fires.

❷ In relatively light fuels, such as grass, herbs, and light brush

❸ When there is an unexpected shift in wind direction or in wind speed

❹ When fire responds to topographic conditions and runs uphill

By understanding the situations that cause fire fighter fatalities and injuries, fire service training can be better focused. However, these situations should not be the only factors measured. With the introduction of the wildland/urban interface, other factors must be considered such as power lines, hazardous materials, explosives, traffic and building collapse, to name a few. You must constantly be aware of the hazards around you.

Similarities Of Fatality Fires

The following is a brief overview of some of the key similarities of three fatality fires: South Canyon, Thirtymile, and Cramer. Twenty-fire fighters lost their lives on these fires. These similarities are based upon a review of the official fire investigation reports and other public documents.

- ❒ Each host fire unit had experienced previous entrapment and/or fatality fire
- ❒ Each unit was a "consolidated unit" and/or had poor working relationships with the adjoining unit
- ❒ Severe to extreme drought conditions and a high Haines Index were present
- ❒ A multiple fire situation existed
- ❒ There was active fire behavior day and night
- ❒ Rapid fire growth unexpected by leadership
- ❒ Personnel were working uphill and/or upcanyon from the fire
- ❒ Multiple day, extended attack operations
- ❒ Strategy and tactics
  - ✣ Direct attack with hand crews
  - ✣ Two of the three fires involved the aerial delivery of fire fighters above the fire
- ❒ Fire fighters' personal actions did not reflect the fire danger
- ❒ Improper application of PPE provided
  - ✣ Especially fire shelters, gloves, and fire clothes
- ❒ ICT 3 involved in significant managerial and/or personal issues not related to the fire suppression action of the fatality fire
- ❒ Numerous leadership failures
  - ✣ Inadequate briefings of assigned personnel
  - ✣ Unsuccessful strategy and tactics not adjusted
  - ✣ Spot weather forecasts not requested
  - ✣ Lack of fire behavior predictions
  - ✣ Confusion on who is in charge
  - ✣ Poor management of fatigue
  - ✣ Risks not assessed and/or poorly managed
  - ✣ Noncompliance with 10 Standard Fire Fighting Orders
  - ✣ Nonmitigation of applicable Watch Out Situations
  - ✣ Need to deploy shelters was unexpected

- Fire Program Managers (FPM)
  - Large span of control
  - Oversight
  - Limited strategic operations experience
  - Poor oversight of the ICT 3's strategy and tactics by the FPM and/or Air Tactical Group Supervisor (ATGS)
  - FPM and/or ATGS did not ask for help in a high workload situation
- Lack of preparedness actions in response to fire season severity and multiple fire situations

Survival Tips

Fighting fires in the wildland/urban interface is dangerous to say the least. Every year fire fighters are trapped, injured, and killed while fighting I-Zone fires. It is essential to learn safety and survival techniques that you can use while fighting fires in the wildland/urban interface. The following acronym, ESCAPET will help you to remember how to survive.

E-Education

Education is the most important survival tool a fire fighter has. Knowledge of fire behavior, human behavior, and the use of resources can make the difference between life and death on the fireground. The ability to predict dangerous situations before, during, and after a fire fighting operation is accomplished through education, either by training programs or by on-the-job experience. Education should be nonstop throughout your career since new technology, lessons learned from new case studies, and educational programs change from year to year. What might have worked for you 10 years ago or even just 5 years ago may not work now.

S-Safety

Think safety at all times. Know what is safe and what is not. Do not rely on the traditional way of doing things to bail you out. Tradition is the single greatest unofficial killer of fire fighters! Knowledge and experience will always win out over tradition in the end. Have confidence in your tools and your team to get the job done safely. Know your standard fire fighting orders and "the things that shout watch out" at a wildland/urban interface fire. Safety is not just the job of the Safety Officer or supervisor; it is everyone's responsibility.

C-Clothing

Wear the proper protective clothing for the type of fire you are fighting. A wildland/urban interface fire is outdoors fire fighting. Always wear wildland fire fighting protective clothing.

A-Alertness

Be aware of everything that is going on around you at all times. Things change fast, and the fire can be unpredictable. Be ready to react to sudden changes.

P-Physical Fitness

Stress is the number one official killer of fire fighters. Being physically fit decreases the risk of injury and death by reducing stress. Fire fighting in the wildland/urban interface can be physically challenging, so be prepared to meet that challenge.

E-Experience

Knowledge and experience work together; one does not work well without the other. There are two ways to gain experience - one way is through the experiences of others, the other way is by doing it yourself. The more experience you gain, the better your chances of survival.

T-Teamwork

The fire service, in general, is a team, as is your crew, in particular. Without teamwork, it would be difficult surviving in any operation. Never work alone and always know what the rest of your team is doing at all times. The life they save may be yours.

Green Sheet: Cedar Fire

Investigation Summaries of Serious CDF Injuries, Illnesses, Accidents and Near-Miss Incidents
Engine Crew Entrapment
Fatality and Burn Injuries
October 29, 2003
CACNF-003056
CACSR-000132
Southern Region
California Department of Forestry and Fire Protection

A Board of Review has not approved this Summary Report. It is intended as a safety and training tool, an aid to preventing future occurrences, and to inform interested parties. Because it is published on a short time frame, the information contained herein is subject to revision as further investigation is conducted and additional information is developed.

Summary

The Cedar Fire was reported on Saturday, October 25, 2003, at approximately 5:37 P.M. The fire, burning under a Santa Ana wind condition eventually consumed 280,278 acres and destroyed 2,232 structures, 22 commercial buildings, and 566 outbuildings, damaging another 53 structures and 10 outbuildings. There was 1 fire fighter fatality, 13 civilian fatalities, and 107 injuries. The fire was under Unified Command with the United States Forest Service, the California Department of Forestry and Fire Protection, and local government.

On October 29, 2003, four personnel from Engine Company 6162 (E6162) of the Novato Fire Protection District, as part of Strike Team XAL2005A, were overrun by fire while defending a residential structure located on Orchard Lane in the community of Wynola, in rural San Diego County. The fire made a wind-driven run through heavy brush directly toward their position, covering a distance of approximately one-half mile in just less than two minutes. One crewmember died at the scene and the three others were provided treatment and then airlifted to the University of San Diego Burn Center.

Conditions

The accident site was located on a ridge near the origin of the San Diego River drainage. Slopes at the accident site range between 12%-20%. The elevation at the accident site is approximately 3800 feet, 400 feet above the bottom of the drainage.

The Palmer Drought Index shows a preliminary reading of -2.88. The fuel models in the immediately area of the accident site were Fuel Model 4-brush (with at least 90% crown closure) and Fuel Model 1-grass. Live fuel moisture values were below critical levels.

At the time of the accident, a strong onshore pressure gradient had developed with sustained winds of 17 mph and a gust of 31 mph out of the west. At 2:30 P.M. at the accident site the temperature was 70 degrees and the relative humidity was 30%.

As all the fire environment factors of fuel, wind and topography came into alignment there was a sustained run from the southwest directly to the accident site as a running crown fire. Flame lengths were calculated to be in excess of 78 feet, fireline intensities in excess of 73,989 BTU/ft/sec, and rates of spread in excess of 16 miles per hour (for the maximum wind speed recorded at 31 mph). It took the fire a little

under 2 minutes to go from the bottom of the slope to the top, a distance of .46 miles. All fuels, both dead and live were totally consumed below the accident site.

Road Conditions: The access to the accident site is a curving ten-foot wide, 490-foot long cement driveway proceeding uphill to the residence. The driveway is overgrown with brush and requires trimming to allow ingress. At the ridge top, the driveway makes a sharp 90 degree curve to the south that finally orients in line with the ridge along the west side of the house.

Make/Model of Equipment: E6162 is a series 2000 International similar to a CDF Model 14. It is outfitted with a 4-person cab, 500-gallon tank, and a 500-gpm pump. The engine is 8 feet 8 inches wide, 24 feet long, and 9 feet 4 inches tall.

Sequence of Events

By 11:00 A.M. on October 29, 2003, the Cedar Fire had crossed Highway 78 spreading along the ridge on the west side of the San Diego River drainage. The fire was making short runs (averaging less than 100 yards) in the grass, brush, and oak trees. Helicopters were making bucket drops in an effort to keep the fire on the west side of the San Diego River drainage.

The fire on the west side of the drainage moved upcanyon and gained elevation under the influence of a west wind, higher up in the drainage, the spread to the northeast, burning the property at 902 Orchard Lane. (See Fire Spread Map.) Spot fires are observed in the area and both helicopters and ground resources are moved to the area of Orchard Lane. This includes ST2005A with E6162, which has a four-person crew including a captain, two engineers (who will be referred to as Engineer #1 and Engineer #2), and a fire fighter.

At about 12:15 P.M., the Strike Team Leader for 2005A, after reviewing conditions, assigns E6162 to the residence at 920 Orchard Lane (the site of the accident). No engines are assigned to 902 or 930 Orchard Lane. (See Orchard Lane Detail Map.) A Captain and an Engineer, in a utility vehicle, arrive at 902 Orchard Lane and begin to fire out around the residence.

While the Captain from E6162 walks ahead to evaluate, E6162 backs up the driveway as overhanging brush is cleared by the crew of E6162. (See Accident Site Sketch). The Captain returns to the engine and expresses some concern about the conditions. The Captain and Fire Fighter return to the residence and determine, based on a large cleared area to the southwest side of the property, that the location is defendable.

The cleared area provides for a view to the west and northwest, tall brush and drifting smoke restricts the view to the southwest and no fire activity is visible. They observe smoke from the fire to the north, near 902 Orchard Lane, which is flanking towards them, and determine it to be the greatest threat. Small runs of fire are taking place across the canyon on the west side of the drainage.

The crew observes an upcanyon and upslope wind, at about 7-10 mph, on a line from where Highway 78 crosses the San Diego River towards the location of 902 Orchard Lane, a natural saddle. The crew develops and implements a plan that includes: brushing and firing below the house; identifying the house and/or engine as a refuge and placing an axe at the back door; using a residential ladder on the house; laying out 1½" hose lines for engine protection all in an attempt to defend the structure. The Captain advises the crew of a fire fighter firing out in the area north of the garage. Engineer #1 observes fire on the

ground near the garage, and begins strip firing from that location. The Captain throws fusees down the slope into the heavy brush below the area strip burned. This results in a partial burn.

At about 12:25 P.M. the Captain and Engineer, in the utility vehicle, arrive at 930 Orchard Lane. They begin firing around the structures from south to north along the west side of the structures. The Captain instructs the Engineer to take the line of fire to the next house to the north, which is 920 Orchard Lane. The Engineer begins to lay fire towards the north in 15-foot brush with dry grass underneath. Active burning conditions result from this firing and the Engineer does not continue north. Fire from the firing operation makes a run east towards the driveway, where a helicopter bucket drop slows it down.

At about 12: 35 P.M. the Strike Team Leader for 2005A arrives at the location of E6162, reviews their progress, and plans. The sky is clear overhead and the winds are moderate. About five minutes after the Strike Team Leader leaves the scene, the crew of E6162 observes an increase in the fire activity below them.

Near where Highway 78 crosses the San Diego River, the fire begins an upcanyon, upslope run in heavy brush and oak fuels. Wind driven, the fire makes a continuous run directly at 920 Orchard Lane, covering a distance of about one-half mile in less than two minutes. (See Fire Spread Map.)

As the fire intensity below them increases, the crew retreats to the passenger side of the engine. The Fire Fighter staffs a 1½" hose line at the front bumper, while Engineer #2 staffs a similar hose line near the rear bumper. Engineer #1 is standing at the rear duals. The Captain is believed to be towards the rear of the engine with the only portable radio.

Members of the crew notice a significant wind increase at this time. A flaming front is observed blowing across the driveway in the direction of the garage. Very active fire is observed below them with flame lengths of 40'-50'. Due to intense heat, the Captain orders the crew to move to the shelter of the residence. (See Accident Site Detail Map.)

Bushes along the patio behind the crew are burning. The Fire Fighter drops his line and runs in the direction of the raised patio. Upon leaving the protection of the engine, he experiences severe thermal conditions. The Fire Fighter leaps past the burning bushes and onto the patio, followed by Engineer #1 who runs to the steps, stumbles and falls to his knees at the top of the steps, recovers, and continues to retreat behind the rear of the house, following the Fire Fighter. Engineer #2 puts on a hose pack stored in the rear compartment of the engine.

Arriving at the rear door (approximately 170' from the engine), the fire fighter and Engineer #1 use the axe to force entry into the residence. Realizing that no one else is following them, they decide to return and look for the Captain and Engineer #2. At about this time, a radio call is heard indicating a fire fighter is down. Fire burns the charged hose lines (at the rear of the engine) causing the tank to be pumped dry.

The Fire Fighter and Engineer #1 return to the south end of the house. As they near the southeast corner, they observe solid flame blowing sideways across the patio. They then see the Captain stagger around the corner out of the flames. He appears to be dazed.

The Captain tells them that Engineer #2 has fallen and states they need to go back for him, the Captain then turns to go back after the fallen engineer. Engineer #1 and the Fire Fighter determine the patio area is untenable. The three retreat back into the residence. Inside they discuss a plan to search for Engineer #2.

After a moment, they open the front door to check the front of the house. Intense heat surges in and the door is closed. After a few minutes, a second attempt is made to try the front door. Engineer #1 exits to search for the missing Engineer followed by the Fire Fighter who turns back when he is hit by a burst of heat.

Engineer #1 moves towards the front bumper line taking small shallow breaths. Engineer #1 observes the body of Engineer #2 on the patio and continues to the bumper line, advancing it towards the body of the down Engineer. Engineer #1 gets a 10-15 second burst of water before the tank is dry.

An increase in heat forces Engineer #1 to take shelter inside the engine. Engineer #1 considers deploying the extra fire shelters stored in the cab. Concerned that the Fire Fighter and Captain may come searching for him, Engineer #1, taking a single breath runs to the front door and rejoins the other two.

The burning structure forces the three to make their way to the engine. The Fire Fighter disconnects the two protection lines. Engineer #1 drives the engine down the driveway to the east. Heavy dark smoke obscures the view and Engineer #1 feels his way, using the feel of the tires dropping off the edge of the pavement to make corrections. At one location, the engine is stopped to avoid running off the driveway. Concern about being overrun again convinces them of the need to continue. The Captain transmits a "fire fighter down" message. The crew continues south on Orchard Lane to a location just short of Highway 78.

The three exit the engine and advise a Hot Shot crew that they have been burned. The Hot Shot crew provides medical assistance prior to the three being flown to a hospital burn unit in San Diego for treatment.

Injuries/Damages

Injuries

The Fire Fighter had minor inhalation injuries to the respiratory tract and first degree burns on the face (under the goggles), and small patches of first-degree burns on the back between the shoulder blades.

Engineer #1 received second-degree burns on the tip of the nose and a two-inch by three-inch area on the back. First-degree burns were also sustained on all knuckles of both hands and an additional two-inch by three-inch area on the back.

The Captain received second-degree burns affecting approximately 28% of the body including the face, ears, arms, elbows, and legs as well as sustaining a respiratory inhalation injury.

Engineer #2 died while running for the house and received extensive burns over most of the body.

Damage

Plastic lens covers on all four sides of E6162 melted or showed heat damage. The vinyl hose bed cover for the driver's side preconnect and both rear hose bed covers melted. There was no obvious heat damage to the paint and the engine was driven away from the accident site.

The wood-frame stucco house at 920 Orchard Lane had a rolled paper and tar roof, and a large wooden deck attached to the north end of the house. The house burned to the ground after the surviving crewmembers left the scene.

Safety Issues for Review

Applicable Standard Fire Orders

#1. Keep informed on fire weather conditions and forecasts
This needs to be an ongoing activity based on all available information. This includes fire weather watches and red flag warnings.

#2. Know what your fire is doing at all times.
This should include the main body of the fire and any fingers and hotspots. If there is any firing taking place in the area, this fire activity needs to be monitored also.

#3. Base all actions on current and expected behavior of the fire.
It is important to consider not only the current and expected behavior, but consideration should be given to the unexpected or possible worst-case scenario.

#5. Post lookouts when there is possible danger.
The presence of a posted, dedicated lookout assigned to the division or area of greatest concern/threat would have allowed for an observation of the fire in the drainage.

#6. Be alert. Keep calm. Think clearly. Act decisively.
Command presence during times of stress is imperative. The leadership demonstrated during this event directly saved lives.

#7. Maintain prompt communication with your forces, your supervisor, and adjoining forces.
This needs to be accomplished at all levels within the operation, including the crew level, strike team/task force level, the division/branch level and the operational level. If air resources are moved into and out of an area this needs to be communicated.

#9. Maintain control of your forces at all times.
When positioning, or repositioning resources during a fluid fire environment, it is critical to ensure that all resources are accounted for, and to the greatest extent possible, know the location of their adjoining forces and the tactics being employed.

#10. Fight fire aggressively, having provided for safety first.
Aggressive actions generally place fire fighters in close proximity to the fire's edge. Safety mitigations must be part of the immediate plan. In this case, safety of the crew was demonstrated by aggressive actions taken at the structure to create a more favorable position, which included a safety zone. When reacting to extreme fire behavior accompanied by a rapidly spreading fire, the safety plan needs to be continually evaluated and updated. It appears that all of the necessary Personal Protective Clothing and Equipment was being worn correctly.

Applicable Watch Out Situations

#4. You are in an area where you are unfamiliar with local factors influencing fire behavior.
Out of area/region crews need to be briefed on local conditions and fire behavior prior to going onto the fireline.

#5. You are uniformed on strategy, tactics, and hazards.
All tactics being implemented both within and adjacent to the assigned division need to be known and communicated to all. This is especially true of firing operations.

#11. You are in heavy cover with unburned fuel between you and the fire.
The inability to estimate fire spread in heavy fuels is often cited as a causal agent in fireline injuries/deaths and is directly related to Situation #12.

#12. You cannot see main fire and you are not in communication with anyone who can.
The lack of knowledge about exactly where the leading edge of the fire is and what it is doing, places those that cannot acquire that information at considerable risk.

#15. You notice that the wind begins to blow, increase or change direction.
While often noticed, if not noticed and communicated in time, any required change in the predetermined safety plan may not allow for the plan to be communicated and implemented.

#17. You are away from a burned area where terrain and/or cover make travel to safety zones difficult and slow.
The ability to reach a safety zone, as opposed to an area of refuge, needs to be carefully scrutinized, allowing for a reasonable time frame under the worst-case situation.

Applicable Common Denominators

- ❒ When there is an unexpected shift in wind direction or speed.
- ❒ The unexpected shift in direction and rapid increase in the speed of the wind were a direct contribution to this accident.
- ❒ Fires run uphill surprisingly fast in chimneys, gullies, and on steep slopes.
- ❒ This fire responded to an upslope/upcanyon influence as it spotted across the highway and into the upper tributary of a major drainage. The accident site was located on a high ridge and at the top of a significant chimney.

LCES

Lookouts

Lookouts dedicated to that role need to be identified and have proper communication ability. The Lookout location, and time they will be in place, needs to be known by all crews assigned to that division/location. The use of aerial reconnaissance and aerial lookouts needs to be used when it is the only viable lookout that can adequately perform the function.

Communications

As prompt radio communication begins to degrade, regardless of the reason, the propensity to rely on face-to-face communication requires that everyone realize the increased time it will take to ensure all who need to know specific information have in fact received it.

Lookouts need to have a clear understanding of desired "trigger points" and to whom and how they will be communicated.

Although not a common occurrence, on this incident the loss of a repeater (destroyed by fire) further complicated radio communications.

Command staff must ensure that any and all significant weather information is broadcast to all levels of the incident organization.

The use of VHF and 800 MHz radio frequencies and the potential for lack of communication on the incident, specifically at the division level must be recognized by all personnel. The assignment of multiple tactical frequencies within a division (air resources, structure group, division tactical channel) must be known, and/or monitored for critical radio traffic.

Escape Routes

Escape routes that are identified at any given moment, need to be constantly evaluated and re-evaluated. The utilization of vehicles/structures as refuge and/or Safety Zones needs to be clearly discussed and assigned accordingly. Creating additional defensible space around structures must be included in the re-evaluation of the number, type and location of escape routes. Escape routes for both vehicular and foot traffic need to remain viable throughout the operation and during the worst-case scenario.

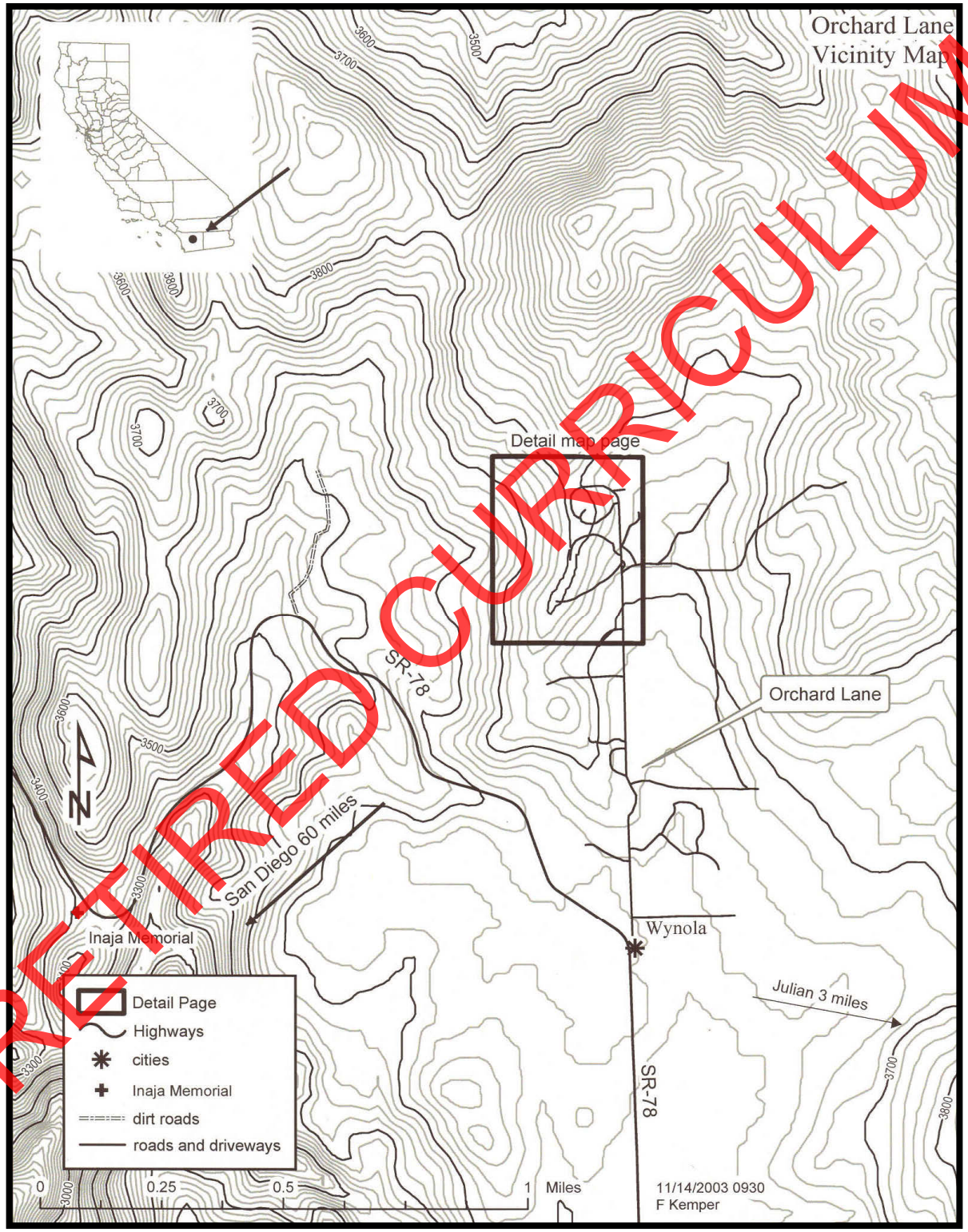
Safety Zones

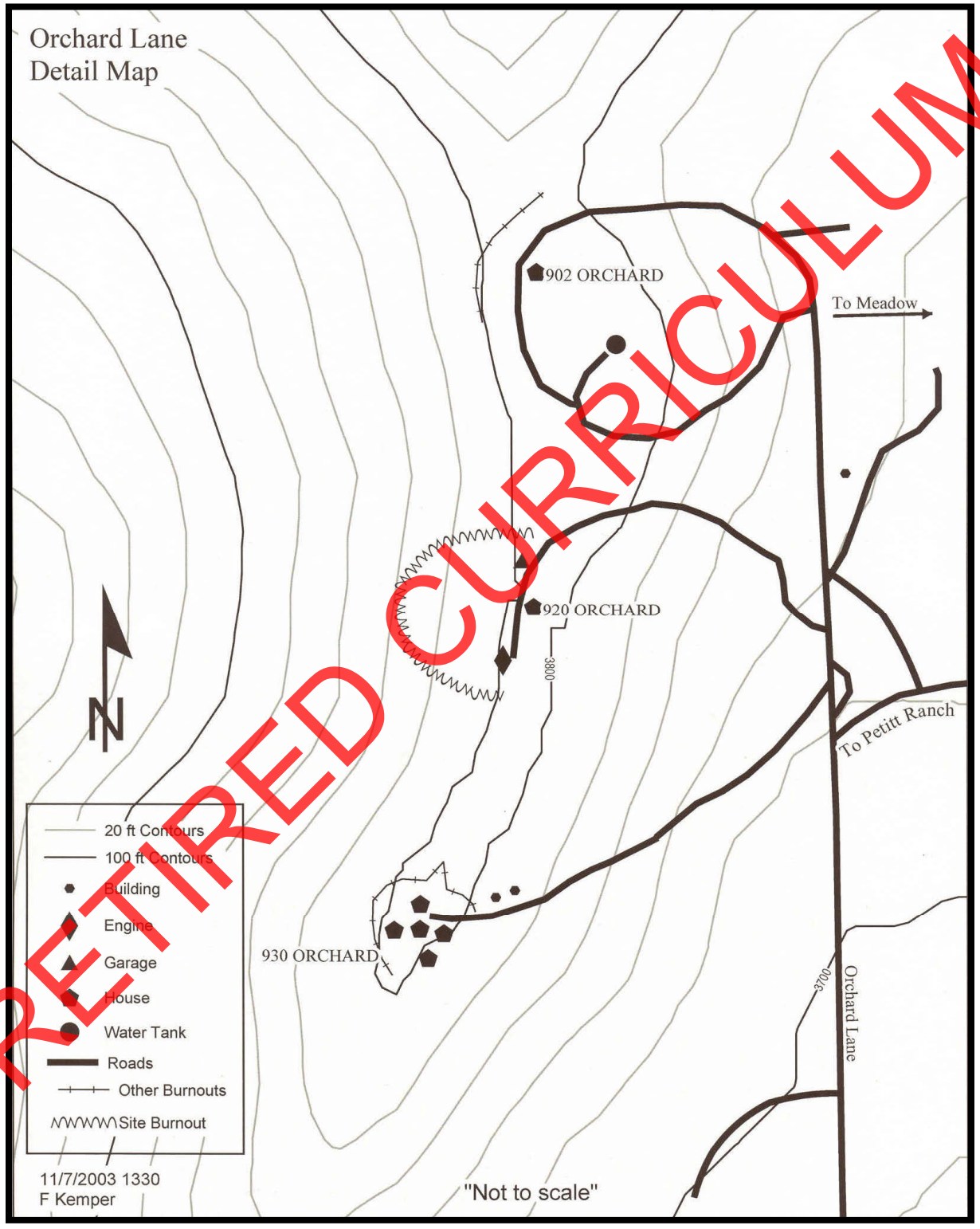
Safety zones need to be identified and/or established and communicated to all who may have to use them. Their size and location needs to be based on both current and expected fire behavior. While safety zones may be adequate for what is expected, they need to be applied to the burning conditions present to ensure they are adequate.

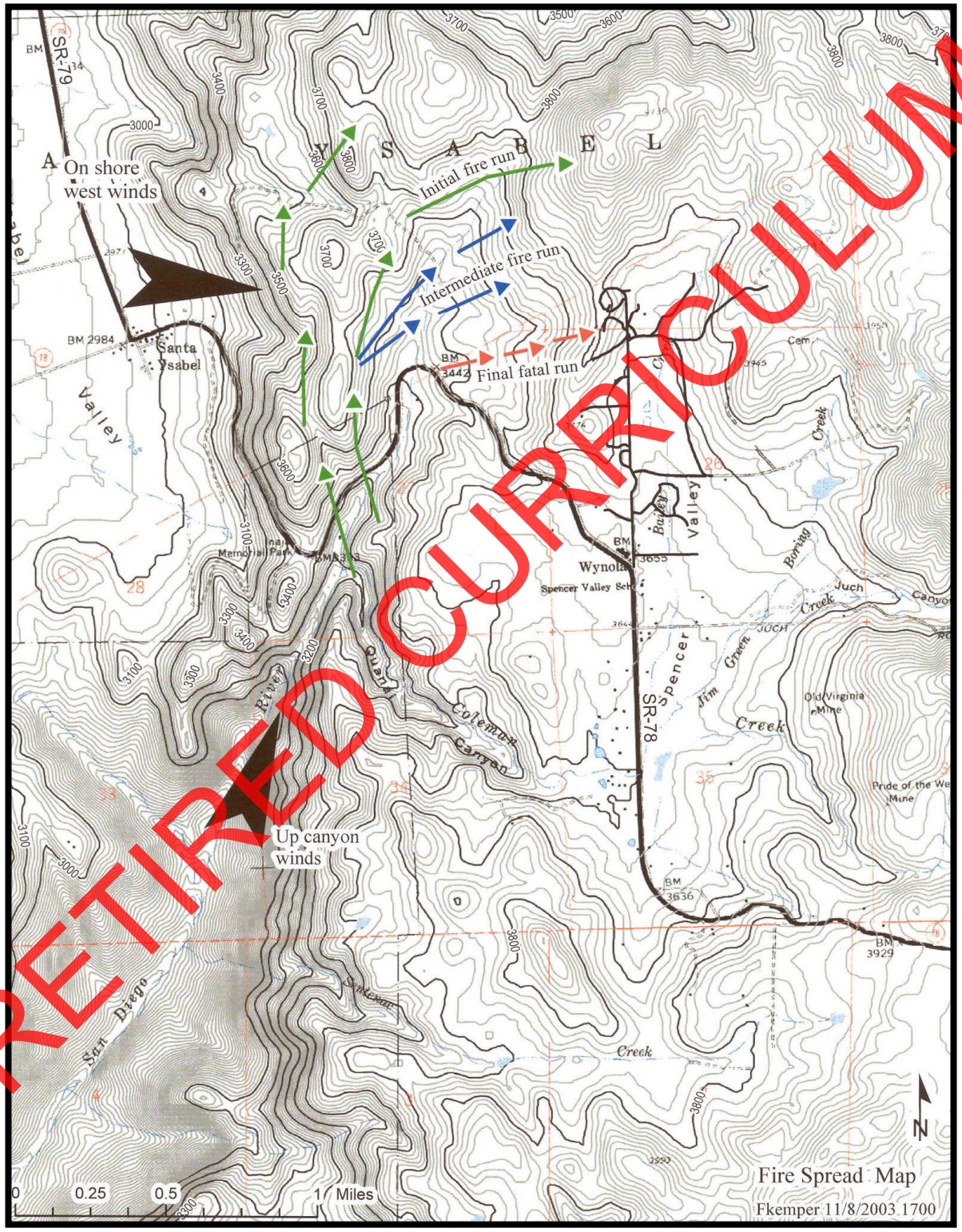
The difference between safety zones and refuge areas needs to be clearly understood by all who may use them. The pros and cons of each and the desired sequence of use also need to be communicated. Safety Zones should allow for the required level of safety from as many angles as possible.

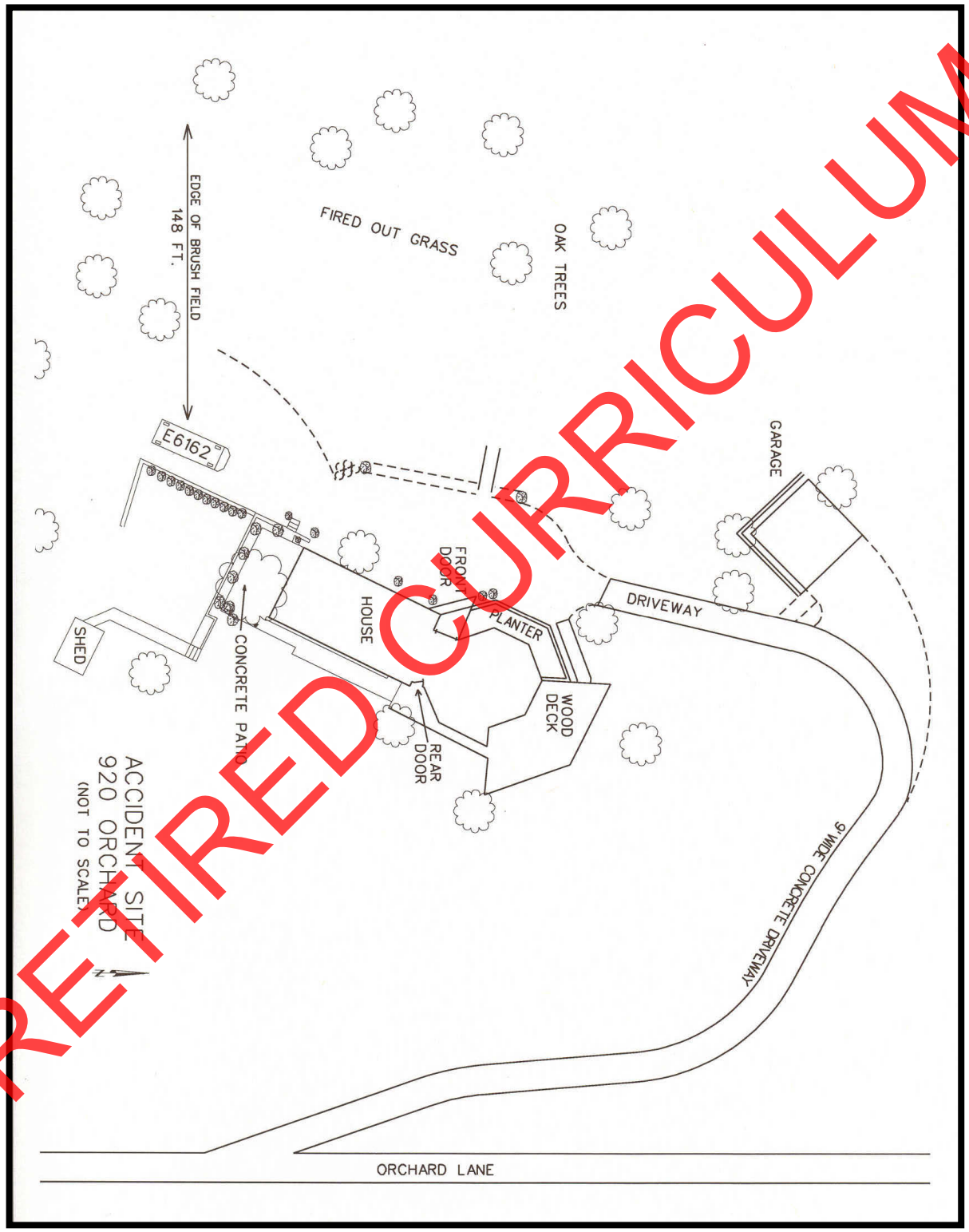
Incidental Issues for Review

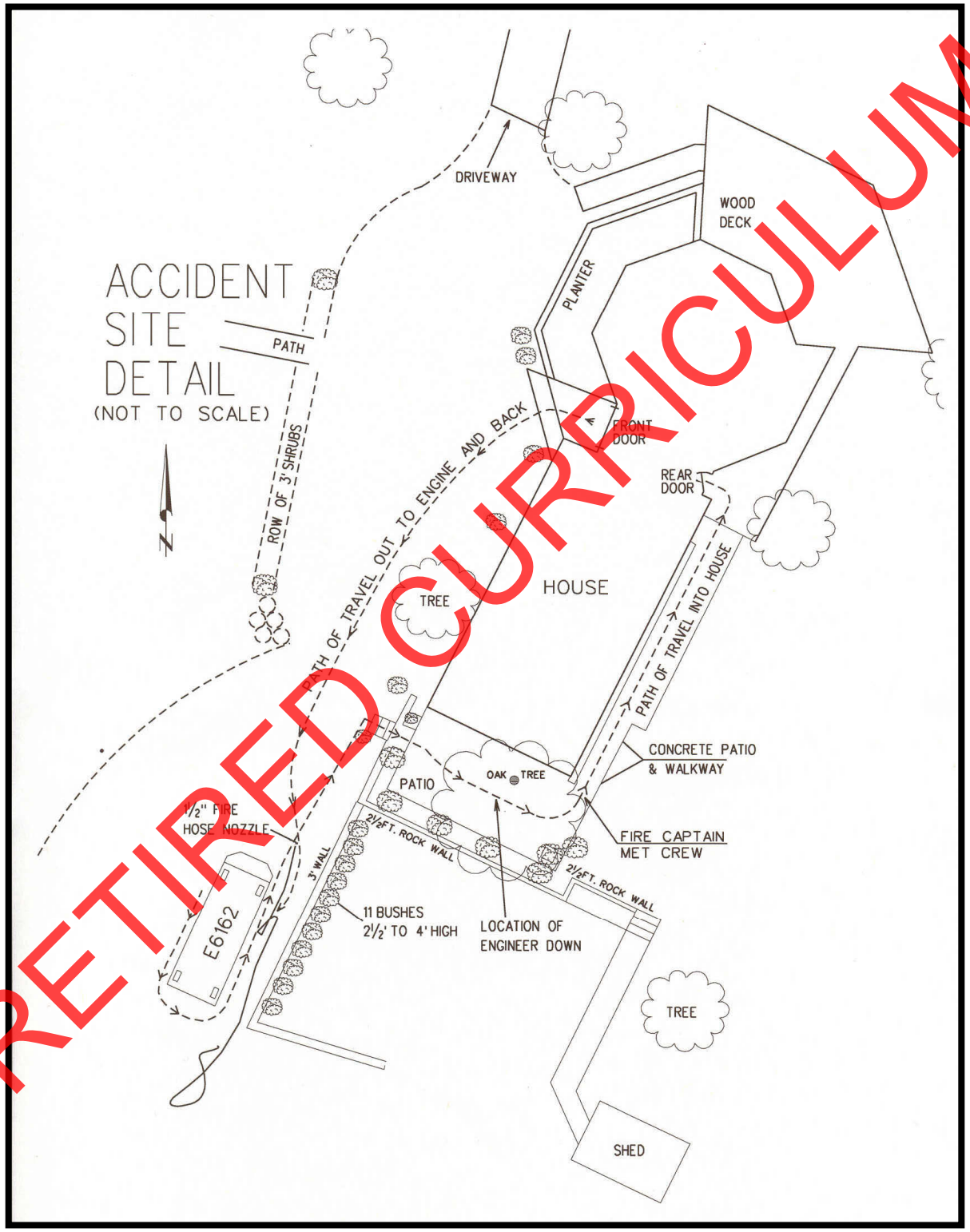
1. Emphasize the need to establish a dedicated "Lookout" position into the ICS organization.
2. Need to review the 10 Standard Orders, 18 Watch Out Situations, and LCES for specific applicability to wildland/interface operations.
3. Need to address interoperability of communication systems within the fire service community. Specifically the 800 MHz versus the VHF frequencies.
4. Need to develop systematic process to inform out-of-area/region resources with local conditions affecting the fire environment.
5. Need to evaluate structure defense philosophies, strategies, and tactics and incorporate into standardized training, technology, and procedures.
6. Approximately 1.5 miles southwest of the entrapment site, 11 fire fighters were killed in a firestorm on the Inaja Fire. (See Orchard Lane Vicinity Map.) The Inaja Fire started November 25, 1956, under strong Santa Ana winds, the fatalities occurred when the winds turned to the west.











Topic 5-2: The Risk Management Process

Student information for this topic can also be found in Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Page 1.

The risk management process was developed to provide fire fighters with a brief and accurate method to recognize and then reduce the risk to fire fighters on the fireline. Each fire fighter has a comfort level that they will risk depending on training, experience, education, and background. The steps in the risk management process will help you make decisions when you are at risk.

Step 1 - Situation Awareness

In this step, you will gather information to help you decide when, where, and how to deploy personnel.

Before a decision can be made, you must obtain the following information:

- ❒ Objectives
  - ✣ What are the primary objectives and expected action plan?
  - ✣ Is there a clear obtainable objective?
  - ✣ Are the objectives known to everyone?
  - ✣ Are there enough resources to handle the objective?
- ❒ Communications
  - ✣ Are communications established and known to everyone?
  - ✣ Can all forces communicate with each other?
  - ✣ Are radio frequencies confirmed?
- ❒ Command
  - ✣ Is one person in charge of the incident?
  - ✣ Is the span of control accurate?
- ❒ Previous fire behavior
  - ✣ Is the fire history known?
  - ✣ What has the fire been doing?
- ❒ Weather forecast
  - ✣ What will the weather be like when the forces are deployed?
  - ✣ What will the weather be like in the future?
- ❒ Local factors
  - ✣ How will local conditions affect fire behavior?

Step 2 - Hazard Assessment

In this step, you will identify hazards on the fireline that would affect your decision to engage or not engage. These hazard considerations should include fuel characteristics, fuel moisture, fuel temperature, terrain, wind, stability, and fire behavior.

- ❒ Estimate potential fire behavior hazards
  - ✣ Look up/down/around indicators that include the conditions, influences, and modifying forces that control fire behavior
- ❒ Identify tactical hazards
  - ✣ Watch out situations that develop
  - ✣ What other safety hazards exist?
  - ✣ Consider severity versus probability

Step 3 - Hazard Control

In this step, you can make changes to certain hazards that have been identified.

- ❒ Standard Firefighting Orders and LCES checklist are mandatory
- ❒ Downhill Checklist
  - ✣ Downhill fireline construction is hazardous in steep terrain, fast-burning fuels, or rapidly changing weather
  - ✣ Downhill fireline construction should not be attempted unless there is no tactical alternative
  - ✣ When building downhill fireline, the following is required
    - ▪ Crew supervisor(s) and fireline overhead will discuss assignments prior to committing crew(s)
      - Responsible overhead individual will stay with job until completed
    - ▪ Decision will be made after proposed fireline has been scouted by supervisor(s) of involved crew(s)
    - ▪ LCES will be coordinated for all personnel involved
      - Crew supervisor(s) is in direct contact with lookout who can see the fire
      - Communication is established between all crews
      - Rapid access to safety zone(s) in case fire crosses below crew(s)
    - ▪ Direct attack will be used whenever possible; if not possible, the fireline should be completed between anchor points before being fired out
    - ▪ Fireline will not lie in or adjacent to a chute or chimney
    - ▪ Starting point will be anchored for crew(s) building fireline down from the top
    - ▪ Bottom of the fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge

Step 4 - Decision Point

In this step, your answers to the following questions take you to the appropriate action.

- ❒ Are controls in place for identifying hazards?
  - ✣ No: Reassess situations
  - ✣ Yes: Next question
- ❒ Are selected tactics based on expected fire behavior?
  - ✣ No: Reassess situation
  - ✣ Yes: Next question
- ❒ Have instructions been given and understood?
  - ✣ No: Reassess situation
  - ✣ Yes: Initiate action

Step 5 - Evaluate

In this step, you will evaluate the personnel and the situation.

- ❒ Personnel
  - ✣ Low experience level with local factors?
  - ✣ Distracted from primary tasks?
  - ✣ Fatigue or stress reaction?
  - ✣ Hazardous attitude?
- ❒ The situation
  - ✣ What is changing?
  - ✣ Are strategy and tactics working?

GROUP ACTIVITY 5-2-1

TITLE:	Thunder Mountain Incident
TIME FRAME:	0:30
MATERIALS NEEDED:	• Incident Response Pocket Guide, NWCG (NFES 1077), 2004 edition, Page 1 • Writing board/pad with markers/erasers
INTRODUCTION:	This activity provides you the opportunity to become familiar with the risk management process.
DIRECTIONS:	1. Read the Thunder Mountain Incident information. 2. In your group, answer the questions for Steps 1-3 of the risk management process. 3. You have 15 minutes to complete this activity. 4. Be prepared to discuss your answers with the class.

THUNDER MOUNTAIN INCIDENT


Division A

Size: 500 acres.

Fuels: Ponderosa pine, grass, slash, and brush.

Exposures: Three structures five miles ahead of the fire.

Terrain: Division A is mostly flat with a few small gullies and ridges. Divisions B and C are located in Roaring River Drainage with steep slopes from river to cliffs at the base of Thunder Mountain on east side of the river. West side has rolling hills on Thunder Mountain plateau.

Access: Road access in Division A is good, with ATVs able to get around most of it. Divisions B and C access is by Roaring River Road and Smith Road intersection. Division D is up Smith Road.

Weather for Today: Temperature 88°F, RH 12%, SE winds @ 12 mph with gusts later in the day, cumulus buildup in the afternoon with a chance of dry lightning.


Divisions B and C


Division D

Hazards and Risks: Snags in Division C; bees in Division D, threatened and endangered species of the deadly "Starback" spider in Division B, power lines in Divisions A and D; air tankers in Division A; helicopter bucket drops southeast side of Roaring River Road; potential for old mineshafts in whole fire area; dusty roads, and drivers have no mountain experience.

Fire Behavior: Early today, in a wind-driven episode, two separate fires burned together to form the Thunder Mountain Incident. Flame lengths of 8 feet were common, ROS observed at 29 chains/hour at one time during a major run. Both of the fires were less than 10 acres at 0130 hours. Expect extreme and erratic fire behavior today and tonight.

Resources: Four Type 1 hand crews and ten Type 3 engines on the fire. Local fire department personnel are involved. The only overhead at this time is a local district Fire Chief as the IC with little experience on a fire of this size and engine captains as the Division Supervisors. At present, two air tankers and three helicopters are working the fire.

Communications: Communications is good on all parts of the fire.

History: The last fire in this area burned 10,000 acres 8 years ago at the same time of year.

Answer the following questions. Record your answers to #7 on the writing board/pad.

Step 1: Situation Awareness

1. Are communications established?

_____

2. Who is in charge?

_____

3. What was the previous fire history?

4. What was the previous fire behavior?

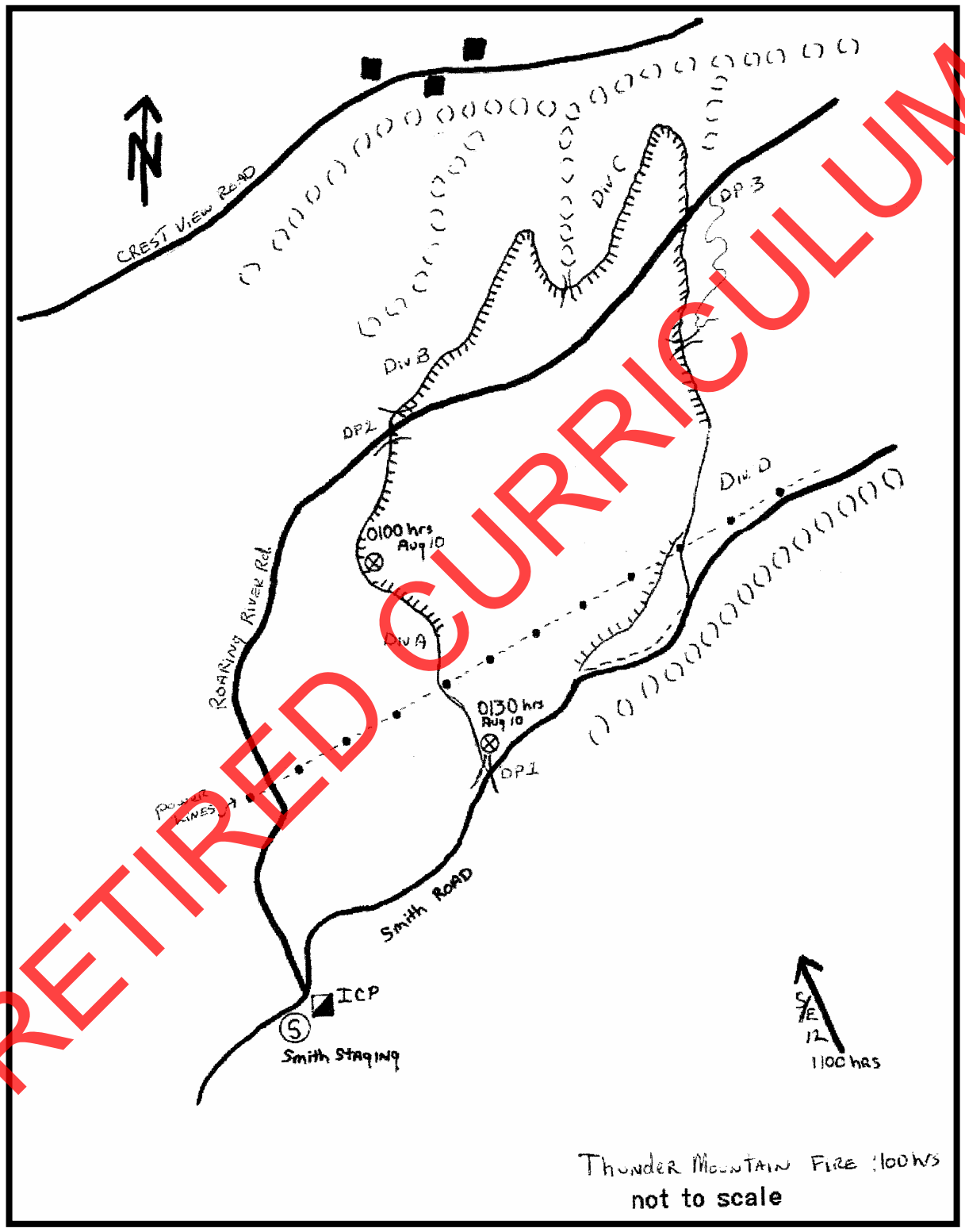
5. What is the weather forecast?

Step 2: Hazard Assessment

6. What are the hazards?

Step 3: Hazard Control

7. Where can changes be made to reduce these hazards? On the writing board/pad, list the hazard and then how it can be mitigated.



Topic 5-3: Entrapment Avoidance

Entrapment avoidance is a decision process not only for engagement/disengagement on the fireground, but to examine the factors that will determine the effectiveness of escape routes and safety zones. Entrapment avoidance does not address last resort survival actions after fire fighters become trapped.

The first objective is to identify trigger points when given a set of fireline conditions to engage in fire fighting activities. The second objective is to define a procedure for recognizing escape routes and safety zones when engaging a fire and a set of fireline conditions, and estimating minimum safety zone sizes. Human factors such as qualifications, training, physical fitness, attitudes, leadership ability, and experience levels can contribute to fireline decision errors when determining the appropriate level of engagement as conditions change.

Skills to Avoid Entrapment

What skills are needed to avoid entrapment? The following is an "ability guide" to help you understand the skills needed to avoid entrapment:

- ❒ Ability to gain good situational awareness
- ❒ Ability to anticipate fire behavior
- ❒ Ability to select effective strategy and tactics
- ❒ Ability to make decisions about when to engage a fire
- ❒ Ability to recognize good safety zones and escape route opportunities

Entrapment Avoidance Decision-making

There are two key decision points for entrapment avoidance: risk decision for engaging a fire and rules of engagement.

Risk Decision for Engaging a Fire

Key points to help avoid entrapment on the fireline:

- ❒ Decide when and where you engage the fire
- ❒ Accepting new assignment and engaging the fire with planned suppression actions
- ❒ Continuing those suppression actions when changes have occurred

Options to consider for a new assignment:

- ❒ Engage fire with a planned assignment
- ❒ Negotiate the assignment
- ❒ Turn down the assignment

Rules Of Engagement

There are certain rules of engagement as part of the fire fighting doctrine. The rules of engagement have been part of fire fighting since 1958. For better or worse, fire fighting has become more complex and so have the rules of engagement.

It is important for you to consider several of these rules when facing the entrapment avoidance process, such as risk management, LCES, the right-to-know, and risk decisions.

Risk Management

The risk management process is a procedural approach to using the rules of engagement. It supports your decision-making on the fireline.

LCES

"Lookouts, Communications, Escape routes, and Safety zones" is one part of the rules of engagement. L, C, E, and S are the key operational actions that are in the Standard Firefighting Orders. LCES is the MINIMUM level of hazard control that MUST be in place before making the decision to engage a fire.

Hazards

The federal Hazard Communication Standard (29 CFR 1910.210) dictates that employees who may be exposed to hazardous chemicals in the workplace have a right to know about the hazards and how to protect themselves. For fire fighting, this can be taken to mean that fire fighters have the right to know the hazardous conditions they may face.

- ❒ What are the hazards?
- ❒ Where do I go to be safe from those hazards?
- ❒ How do I get there?
- ❒ When should I go there?

As the company officer, you have the responsibility to tell your crew about any hazards and how to protect themselves as soon as you know. When possible, relay this information face-to-face.

Risk Decisions for Changing Situations

As a company officer, you have the responsibility to protect your fire fighters from unnecessary risk. I-Zone fires are dynamic as they move and sometimes the risks change as the fire changes. The hazards should be reassessed as the environment changes.

- ❒ Options for a changing situation
  - ✣ Continue full engagement
  - ✣ Hold in place
  - ✣ Change tactics
  - ✣ Disengage and retreat
- ❒ Safety practices to put into place
  - ✣ Lookout observation
  - ✣ Communications
  - ✣ Re-evaluate escape routes and safety zones

Trigger Points

Trigger points help you identify or anticipate an event before it occurs and then initiate a preplanned response. They also help you evaluate the situation and make decisions based on the risk management process.

When there is a change in fire activity such as weather, fuel type, or terrain, as well as human factors such as tactical progress and logistical support, a trigger point is activated to remind us to pay attention to those changes. The following trigger points are critical and quick action on your part is necessary.

Environmental

- ❒ Changes in wind direction
- ❒ Rapidly dropping RH
- ❒ Wind and slope come into alignment
- ❒ Combination RH and wind speed threshold exceeded
- ❒ Fire transitions from surface to torching

Operational Concerns

- ❒ Loss of lookout
- ❒ Loss of communication
- ❒ Escape time increases
- ❒ Failure to meet performance standards
- ❒ Air support diverted
- ❒ Resources diverted
- ❒ Excessive fatigue

Trigger points will vary by geographic area and fuel type. You should determine trigger points when potential exists for the fire situation to degrade. Ensure that your situation awareness includes monitoring factors that relate to the trigger points that you have set. Have a planned response in place for your actions when a trigger point is hit. Do not ignore a trigger point that has been hit.

Remember, as a company officer you have the responsibility to communicate a clear change in orders to your fire fighters, account for all your fire fighters, ensure your fire fighters change engagement as planned, and communicate the information to adjacent resources and up the chain of command.

The company officer should also ensure that an experienced fire fighter with a portable radio is the last person out during a retreat. In most cases, this will probably be you. The last thing the company officer should do is reassess the situation and rebrief before reengaging the fire.

Topic 5-4: Last Resort Survival

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Chapter 1 and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 20 and 21.

Last resort means, last resort. Your options may be limited, but act on all of them and immediately act on the best one! Use all the personal protective equipment you have, but especially protect your airway.

Escape if You Can

- ❒ Drop any gear not needed for fire shelter deployment
- ❒ Keep your fire shelter, hand tool, quart of water, and radio
- ❒ You may be able to use the fire shelter for a heat shield as you move
- ❒ In light fuels, go into the burned area
- ❒ If you are on the flank of the fire, try to get below the fire
- ❒ Consider vehicle or helicopters for escape

Find a Survivable Area

- ❒ Stay out of hazardous terrain features
- ❒ Use bodies of water that are more than two feet deep
- ❒ In light fuels, you may be able to light an escape fire
- ❒ In other fuels, you may be able to light a backfire
- ❒ Call for helicopter or retardant drops
- ❒ Cut and scatter fuels if there is time
- ❒ Use any available heat barriers
  - ✣ Vehicles
  - ✣ Structures
  - ✣ Large rocks
  - ✣ Dozer berms
- ❒ Consider vehicle traffic hazards on roads

Fire Shelters

Deployment Site

- ❒ Find the lowest point available
- ❒ Maximize distance from nearest aerial fuels or heavy fuels
- ❒ Pick a surface that allows the shelter to seal
- ❒ Remove ground fuels
- ❒ Get into the fire shelter before the flame front hits
- ❒ Position your face pressed to the ground
- ❒ Deploy next to each other
- ❒ Keep talking

Expect

- ❒ Extreme heavy ember showers
- ❒ Superheated air blasts to hit before the flame front hits
- ❒ Noise and turbulent powerful winds hitting the fire shelter
- ❒ Pinholes in the fire shelter that allow fire glow inside
- ❒ Heat inside the shelter equals extreme heat outside
- ❒ Diminished radio function inside the shelter
  - ✣ See the following Orange County Safety Bulletin
- ❒ Deployments have lasted up to 90 minutes
- ❒ When in doubt, wait it out

How Long To Stay Inside Your Shelter

- ❒ Once you commit, stay there
  - ✣ No matter how hot it gets inside, it is worse outside
- ❒ No fixed time
- ❒ Indicators
  - ✣ Drop in noise
  - ✣ Reduced winds
  - ✣ Less heat
  - ✣ Change in color
- ❒ Do not leave until instructed by your supervisor

ORANGE COUNTY FIRE AUTHORITY
SAFETY BULLETIN

Safety Advisory

800MHz Radio and Fire Shelter Use

The following is an important change in procedures when deploying your fire shelter and using the 800 MHz Radio. ***This concern only addresses the "800 MHz Radio" and is not applicable to the Bendix King pack set or the NIFC cache radios.***

It has come to our attention that the 800 MHz radio signal will not penetrate the material of the fire shelter. The material of the shelter won't let you transmit to the outside of the shelter or receive massages while inside the shelter. In effect, the material of the shelter blocks all 800 MHz radio waves. The radio waves will "bounce around" inside the shelter. All tactical frequencies are subject to this problem. When you enter the shelter your 800 MHz will give you a "Out of Range" messages. The Talk-a-Round channels do work but for an extremely limited distance and line of sight only which will be of little or no assistance. Further more, this "bouncing waves" can cause harm (burn) to the retina of your eyes by keeping the signal inside the shelter. Additionally, this "bounce effect" can damage the transmitter function of the radio rendering it inoperable. You are directed to take the following actions when fire shelter deployment is imminent!

- Notify your immediate supervisor of the situation and your position and plan.
- Notify your supervisor when you have reached your safety zone.
- Report your deployment position to your immediate supervisor, number of personnel deploying, prepare the ground, and order deployment.
- Ensure all personnel are sheltered and make a final check of the area for employees in distress or in need of assistance.
- Announce to your immediate supervisor that you are sheltering and that this will be your last transmission until the danger has passed. Don't attempt to use the 800 MHz Radio while inside the fire shelters.

Topic 5-5: Properly Refusing Risk

Student information for this topic can also be found in Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 18-19.

Every individual has the right and obligation to report safety issues and express any concerns regarding their safety. Supervisors are expected to give these issues and concerns serious consideration. When an individual thinks an assignment is unsafe, he or she is obligated to identify, to the degree possible, safe alternatives for completing that assignment. Turning down the assignment is one possible outcome of managing risk.

Turndown

A "turndown" is a situation where an individual has determined he or she cannot undertake an assignment as given and is unable to agree on an alternate solution. Every effort must be made to negotiate a safe alternative by all parties involved. Turning down an assignment must be based on an assessment of risks and the ability of the individual or organization to control those risks. Individuals may turndown an assignment as unsafe when:

❶ Violation of safe working practices.

a. If you are fighting an I-Zone fire, structure fire, or wildland fire, you should have a lookout that can see the operation and report any changes that may be a risk to the fire fighters. If you are given an assignment and you do not have a lookout, you would be in an unsafe situation and have the right to turndown the assignment.

b. If you are fighting an I-Zone fire without established escape routes before engagement then you have the right to turndown the assignment until you have a safe alternative or an escape route has been established.

c. If you are assigned to protect structures in an area without turnarounds or wide enough roads to navigate or you are in an area where you may be overrun by fire before getting to that structure, then you have a right to turndown that assignment until you have an alternative solution.

d. If you are assigned to protect structures near live power lines that are down and you think that you cannot protect those structures without the risk of injury, then you have a right to turndown the assignment.

❷ Environmental conditions make the work unsafe.

a. If you are assigned to protect structures in an area where extreme fire behavior exists, a large flame front is approaching your location at a rapid rate, and long-range spotting is occurring, you may believe that the fire behavior is too extreme to safely operate. You have the right to

turndown that assignment until fire conditions change or you have negotiated an alternate solution.

b. If you are assigned to an area where smoke conditions would make it unsafe to drive to your assignment, then you may turndown the assignment until the conditions change or an alternate route is established.

c. If you are assigned to an area where lightning is still active and you believe it is unsafe to operate, you have the right to turndown the assignment until the storm passes or an alternate solution is established.

d. If are operating in an area with strong winds and you think the wind conditions could make it unsafe to operate then you may turndown the assignment.

❸ Lack of the necessary qualifications or experience.

a. If you are assigned to burnout around a structure or to use fire to fight fire and have not been trained or you believe that you do not have the experience to conduct the firing operation, then you have the right to turndown that assignment.

b. If you are assigned as a structure group supervisor without the experience or training for that position, you have a right to turndown that assignment

c. If you are assigned to fall a tree without receiving the proper training or you do not think that it is safe to fall that tree, you have the right to turndown that assignment.

d. If you are assigned to cut fireline downhill below a structure and you have never cut line before without supervision, you have the right to turndown that assignment if you believe it to be unsafe.

❹ Defective equipment is being used.

a. You have a right to turndown an assignment if you are assigned to mobile attack and your pump is not working correctly.

b. You have the right to turndown an assignment if you are told to go into a burning building and your SCBA is out of air.

c. You have a right to turndown an assignment if you are assigned to a four-wheel drive route and you cannot engage the front axle.

d. If you are assigned to an active portion of the fire and your fire shelter has been damaged and you believe it to be unsafe to use, then you have the right to turndown the assignment.

The individual will directly inform the supervisor that he or she is turning down the assignment as given. The most appropriate means to document the turndown is using the criteria outlined in the Risk Management Process.

The supervisor will notify the Safety Officer immediately upon being informed of the turndown. If there is no Safety Officer, notification shall go to the appropriate Section Chief or to the Incident

Commander. This provides accountability for decisions and initiates communication of safety concerns within the incident organization.

If the supervisor asks another resource to perform the assignment, the supervisor is responsible for informing the new resource that the assignment has been turned down and the reason(s).

These actions do not stop an operation from being carried out. This protocol is integral to the effective management of risk as it provides timely identification of hazards to the chain of command, raises risk awareness for both leaders and subordinates, and promotes accountability.

SAFENET

Frontline fire fighters have another tool that provides a way to be heard and resolve unsafe situations. That tool is SAFENET and it provides a method for fire fighters to report safety concerns they find during an incident. The development of SAFENET was recommended in Phase III of the Wildland Firefighter Safety Awareness Study and originally intended for wildland fire operations. The form is available for use on any incident, however, from wildland fires, urban interface fires, prescribed fires, or all-risk operations. The information provided on the form will also help collect important, safety-related data at the National Interagency Fire Center to determine long-term trends and problem areas.

Here are some facts about SAFENET and how it works:

- ❒ Anyone can fill out a SAFENET, at anytime, to report a valid concern about unsafe situations
- ❒ SAFENETS should be submitted to your supervisor, whose responsibility it is to resolve the situation as quickly as possible
  - ✣ SAFENETS may also be submitted directly to the National Interagency Fire Center
  - ✣ SAFENETS may be submitted via the Internet or by telephone
- ❒ SAFENET forms can be ordered through the cache system
- ❒ You do not have to identify yourself on a SAFENET; you can submit it anonymously
  - ✣ All SAFENETS have the names removed before posting to the web
  - ✣ If you do sign your name, however, confidentiality cannot be guaranteed
- ❒ There is no punishment or penalty for filing a SAFENET
- ❒ SAFENETS are not mandatory

SAFENET is not the only way to correct a safety-related concern, and it does not replace accident reporting or any other valid agency reporting method. It is simply an easy, quick way to report a safety concern. It is also a way for frontline fire fighters to be involved in the daily job of being safe and keeping others safe by documenting and helping to resolve safety issues.

To reach SAFENET on the internet, go to **http://safenet.nifc.gov/**

Topic 5-6: Fire Fighter Fatality and Near-miss Case Studies

Every case study of fire fighter fatalities and near-miss incidents during a wildland/urban interface fire will be unique and have its own history. However, several common denominators will surface from each case study.

As discussed earlier, each tragic event will usually be a result of a combination of smaller, less important mistakes that lead up to the disaster. The important issue is to learn from those mistakes so they can be predicted and avoided in the future.

By using the Fire Fighter Fatality and Near-miss Investigation Element Matrix found in Activity 5-6-1, a common denominator between these case studies can be developed. Each incident can be viewed by the use of the "process of elimination" that is used in most investigations.

Measured By Significance

The factors that contribute to a disaster can be measured by their significance such as, "How significantly did they contribute?" or "How significant was their influence?"

When looking at the matrix, there will be a subject to investigate under the category "Involved Personnel Profiles." If the personnel involved in the incident had very little training and that caused injury to a fire fighter, the category checked to the right would be "Significant Contribution." However, if the individual was well trained and the injury was not contributed to the lack of training, the category checked on the matrix would be "Did Not Contribute."

Your instructor will give a presentation on the Thirtymile Fire that occurred in July of 2001 in the Okanogan National Forest. This fire resulted in four fire fighter fatalities and serious injuries to numerous others. These deaths and injuries resulted from the entrapment of 14 fire fighters and 2 civilians, and their subsequent deployment of 14 fire shelters.

The investigation identified several interconnected probable causes that were addressed by the U.S. Forest Service. Understanding the probable causes and taking all possible actions to prevent similar happenings in the future was critical for not only the forest service, but also for other federal, state, and local government fire suppression organizations who must learn from these unfortunate and tragic happenings.

The lessons learned because of the fatalities and near-miss fires are more about what was not done than what should have been done. There are many opportunities to prevent these disasters. The most common denominators in all of theses cases are failure to recognize a rapidly deteriorating fire situation, placement of fire fighters in a vulnerable position, lack of communication about critical information, leadership's ineffective control and command of operations, and finally, and most critically, the failure to adhere to safety procedures and standard fire fighting orders. While studying the cases regarding fatalities and near-miss fires, keep in mind these common denominators.

GROUP ACTIVITY 5-6-1

TITLE:	Fire Fighter Fatality And Near-miss Presentations
TIME FRAME:	3:00
MATERIALS NEEDED:	• Fire investigation report (found in Appendix A) • Fire Fatality and Near-miss Investigation Element Matrix • Writing board/pad with markers/erasers • Pen or pencil
INTRODUCTION:	By studying fire fighter fatality and near-miss reports, we can better understand why these tragic events occur. We hope that we can learn from these investigation reports and prevent further injuries and loss of life. This activity will provide you an opportunity to become familiar with these events.
DIRECTIONS:	1. Read your assigned fire fighter fatality or near-miss investigation report. 2. Check the appropriate boxes on the Fire Fighter Fatality and Near-miss Investigation Matrix. 3. Develop a presentation that includes a summary of the fire and your findings. 4. Sketch a map of your fire on the writing board/pad. 5. You have 45 minutes to develop the presentation. 6. Designate a spokesperson and be prepared to give a 15-minute presentation of your findings to the class.

FIRE FATALITY AND NEAR-MISS INVESTIGATION ELEMENT MATRIX

Name of Fire:			
Fire Behavior	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Fuels			
Weather			
Topography			
Predicted vs. Observed			
Environment	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Smoke			
Temperature			
Visibility			
Slope			
Other			
Control Mechanisms	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Span of control			
Communications			
Ongoing evaluation			
Firefighting orders			
Watch outs			
LCES			
Downhill guidelines			

Involved Personnel Profiles	Did Not Contribute	Influenced	Significant Contribution
Training, qualifications, and physical fitness			
Operational period, fatigue			
Attitudes			
Leadership			
Experience levels			
Equipment	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Available			
Performance/nonperformance			
Clothing and equipment			
Used for intended purpose			
Incident Management	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Incident objectives			
Strategy			
Tactics			
Safety briefings			
Major concerns addressed			
Instructions given			

Topic 6-1: Pre-incident Operations

Student information for this topic can also be found in Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Chapter 6, ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapters 1, 11, and 12, and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 1-30 and 39-78.

Tactical operations in the I-Zone require the knowledge and skills used in both wildland fire fighting and structure fire fighting. It takes a careful blend of both disciplines so that safe and efficient structure protection can be employed while still being effective in the suppression of the wildland fire. The knowledge of I-Zone tactical operations is important for the protection of the structures and for the safety of suppression crews. Although you will be involved in both structure protection and wildland fire perimeter control, structure protection is your priority. You will, however, be responsible to handle any slop-overs, spot fires, or other incident objectives that come your way. Always remember you are still in a wildland fire environment.

Engine Preparation

Preparing your vehicle to minimize damage and maximize safety begins long before the incident starts. Walk around the apparatus and visualize where you will have your protection and attack lines. Your protection line is usually 1½", should be long enough to go around your apparatus, and used primarily for engine and crew safety. The protection line is charged and secured to the engine for easy access in case of an emergency.

The attack lines are used for extinguishing the fire perimeter and protecting any structures. Two lines will usually be long enough to reach around both sides of the structure and cover the roof area. The shut-off at the engine allows you to disconnect the hose quickly in case there is the need for rapid disengagement. All hoselines intended for use should be charged, secured, ready for quick deployment, and redeployment.

Departments may use different types of equipment to store wildland fire hose and can vary from backpacks, backboards, and webbing (Velcro, clips, and parachute cord). All are functional and which type you use really depends on personal preference. Experiment and see what works best for you and your apparatus.

Upon arrival at the incident, remember to close the windows and doors upon exiting the apparatus. Because of poor visibility due to smoke and fire, it is best to leave your emergency and headlights on. Safely store your personal bag and chainsaw fuel or any other flammable items to prevent hot embers from igniting them. It is also imperative to have an air intake filter that will not allow hot embers to enter your engine. Inspect your apparatus to eliminate any hazards long before you get an I-Zone call.

Personal Protective Equipment

Each department has its own policy and procedures for personal protective equipment. You are obligated to comply with your department's policy and procedures, but you should also realize that when you are in another department's jurisdiction you should comply with their requirements as well. If you do not have the gear the jurisdiction requires, you will need to secure it prior to assignment.

On urban interface fires, which PPE is appropriate? For performing an interior attack, structure PPE and SCBA is necessary. For wildland fires and structure protection, wildland PPE works fine. Some, but not all, of the gear recommended for a wildland fire fighter include a fire shelter, water, goggles, Nomex pants and jacket, helmet/Nomex shroud, wildland boots (laced, no steel, lug sole, minimum 8" leather), and leather gloves. This equipment changes from department to department, but the bottom line is to not participate in any activity for which you do not have the proper safety gear.

No one answer is correct for every situation. Limit your activity to the level of protection you have. Remember always wear ALL your safety gear. Fire fighter safety and survival is the number one priority.

Figure 6-1-1: Wildland PPE

Specialized Equipment

Some of the specialized equipment that could be used on an I-Zone fire includes foam application devices, thermal imaging, chainsaws, firing equipment, and portable pumps. Advise your supervisor of any specialized equipment or personnel certifications (USAR, paramedic, etc.) you have during your initial briefing. Find out what type of specialized equipment is available to you from your adjoining resources. Some other useful equipment you will want to have include a belt weather kit, GPS unit, compass, maps of the area, and electronic weather devices.

Documentation

You will have the usual forms for vehicle accidents, ICS, vehicle inventory, medical response reports, financial documents, phone lists, emergency crew information, etc. on your apparatus, but you should consider having I-Zone checklists and reference documents. Information will be available in the Fireline Handbook, Field Operations Guide, Incident Response Pocket Guide, and other reference material that you take with you on incidents. Start a Unit Log as soon as the incident moves beyond an initial attack assignment or upon a major fire assignment.

A small cache of office supplies, such as heavy-duty markers, paper, stapler and staples, paper clips, scissors, and tape are useful under a variety of circumstances.

Pre-incident Training

Pre-incident training is important to check system effectiveness and increase efficiency. Develop I-Zone drills for your engine company and work with other agencies to resolve problems before the call.

Public Relations

Seldom will the need for effective public relations be greater than before, during, and after an I-Zone fire. Practicing proactive public relations is the fire fighter's responsibility in maintaining a positive image of the fire service. There are many ways to leave a good impression. The first step is a mindset. As a fire fighter, consider the property you are protecting is your own; remember that everything has value to someone. By performing tasks such as salvage and protecting resident's valued possessions, you will be leaving a positive, lasting impression.

Fire fighting crews should maintain a high visibility with residents during and after the fire. Residents want to see a fire engine at their property or patrolling the area.

Residents threatened by wildfire will be experiencing a great variety of emotions -- fear, apprehension, anger, etc. Some of these emotions will be directed toward the fire fighters. As a company officer, you will be required to control your emotions while trying to maintain control of your own situation. So, expect panicked residents and remember your mission.

Be prepared for a multitude of questions from residents that do not understand the overall incident objectives or fire fighting operations. You may also be in an area with no Public Information Officer (PIO) present. The company officer should deal with questions professionally and concisely.

Fire Prevention

Work with residents to make your community fire safe. Convey fire prevention messages and stress the importance for defensible space, building construction, and any other hazards that will make defending the structures in your initial response area less difficult.

Media Relations

Nothing brings out the media faster than a disaster. Expect large numbers of media representatives wandering around the incident. The media has the right to obtain information and footage for a story, but you have the right to limit their access if they are violating a crime scene, on private property, or

interfering with you and your crew. By preparing, communicating, and interacting with them, the fire service will maintain a professional relationship and relating a positive image of the fire fighting effort to the public.

With a significant incident, you should request a Public Information Officer. If a PIO is unavailable, be courteous and professional. Listen to their questions carefully and organize your thoughts before answering. Keep your answers concise, but brief. Never provide undocumented information or speak for another agency. Refer those questions to the jurisdictional agency. Avoid speculating or giving names of fatalities or those injured.

The proper establishment of a media area and timely briefings by a PIO will provide a good working relationship with media and allow them to get the necessary information. Having business cards to hand out to the media and residents, or leave at different locations so individuals can call with questions will go a long way to help with public relations. In addition, collect telephone numbers so you can get back in touch with people you might have follow-up questions.

Engine Company Conduct

- ❒ Do not treat the assignment like it was a vacation
  - A. Your actions are a reflection of your organization
  - B. Limit recreation to out-of-service hours
- ❒ Know who you are working for
- ❒ Maintain a state of readiness when not assigned
  - C. You can be re-activated at any time
- ❒ Limit procurement of equipment to what is needed
  - D. All equipment must be returned before demobilization

From "Wildland Firefighter," February 1999

COURT DOCUMENTS REVEAL POTENTIAL SCOPE OF FIRE EQUIPMENT THEFTS

A Washington State fire department outfitting a dozen or more fire trucks with equipment stolen from the U.S. Forest Service, taking some of the equipment while on duty in Yellowstone National Park during the 1988 fires, court documents allege. The U.S. attorney's office in Spokane said Wednesday, January 20, it will be months before an ongoing investigation is concluded and it decides whether criminal charges are filed against the district or its employees.

Seized items include 7,200 feet of fire hose, tarpaulins, portable water tanks and assorted pairs of Nomex pants and shirts. Many items had U.S. Forest Service or other federal agency markings obscured.

- ❒ Maintain and wear all appropriate personal protective equipment
- ❒ Use normal radio procedures

E. Be professional

- ❒ Do not enter any residence without the owner's permission except to fight a fire in that structure or seek refuge

F. Respect the property of the residents you are protecting

- ❒ Do not transport or consume drugs or alcohol

> Firehouse.com 10-10-2003
>
> **FIREFIGHTERS' VAN DRIVER ALLEGEDLY DRUNK IN OREGON FATAL CRASH**
>
> VALE, Ore. (AP) -- A firefighter driving a van with seven colleagues had a blood alcohol content over the legal limit when they were all killed in a collision Aug. 24, according to court papers filed Thursday.
>
> The crew bus driver had a blood alcohol content of 0.13 percent, records said. Oregon's legal driving limit is 0.08.
>
> The prosecutor filed several charges, including reckless endangerment, against the company that employed the firefighters, alleging supervisors knew that large amounts of alcohol were being purchased but did not intervene.

Engine Use

- ❒ **Do not** empty the engine's water tank in order to respond faster

G. Keep at least 100 gallons

Working with and Around Inmate Hand Crews

Inmate hand crews work in an extremely structured system. Any communication must be made through their supervisor. Do not visit, converse, or share messages and exchanges with inmate hand crews at any time.

Response Attitude

Your attitude on an incident can reflect directly on the department you are representing. It is not us versus them, it is we the California fire service. Send mutual aid in the same manner you expect to receive it. Attitude is everything.

Safety Before and During Response

There are more rules regarding safety and slogans for fire fighting safety than can be listed here. There are wildland as well as structural safety hints. Unit 5 is dedicated to I-Zone fire fighting safety. Below are a few of those safety items related to response.

- ❒ Hydration
  - H. Do not wait for arrival at an incident to begin hydration; hydrate before and during response
  - I. Disposal of empty water bottles can be a hazard; keep them packaged or in a safe location
    1. Empty bottles rolling around the cab of an engine contributed to a grave injury to a fire apparatus operator in the Calabasas Fire in Los Angeles County as the bottle rolled under the brake peddle at the wrong time
- ❒ Seat belts
  - J. The importance cannot be stressed too much here. A number of fire fighters are killed each year on the highways due to lack of seat belt use. It is the number one killer of water tender drivers. Buckle up!
- ❒ Avoid excessive speed
  - K. Frequent braking can cause brake fade
  - L. Watch downhill speeds
  - M. Have brakes adjusted on a regular basis
  - N. Slower engines in a team usually lead the team keeping them together
- ❒ Watch for driver fatigue when traveling great distances or after long work schedules
  - O. Schedule frequent breaks
  - P. Rotate drivers
- ❒ Secure equipment before traveling
  - Q. Travel bags
  - R. Extra gear for long stays out of the area
  - S. Hose beds and tools secured for long travel
    2. During a response to a large fire in Southern California, an engine from Northern California lost a load of hose in the road killing a motorist following the unit
- ❒ Watch gauges carefully
  - T. It is common for engines used only for short trips around their first-in area to overheat on long trips
  - U. Keep an eye on the air pressure in the brake system
  - V. Get fuel before it gets to far down where a fuel stop may be out of range
  - W. Top off fuel tanks whenever possible

Topic 6-2: I-Zone Incident Operations

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Chapter 6, ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapters 11 and 12, and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Pages 1-20, 68-93, and back cover.

Engine Response

Driving to and arriving at the incident is dangerous. Remember most accidents occur at intersections with speed as a major contributor. Drive safe! While entering an area, make sure you are ready to fight fire and protect structures. Setup protection and attack lines, start the auxiliary pump, if you have one, and be fire ready with PPE and any other setup scenarios. After you arrive at the incident and lose visibility due to heavy smoke, you will need to stop and wait for the smoke to clear or use a scout before proceeding. The scout should utilize a flashlight and portable radio. If you feel it is unsafe to let someone off the apparatus, you will need to park in a safe area and wait for the smoke to clear or leave the area and find another access to the incident. Do not assume down power lines, animals, or other vehicles and personnel are not ahead of your apparatus. Be especially aware of evacuees driving erratically. With extreme visual restrictions, you are in an unsafe environment and should leave the area. Identify safety zones, escape routes, travel distances, travel times, landmarks, bridge load limits, poor access, narrow one-way roads with no turnarounds, structure addresses with narrow/winding driveways, and start documenting the information.

Share this information when you meet your supervisor and adjoining resources. You will want to look at the big picture and get an overall view of the incident, imminent threat, and potential. Start documenting your fire history. Utilize the ICS 214 Unit Log and ICS 201 Incident Briefing forms. Whenever you make any notations include the time. Try to get oriented to the area as quickly as possible. Base your actions on current and predicted fire behavior.

Engine Placement

The first rule in structure protection is to stay loose, be flexible, and stay mobile. You want to maneuver in front of and behind the main head of the fire, similar to a surfer riding a wave. This is commonly referred to as "bump and run" or "pump and run" -- hitting the hot spots as the fire progresses. If there is no organized incident command in place, you will need to take independent action until a formal command structure is in place. Do not freelance or be subordinate however. Follow your department's standard operating procedures and establish ICS as soon as possible.

It is also a good idea to turn around and look back every once in awhile to make sure the fire was completely suppressed on the structures you worked on earlier. Sometimes, the fire will smolder and start up again shortly after you have left the scene.

When you arrive at a residence, make sure you back the apparatus in. This will allow quick disengagement under demanding circumstances. Pick the clearest spot on level ground away from the

heat source. Utilize the structure or any other barrier for protection. Anticipate which direction the fire will come from and where the flame impingement will occur. In some cases, you will not have any choice where you park and you should take all of these items into consideration in spotting your apparatus. Do not block roadways, driveways, or any other means of moving vehicles into or out of the area. Pull off to the side whenever you need to stop for any period of time. Once you stop, utilize your chock blocks. You will need to set up a system of deploying and picking up the chock blocks so there is no breakdown of communication. Always look for hazards, then flag, document, and share this information with everyone. Some, but not all, of the hazards you should be aware of include:

Figure 6-2-1: Engine Placement

- ❒ Power lines
- ❒ Propane tanks
  - X. Underground tanks are becoming common in many areas of California
- ❒ Septic tanks and old wells
- ❒ Trees
- ❒ Flammables
- ❒ Pesticides

Orientation on Arrival

It is important that personnel initiate a general familiarization of the assigned area as soon as possible. Determine cardinal directions and prominent landmarks. If you have a GPS unit, take some coordinates and document the information on a map of the area. This will become very important if you need air support, helicopter water drops for personnel safety, structure protection or a quick exit under adverse conditions of smoke and fire. Survey the road network for tactical positions and likely safety zones and escape routes. Document your driving time to set trigger points and disengagement time frames. Ascertain the predicted fire behavior and fire weather forecast to formulate the potential and what actions you will be able to accomplish in the time frames available. Locate and determine water sources and capabilities. Contact your supervisor for a briefing and get the specifics of your assignment. Some, but not all, of the information you need from your supervisor includes:

- ❒ Your assignment, directives, and contingency plans
- ❒ Resources available to you and your adjacent resources
- ❒ Communication frequencies and medical plan
- ❒ A meeting place to account for your personnel should a trigger point be activated
- ❒ Identification of any known hazards and risks

  Y. Share this information with adjoining resources

- ❒ Establish LCES (mandatory minimum standard)
- ❒ Initiate the risk management process

Safety During Structure Protection

Strategic determinations must be based upon Firefighting Order #3, "Base all actions on current and expected behavior of the fire." Implement LCES and start the risk management process. Determine life safety for assigned personnel and residents.

Crew Safety Plan

Brief your crew as soon as you have completed your size-up and developed a safety plan. This will motivate your personnel by allowing them to discuss and understand the plan. Remember, you want to be the first person to know when you are not meeting your objectives or there is a safety issue. LCES is the minimum standard and the lookout has the primary responsibility but it is everyone's duty to lookout for each other. Communications should be assigned and tested. Escape routes should be identified and made known to all personnel. The structure would be a primary safety zone with the engine as a secondary safety zone. Remember do not have any predetermined decisions because you should evaluate every situation and take the appropriate action as it is occurring. While you move from site to site, re-evaluation of LCES will need updating. Rebriefing will occur as necessary. Accountability of your personnel is an on-going process and you should know where everyone is located at all times. Along with LCES you will have safety zones designated so if you need to retreat during an overrun or blow-up condition you have a meeting site where you can account for all your personnel and will be able to regroup. Establish a call back signal and make sure all personnel know it. You can also use the PA for tactical or safety concerns.

Utilizing a Structure as a Refuge

There are three allowances for entering a structure you are protecting. First, the Strike Team/Task Force Leader has received permission from the property owner. The owner's contact information and permission must be documented on the ICS 214. Second, if the structure is in imminent danger from an approaching fire and entry is warranted to conduct appropriate protective measures such as closing the windows, removing flammable curtains, closing doors, etc. Third, if the crew must take refuge inside to retreat from the fire.

Spot the apparatus to the safest area on the protected side of the structure. Maintain control and account for all personnel. Remember the structure will burn slower than the passing fire. Go into the structure taking a portable radio, PPE, SCBA, and web gear with you.

Anytime you take refuge, be it in a fire shelter, vehicle, or structure, always notify your supervisor immediately, advising of your location and any assistance needed. The only time you should enter a structure is to take refuge or mitigating interior hazards. All personnel that enter a structure will treat the property with due respect and conduct themselves in a professional manner. Notify your supervisor and document the entry and departure time and the reason for entry. Leave a note or business card explaining the need for entry and a phone number so the residents can contact you with any questions.

Utilizing an Engine as a Refuge

Keep the pump and engine running, although the engine may fail due to lack of oxygen. Have a 1½" protection line deployed and ready. Do not take the protection line inside the cab. Get into the cab with your portable radio, full PPE, SCBA and web gear. Deploy the fire shelter on the windows to reflect the radiant heat. Stay inside the cab until you are sure it is safe to leave the cab. Upon leaving the apparatus, check the engine for damage and suppress any fire. Determine whether to stay or move on. Update your supervisor and document the incident.

Initial Size-up Considerations

A complete assessment of the structures identifying their vulnerability to the approaching fire and how many structures are in your assigned area. You will need to determine the potential and order additional resources as soon as possible. Some of the considerations would be the location of the structure relative to predicted fire behavior, fuels, and topography.

Fire Behavior

Would an offensive, defensive, or combination attack be best? Visualize how the fire will progress when it reaches the structure and be prepared to hit the hot spots. Identify where the fire will hit the hardest, heat will transfer, and direct flame contact will occur. Fuel and topography will dictate whether radiant heat, convected heat, and airborne firebrands will be a consideration.

Fuels

Assess fuels for possible fire behavior characteristics and direction of travel. Light flashy fuels will increase the possibility of spotting above or below you. Fire runs will be short and rapid creating a shorter crew commitment time. Heavier fuels will generate intense heat, have longer exposure and longer crew commitment times.

Topography

Topography will also play a significant role in affecting fire behavior. Percentage of slope and aspect should be considered with emphasis on chutes, chimneys, and steep slopes. Traditionally, this is where fire fighters will see increased fire activity and a higher degree of risk.

Structure Configuration

The structure characteristics will greatly affect your plan. Whether it is constructed of flammable materials, fire resistive materials, or a combination of both types of construction. Some things you will also need to look at are openings where heat or embers can enter and may ignite the structure. Roof and eaves construction will be a major consideration. Improvements such as decks, sheds, fences, and other improvements will be assessed for vulnerability and possible removal to minimize continuity of fuel. Woodpiles, cars, boats, and trailers should also be looked at for possible movement before the fire arrives. Sheds should be inspected for hazardous materials or anything else that could be a threat to fire fighters. Defensible space will be evaluated for structure and fire fighter protection. Document all considerations, set your priorities, and determine the amount of time that is available to eliminate as many hazards as you can before the fire arrives.

Resource Request

Contact your supervisor for personnel and equipment requests as soon as possible allowing for reflex time. Remember, fire fighter safety is our number one priority.

Evacuation

Life safety is always our top priority and will be considered when recommending an evacuation. Evacuations involve everyone on the fire and must be coordinated between all agencies and the public. It is a very stressful time for residents and every effort should be made to provide for their safety and comfort. Meeting the goal and objectives of the Incident Action Plan also needs to be considered.

Some questions you need to ask yourself are:

- ❒ Is evacuation necessary?
- ❒ Can a safe evacuation be executed?
- ❒ Who will carry out the decision to evacuate?
- ❒ What will happen to the people that are evacuated?
- ❒ How will you organize your incident to include evacuation?

Public Information

Residents should be advised of the current situation, potential hazards, and any life-threatening hazards. This information must be conveyed honestly and in terms that residents will understand. It cannot be overemphasized to the residents that they should "Go while it is safe."

If there is a possibility for a mandatory evacuation in the future, residents should be advised so they have some time to prepare. Alternative considerations must be given for travel routes, safe locations, and evacuation centers. Coordination with on-scene law enforcement, emergency services, and support personnel is important for a successful operation. Law enforcement has the primary responsibility for evacuation, but the fire service should assist to provide protection for the residents as they leave.

Press Release

To help with media demands for information, a press release about any evacuation will be developed and released by the Information Officer. However, the company officer is routinely asked to provide information before an official press release can be distributed. Information you will be asked about is:

- ❒ Who is to be evacuated?
- ❒ What routes are going to be used?
- ❒ What roads will be closed and for how long?
- ❒ Where to go?
- ❒ When to go?
- ❒ What is the proper clothing to wear?
- ❒ What hazards might be expected?

Explain how dangerous the environment is with poor visibility, blocked access, emergency vehicle travel, and fire fighters working on or near the roadway. Emphasize to residents "to go while it is safe."

Evacuation Destinations

Shelter-in-Place

Shelter-in-place should be considered for a low intensity fire where structures have good clearance, made of fire resistant materials, and the fire department feels it is safe to stay.

Public Safe Area

Public safe areas are temporary holding areas for smaller groups of people that provide a safe haven until shelter locations can be established. They should provide the necessities to accommodate the residents for a short period of time. Rather than moving a large group of people a long distance for an extended period, consider moving them to a safe area for a short period and then allow them to return to their property when it is safe. Remember, they are the best people to look after their property. If you are unable to allow them to return home, move them to a shelter for better logistical needs and support.

Shelters

The American Red Cross is the one agency required to establish shelters for the immediate, short-term housing and care of evacuated residents. Other agencies may very well assist with this process. County animal control or other similar agencies may provide transportation and temporary housing for pets and farm animals.

Whenever people are evacuated from their home and sheltered for a considerable amount of time, the following concerns must be addressed:

- ❒ Who will secure their property?
- ❒ Who will keep evacuees informed of what is happening?
- ❒ Who will get family members back together?
- ❒ What will happen to people that cannot drive or are bedridden?

You will want to talk to the local residents to gather some of this information. Their input will help in the process and make it more efficient and successful.

Legal Authority

We know that law enforcement has the responsibility for evacuation. However, questions persist about who has the legal authority to evacuate and news media access. California Penal Code 409.5 lists who has authority for evacuation and media access statutes. We will always be subject to different interpretations of the law and how they apply. We need to know the law and how it applies to fire fighters, law enforcement, and the public.

Penal Code 409.5

409.5(a) Gives certain Peace Officers the authority to close an area of a disaster by means of ropes, markers, or guards to all persons not authorized to enter or remain within the closed area.

409.5(b) Gives certain Peace Officers the authority to close the area around a command post.

409.5(c) Makes it a misdemeanor for an unauthorized person to willfully and knowingly remain within an area as (a) or (b) above after receiving notice to evacuate or leave the area.

409.5(d) Nothing in this section shall prevent a duly authorized representative of any news service from entering the closed areas.

If a dangerous condition exists and the media insists on entering the area, you have an obligation to warn them of the danger and try to provide any PPE to assist them. However, you will not be able to restrict their entry into the dangerous area. You can stop the media or get law enforcement assistance if you feel an area is a crime scene or you determine the media is interfering with your ability to do your job. The media can be very good with getting information out to the public if used in a positive manner.

Allowing People Back

Residents should be allowed back to their homes as soon as possible. Several questions must be answered before reentry can happen.

- ❒ Is it safe from a fire and hotspots?
- ❒ Is it safe from a traffic standpoint with emergency vehicles on the roadways?
- ❒ Is it safe for fire fighters working on or near the roadways?

The Operations Section Chief will recommend to the Incident Commander when to reopen evacuated areas and roads. Reopening these areas and roads will need to be coordinated with law enforcement.

Resident's Advice

If the resident refuses to leave, they can take specific actions to prepare the house. Some of the things you can tell them to do before law enforcement arriving on-scene would be:

❒ Evacuate family members and pets

Z. Move those people that will not be taking an active part in protecting the structure

3. Reduces the number of people exposed to the risk

AA. Have them pick a meeting place and time

❒ Remove combustibles

BB. Move all flammable materials away from the structure

CC. Store lawn furniture

DD. Scatter woodpiles

❒ Shut off the gas and any source of gas

❒ Leave the electricity on

❒ Get water for fire fighting

EE. Connect any garden hoses

FF. Fill the pool, hot tub, garbage cans, buckets, or other large containers with water

GG. Place some of the containers within the structure

❒ Ladder the structure

HH. Secure a resident's ladder at a safe place for fire fighters to get on the roof and extinguish spot fires

❒ Pumps and generators

II. Fuel and set up any gas-powered pumps or generators that will help in the fire fighting effort

❒ Escape

JJ. Have a resident back the car into the driveway with the windows rolled up and the keys in the ignition

KK. Put any valuables in the car

❒ Doors and lights

LL. Disconnect and unlock the garage door operating system

MM. Turn on the outdoor lights

NN. Close all doors inside of the structure

4. Reduces drafts

5. Helps confine a fire if it does get into the structure

OO. Leave all doors unlocked

You will want to reemphasize to "go while it is safe."

Structure Triage

Structure triage is the sorting and prioritizing of structures requiring protection from wildfire. The primary consideration when evaluating whether a structure can be protected is fire fighter safety. The goal is to do the most good with resources and time available. Therefore, you must quickly divide threatened structures into three broad categories.

- ❒ Not threatened/savable needing little or no protection
- ❒ Threatened
- ❒ Unsavable

Categories of structures can change quickly due to fire behavior, fire fighter safety, and arrival of additional resources, air support, or other changing conditions. As you categorize the structures, give them a value and document the information along with the address.

Triage Decision-making

The following factors affect structure triage decision-making.

Fire Fighter Safety

Fire fighter safety is the primary consideration when evaluating whether a structure can be protected. The minimum standard for fire fighter safety is LCES. You must have safe access, safety zones and escape routes established throughout your operation. A risk assessment utilizing the risk management process of hazard awareness, hazard assessment, hazard control, decision point and evaluation should be utilized throughout the incident with emphasis on the decision point "go/no go." Know your trigger points and escape time frames. Safety zone availability, size, and time to prepare will need to be assessed. Identify special hazards and convey all safety considerations during your tailgate safety sessions. All personnel who arrive after the tailgate sessions will receive a safety briefing. All safety concerns and trigger points will need to be reviewed and updated throughout the incident. Document all tailgate sessions and safety briefings on your ICS 214 Unit Log.

Structure Configuration

Road Access

You will need to consider the width of the road, proximity of fuels, road grade, surface, turnouts, and turnaround. Look for addresses or other identifying information. Document the information on a map of the area. Locate possible safety zones and turnouts for safely passing other vehicles.

Building Construction

One of the first things you want to do is look at is the roof and eaves for the type of construction. Shake shingle roofs and exposed eaves with a large overhang will lessen your chances of saving the home. Other damaging features are exposed wooden elements such as wood decks, wooden fences continuous from the vegetation to the structure, lightweight flammable curtains, large windows facing the heat source, and any flammable materials adjacent to the structure.

Defensible Space

Defensible space is probably the single most important consideration in determining the viability of a structure. Clearances of 100 feet or more are desirable, but will depend on adjacent fuels and topography. Try to visualize the fire conditions when the fire hits the structure to determine adequate clearances.

Hazardous Material

You will need to assess the probability of hazardous materials and safety hazards at the scene. Look for clues of possible pesticides, herbicides, and flammable materials. Storage sheds away from the main structure should be of special concern especially in agricultural or rural areas. Safety hazards such as power lines and LPG tanks should be surveyed and apparatus kept at a distance.

Available Water

The fixed water system should be evaluated. Flow hydrants to determine residual pressure. If you are in a strike team test more than one hydrant to evaluate the water system potential. Survey the area for water tanks, swimming pools, or other types of water sources.

Fuels

The most important consideration with fuels is the continuity and type. Is the vegetation light flashy fuel, brush, timber, or a combination? Is the fuel continuous from the wildland to the structure with little or no defensible space?

Fire Behavior

Fire behavior will need to be monitored on a continuous basis. Some considerations will be:

- ❒ Direction and rate of spread
- ❒ Flame lengths
- ❒ Wind; shifting or above 10 mph
- ❒ Stability; fire whirls, dust devils
- ❒ Torching, spot fires, firebrands, or well developed smoke column
- ❒ High temperature
- ❒ Low relative humidity (below 25%)
- ❒ Topography, with emphasis on chimneys and chutes

Timing the fire's arrival is important for the amount of time you have available to prepare and the possibility of additional resources arriving.

Available Resources

The number and types of engines, water tenders, crews, dozers, and air support will determine your course of action, LCES considerations and structure triage priorities. Resources will need to be ordered as soon as the number of structures has been identified. Coordination and dissemination of the information needs to occur quickly so ordering, travel, and arrival of additional resources can happen as quickly as possible. The arrival time of additional resources will factor into your structure triage. A

good rule of thumb is one engine per structure. One additional engine for every four structures will be used as a backup and patrol. When structures are closer together, fewer engines may be used. You should confirm all resources are on-scene. Remember you cannot use them until they arrive. You should also know if aviation support is available.

Conditions That May Make a Structure Unsavable

There are conditions that will make a structure unsavable. Some but not all of those considerations include:

- ❒ Inadequate defensible space and no time to modify
- ❒ No safety zone, adequate escape routes or refuge available
- ❒ Fire making significant sustained runs and structure is in close proximity
- ❒ Fire behavior is extreme and spot fires are igniting around the structure
- ❒ Structure involvement is more than current resources can handle

  PP. Usually more than 25% involvement
- ❒ Inadequate water supply
- ❒ Topography
- ❒ Fire's intensity dictates you leave the area NOW
- ❒ No place to park engine safely

The fact that one or more of these conditions exist does not automatically place a structure in the unsavable category. If your resources are not immediately needed elsewhere and a safe attack can be made on an apparently unsavable structure, consider making the attempt.

Assigning Structure Values

Structure triage is a subjective process and a lot will depend on the amount of time available to triage the structures and the size of the area you are assigned. Assessing a numeric or color value and putting this value along with the street address on a map of the area will help when the fire arrives and you start protecting the structures.

Some value systems currently in use include:

- ❒ Numeric value on a scale of 0-10

  QQ. 7-10 = Not threatened

  RR. 3-6 = Threatened

  SS. 0-2 = Unsavable
- ❒ Numeric value between 1-3

  TT.3 = Not threatened

  UU. 2 = Threatened

  VV. 1 = Unsavable

❒ Color value

WW. Green = Not threatened

XX. Yellow = Threatened

YY. Red = Unsavable

There may be other ways to assess structures. Pick the one that works best for you and put it to use. Utilize the time before the fire arrives to prep the structures and reclassify the structures accordingly.

Preparing the Structure

Utilize the time before the fire arrives to prepare the structure. Coordinate the effort with adjoining resources. You will need to determine if residents are home. If residents decide to stay, advise them of the dangers and the benefits to leaving the area. Law enforcement has the legal responsibility for evacuation and should be contacted if the residents are interfering with your ability to do your job or you feel the situation is getting too dangerous for the residents to be at the scene.

6-2-2: Preparing a Structure

Exterior of the Structure

Ladder the exterior of the structure, away from the power drop and approaching fire using the resident's ladder if available. Clear the roof and gutters of any light flashy fuel. Cover the air conditioner, swamp cooler or other openings and windows with on-site materials. Any flammable items put them inside the structure. Remove the vehicle or place it in the garage facing out, windows up, and key in the ignition. Consider removing or modifying decks, fences, and overhangs. The gas should be shut off and know where the electrical shut-off is located. Do not turn off the electricity until the structure becomes involved.

Interior of the Structure

Upon entering the structure, become familiar with the floor plan. Find the attic access and place a ladder nearby for entry, but without creating a hazard. Close all the windows, doors (do not lock), vents, and remove nonflammable drapes/shades. Put pets and valuables in a less exposed room. Leave a note for the resident explaining what happened, notify your supervisor, and document the activity.

Fuel Modification

Assess the amount of defensible space. Remember, defensible space is about three times the flame length in moderately heavy fuels. Flames in most live fuels will be 2-3 times the fuel height. For a controllable fire in light fuels, defensible space is less than 3 times the fuel height.

Observe the ongoing fire behavior and visualize how the fire will progress and plan accordingly. Remove fuels to prevent fire moving in crown foliage or continuous fuels. Start closest to the structure and work outward toward the advancing fire. Cut away lower limbs and all ladder fuels. Remove enough small trees and shrubs to break up the crown and continuous fuel mass. Scatter the trimmings away from the upwind or downhill side of the structure. Do not pile the trimmings. Do not needlessly destroy landscaping. Move or scatter firewood, lumber, or kindling piles. Clear vegetation around the LPG tanks a minimum of 2-3 times the fuel height.

Hand crews have the personnel to prep the exteriors of structures quickly. They can also assist in firing operations. Order hand crews if needed and time allows.

I-Zone Tactical Operations

There are different modes of attack and after the initial size-up of the situation you will need to determine which mode of attack will best fit your goal and objectives. The offensive attack will directly attack the fire and will contribute to the containment of the fire and protect structures. A defensive attack will protect structures without containment action. Do not get stuck in a defensive mode for any longer than necessary. While protecting, the structures try to keep the fire contained within natural and manufactured barriers. Coordinate these activities with adjoining forces.

"STRIKE" Acronym

In general, the tactical operations can be broken down into a six-step process remembered by the "STRIKE" acronym.

❶ ***Set-up (Basic Evolution)***

Set-up systems and wear full personnel protective equipment.

❷ ***Take A Look Around***

Become familiar with the area and situation status. Determine what has happened, what is happening, and what will happen.

❸ ***Reduce Fuels and Cover Openings***

Structure preparation.

❹ ***Inform Crew***

Conduct a tailgate briefing and include LCES and the risk management process. Inform the crew of their assignment and objectives.

❺ ***Knock the Fire Down***

Utilize direct attack whenever safe. Pick up spot fires.

❻ ***Extinguish and Check for Unseen Ignitions***

Check for fire extension in the attic, eaves, vents, etc.

Supplementary Lines

Deploy a line for embers igniting the roof. Have the line secured, coiled on the roof, and easily available to hook up and flow water to the roof area. Have the hose and ladder in the same area. The protection line should be coiled on the engine to allow easy access. It will be charged and ready to go

at all times. Interior attack lines should be set up. Any prelaid hose couplings should be put out of harm's way. Place the hose so it can be quickly found and utilized. Use any available water sources to top off your water tank.

Activity for Roof Fires

Spotting usually occurs by airborne firebrands. Remain mobile, surveying all of your assigned area. If you deploy hoselines, leave them in place when you leave the site. Post lookouts strategically to survey the entire area giving you the opportunity to attack spot fires quickly. Limit mop-up, but ensure containment and no further spread. Check periodically to ensure 100% mop-up. If the roof is involved, use an exterior stream on the outside of the roof and pull the ceiling at the leading fire edge to check extension. Wear appropriate PPE for interior attack. When the roof is more than 25% involved, you will need to assess the probability for success and act accordingly.

If the structure is more than 25% involved and is a threat to other structures or your control line, consider an anchor and hold option.

Activity for Perimeter Control

Suppress fire at the perimeter. Set objectives to hold the fire with manufactured and natural barriers. Pick up spot fires or areas where the fire will hit the hardest and most likely jump the control lines. Directly attack at the fire edge establishing control lines that will hold the fire. Try to tie as much line in as possible as you move within your assigned area.

Time limits or fire intensity will prevent full control. When this occurs, knock down the fire. Then, using your hoselines, lead the fire around the structure while constantly checking the structure for ignition sources. Come back and check for hot spots once things slow down or request additional engines to mop-up and patrol after you have left the area. If the fire is too hot to handle, be sure to protect the engine and crew using your safety plan. Ensure you have adequate time to implement the safety plan.

"Pump and Run"/"Bump and Run"

Stay mobile. Mobility is essential to successful structure protection and crew safety. When the fire intensity gets too hot, it may force disengagement. Do not wait too long to make the decision to disengage, or you may jeopardize your crew or equipment. Move on to new structures that may need immediate help. Pick up spot fires and try to contain the fire perimeter while moving. Go back to the disengaged area when the fire passes and initiate action. Deploy hoselines and equipment keeping them short and as few as possible to facilitate rapid disengagement and mobility. If multiple lines are laid, try to connect them with gated wye valves. Allowing independent action, quick shutdown, and disconnect for each line. Do not lay hoselines in front of the engine.

Anchor and Hold

While the pump or bump and run practice has been quite successful in I-Zone fire fighting, it may not always be the best choice. The company officer or IC must take a number of factors into consideration when deciding the best tactic. During the "Old Fire" in San Bernardino, the fire began rural and soon became urban by burning into the city. The fire-fighting forces used the bump and run tactics but soon found that they were not stopping the fire's progress into the city; it continued block by block with no

end in sight. There was too much heat and spotting being generated to stop the fire. It became apparent that the only way to stop the fire's progress was to "take a stand" and hold it against tremendous odds. Type 1 engines were strategically placed using master streams and large quantities of water, and a line was drawn for an "anchor and hold" tactic to stop the fire's progress. The heat was knocked out of the fire as it moved upon them, stopping the firebrand production and halting the forward progress of the fire front.

Water Use Guidelines

Try to keep at least 100 gallons of water reserved in your tank for crew protection. Top off the tank at every opportunity including garden hose, swimming pool, hot tub, pond, or any available water source. Do not utilize hydrants except to refill your tank. You want to stay mobile. Conserve water by avoiding wetting down an area. Apply water only if it controls the fire spread or significantly reduces heating of the structure being protected. Keep the fire out of the heavier fuels and extinguish the fire at its lowest intensity, not when it is flaring up. Knock down fire in the lighter fuels. Have enough water to last the duration of the main heat wave to protect the crew. In rural areas where water is scarce, water tenders will be needed to support operations.

Structure Protection Attack Modes

There are three modes of attack for structure protection.

❒ Defensive

ZZ. The main fire cannot be controlled in time to eliminate the threat

AAA. Concentrate on saving as many structures as you can

❒ Offensive

BBB. Main fire can be controlled before the structures are threatened

CCC. Attack the main fire

❒ Combination

DDD. Part of the main fire can be controlled and/or defensive action will create control lines

EEE. Attack the main fire

FFF. Protect structures as they become threatened

GGG. Extend perimeter control from locations where structure defense has given you an anchor point

Structure Protection Situations

There are four structure protection situations.

❶ Spotting

HHH. Airborne firebrands are the immediate problem and may last for hours

III. Remain mobile and survey all assigned areas

JJJ. Lay lines only when necessary

KKK. Attack spots as quickly as possible and ensure they do not rekindle

LLL. Under extreme conditions, you will not have enough water for many spots in heavy fuels

MMM. Request additional engines or move out

❷ Full control

NNN. Perimeter control is possible

OOO. Pick the location for control lines

PPP. Take action to stop the fire at the edge of the yard

QQQ. Construct a line that will hold and not rekindle

RRR. Fire-out the line if time is short

SSS. Connect your line with other control lines or anchor points (tie-in)

❸ Partial control

TTT. The location of control lines is not your choice

UUU. Time is limited or fire intensity prevents full control

VVV. Knock down the fire front moving at the structure

WWW. Lead the fire around the structure with your attack lines

XXX. Check the structure for ignitions

❹ No control

YYY. The fire has passed you by or is too hot to control

ZZZ. Precede fire fighting to protect residents and your apparatus

AAAA. Attack the fire in or on the structure, if it is safe

BBBB. Use breathing apparatus and hoselines as necessary

CCCC. Move to a safety zone or retreat if necessary

DDDD. If not all is lost after the fire moves past a structure, move back in and take action

Foam and Gels

Foam is an excellent tool for prevention and suppression of fire in the I-Zone. Foam has many advantages and some disadvantages. Foam has been around for quite some time but in the early 1980s lower mix levels, below 1% per 100 gallons, were developed which allowed developing Class A foam for wildland and urban interface fires. New Class A foams are constantly being developed in different properties and applications. You will need to stay informed of the new types and applications of foam for use in the I-Zone.

Foam Properties

Class A foam is a collection of gas-filled bubbles formed from aqueous solutions of detergent or soap-based surfactants used to attach and penetrate ordinary combustible materials. Foam will delay or

eliminate combustion of fuels by eliminating all three sides of the fire triangle and has many advantages and some disadvantages:

Advantages

- ❒ Greater capacity to resist ignition
- ❒ Attaches to fuels and increases fuel moisture retention and reduces vapor release
- ❒ Reduces fire intensity
- ❒ Makes fire hose lighter for easier movement
- ❒ Less friction loss
- ❒ Increases the effectiveness of water
- ❒ Reduces mop-up time

Figure 6-2-3: Foaming a Structure

Disadvantages

- ❒ Will cause skin irritation and other medical conditions in some users
- ❒ Corrosive to some metals
- ❒ Damages leather
- ❒ Possible harmful environmental effects
- ❒ Plugs small pipes and orifices

Mixture Types

You can generate various foam consistencies using the foam to water ratios below.

GALLONS OF WATER

FOAM %	5	10	50	100	150	200	250	300	350	400	450	500
0.1	.5 oz	1.0 oz	6.0 oz	13.0 oz	19.0 oz	25.0 oz	32.0 oz	38.0 oz	45.0 oz	51.0 oz	58.0 oz	.5 gal
0.2	1.0 oz	2.5 oz	13.0 oz	25.0 oz	38.0 oz	51.0 oz	.5 gal	76.0 oz	89.0 oz	.8 gal	.9 gal	1.0 gal
0.3	2.0 oz	4.0 oz	19.0 oz	38.0 oz	58.0 oz	76.0 oz	.75 gal	.9 gal	1.0 gal	1.2 gal	1.3 gal	1.5 gal
0.4	2.5 oz	5.0 oz	26.0 oz	51.0 oz	76.0 oz	.8 gal	1.0 gal	1.2 gal	1.4 gal	1.6 gal	1.8 gal	2.0 gal
0.5	3.0 oz	6.0 oz	32.0 oz	.5 gal	.75 gal	1.0 gal	1.25 gal	1.5 gal	1.75 gal	2.0 gal	2.25 gal	2.5 gal
0.6	4.0 oz	8.0 oz	38.0 oz	76.0 oz	.9 gal	1.25 gal	1.5 gal	1.75 gal	2.0 gal	2.5 gal	2.75 gal	3.0 gal
0.7	4.5 oz	9.0 oz	45.0 oz	89.0 oz	1.0 gal	1.5 gal	1.75 gal	2.0 gal	2.5 gal	2.75 gal	3.0 gal	3.5 gal
0.8	5.0 oz	10.0 oz	51.0 oz	.8 gal	1.2 gal	1.6 gal	2.0 gal	2.5 gal	2.75 gal	3.0 gal	3.5 gal	4.0 gal
0.9	5.5 oz	12.0 oz	58.0 oz	.9 gal	1.4 gal	1.75 gal	2.25 gal	2.75 gal	3.0 gal	3.5 gal	4.0 gal	4.5 gal
1.0	6.0 oz	13.0 oz	.5 gal	1.0 gal	1.5 gal	2.0 gal	2.5 gal	3.0 gal	3.5 gal	4.0 gal	4.5 gal	5.0 gal

One gallon (gal) is equal to 128 ounces (oz). One quart is equal to 32 ounces.

Foam consistency is a major factor in determining how effectively it will perform. Dry foam holds its shape, adheres well, and releases the contained water slowly, creating a better insulating blanket than wet foam, which flows and drips releasing water quickly. Fluid foam, intermediate to the dry and wet foam types, releases the solution more rapidly than the dry foam, but holds it shape and adheres better than the wet foam. It may be better at cooling and wetting than the dry foam. The foam solution, a slightly frothy fluid containing wetting agents, may be the choice when fighting deep seated fires and smoldering snags. Depending on the water to foam mixture you can get different consistencies:

Solution

A clear to milky fluid lacking a bubble structure that is used on mop-up for deep penetration.

Wet Solution

Wet solution is a low expansion foam in the .3%-.5% range with a fast drain time. It has excellent penetration properties and is used on direct attack operations for knockdown and extinguishment. It also works well for the initial application for structure protection.

Fluid

Similar to watery shaving cream. Flows easily with moderate drain time and clings to fuels better than wet solution

Dry Solution

Dry solution is a high expansion foam in the 1% range, has the property of shaving cream, and is very useful in exposure protection situations.

Combination

A combination of wet and dry foam is very effective. First, apply a wet solution for penetration followed by a dry mixture to seal the wet layer to slow the moisture evaporation process. The objective is to keep as much moisture in contact with the fuel to raise the fuel moisture level increasing duration and temperature necessary to ignite the material.

Fire-blocking Gels

Fire-blocking gels are relatively new products that have come onto the market in the last few years. They are superabsorents that use cross-linked polymers to absorb many times their weight in water.

The water in the gel is held by a three-dimensional network of cross-linked polymers. When the water evaporates, the gel collapses. Gels provide a longer protection period than foam because it takes longer for the water in the gel to evaporate than for the air bubbles in foam to burst. Just like foam, gels adhere to walls and to the underside of overhanging eves.

Fire-blocking gels are supplied as a concentrate and prepared for use in the same manner as fire fighting foam, and are mixed using standard eductors in concentrations ranging from 1 to 6 %.

Applications

Foam is a mixture that requires a device to proportion, meter, or mix the foam concentrate into water. Air must be added to the foam solution to complete the process. There are several methods to creating foam.

Injection Systems

❒ Bladder type

EEEE. Uses the pressure of the water in the hoseline to surround and squeeze a bladder with foam concentrate through a metering valve into a low pressure area created by a differential valve

❒ Direct injection - flow meter based

FFFF. Uses an electronic flow meter and receiving device to direct a concentrate pump and motor to inject a metered amount of concentrate that corresponds to the flow

❒ Direct injection - venturi based

GGGG. Uses a venturi to create a low pressure area that is sensed and mechanically transmitted to a pilot valve

HHHH. The more differential in the venturi, the more foam that will be injected proportionally

Eductor

The in line eductor has good control of mixtures, but has poor set-up times and mobility. Several types of preplumbed systems produce good mixtures and have the mobility necessary for urban interface fires. The solutions can be regulated to give a wet then dry mixture, enhancing fire fighter capability.

Batch Mixture

Foam is added to the tank and discharged using fog or expansion air aspirating nozzles.

Compressed Air Foam System (CAFS)

The air is pumped in creating a "scrubbing" mixture of air and foam, which creates small tightly, packed bubbles. CAFS significantly improves fire suppression, mop-up, and structure protection. The foam produced clings to any surface it meets and lasts longer than air aspirating or fog nozzles. CAFS system allows you quick changes of properties. This allows you to place a wet solution quickly coated with a dry solution. Hose stream distances are greatly enhanced by the CAFS system.

Maintenance

All foam concentrates have a detergent base therefore, cleaning all of the plumbing; pumps, tanks, and other exposed surfaces can be expected to prevent corrosion. Flush tanks for at least twenty minutes after use. Clean any equipment that comes in contact with the foam.

Aircraft Use in the I-Zone

Both air tankers and helicopters can be very useful in urban interface fires. You will need to check on availability of aircraft because your tactics will be directly affected by availability of aircraft. Aircraft is controlled by the Operations Chief and directed by the Air Tactical Group Supervisor (Air Attack). You will have to go through the chain of command for utilization. You should also monitor tactical channels and the air to ground frequency to monitor any changes in availability. Aircraft may be diverted to a higher priority incident.

Some of the uses for aircraft will be retardant or bucket drops to protect structures, crew protection, perimeter control, and evacuation support. To utilize aircraft support you need to know about the size, capabilities, and application of the aircraft. If you are using helicopters with fixed tanks for structure protection, check on the availability of foam to enhance structure protection. Principles of aircraft drop applications are:

- ❒ Determine if the tactics are based on direct or indirect attack

IIII. Set your strategic priorities and advise your supervisor

- ❒ Establish an anchor point and work from it
- ❒ If you are using direct attack for perimeter control, provide ground support to reinforce the retardant drops
- ❒ Plan the drops so they can be extended or intersected effectively
- ❒ Advise of any hazards

JJJJ. Personnel working in the area

KKKK. Power lines

LLLL. Trees

MMMM. Topography, etc.

Once you have made the request for air support you will need to direct the retardant or bucket drops. Some of the considerations you will need are:

- ❒ Give the general location on the incident
- ❒ Finalize the location

NNNN. GPS coordinates

OOOO. Clock direction

6. Straight in front of the aircraft is 12 o'clock
7. Out the right door is 3 o'clock
8. The tail is 6 o'clock
9. Left door is 9 o'clock
10. When giving directions, remember that helicopters and fixed wings generally orbit in a right-hand pattern and air tankers in a left-hand pattern

PPPP. Position on slope

11. Lower third
12. Upper third
13. Midslope
14. Top of ridge, etc.

QQQQ. Describe prominent landmarks; visualize what the pilot sees from the air and describe the target

RRRR. Utilize the incident

15. Right flank

16. Head of fire, etc.

❒ Give feedback about drop accuracy

SSSS. Be honest and constructive

TTTT. Let your supervisor know if the drop is early, late, uphill, downhill, on target, too high, or too low

UUUU. Report low drops immediately

You will need to report any unsafe drops immediately. Move out of the area while the drops are occurring and move back in when it is safe. Life safety is a priority and aircraft should be called immediately for support when needed. If you are caught in the path of a retardant drop, you will need to drop to the ground facing the drop or seek shelter behind a house, vehicle or other major obstruction if time allows. Have your chinstrap on/helmet facing the drop to protect your head from flying debris and hold on to any tools/equipment you have with you. You will want to wash off any retardant to prevent skin irritation. Move out of the area and advise your supervisor of the situation and that there are people working in the area. The area should be cleared before any more retardant drops occur. Coordinated aircraft support can be an extremely useful tool. Work through the chain of command to set strategic priorities and use the aircraft to its fullest potential.

I-Zone Defensive Firing

Defensive firing in the urban interface is a useful tool to protect structures. You will need basic training in firing methods and related firing devices before using this tactic in urban interface fire fighting. Firing operations are timed events that need a beginning (anchor point) and a termination point (tie-in) to be successful. All too often decisions regarding the use of fire are made too late to be effective in protecting structures. Therefore, you will need to develop a plan and implement it as soon as possible. You will need to

Figure 6-2-4: Defensive Firing

coordinate the firing operation with adjoining resources.

Although firing operations are a low frequency occurrence, they present a relatively high risk of undesirable results if not properly developed and implemented.

Authority

Under Public Resources Code 4426, a person shall not set a backfire or cause a backfire to be set except under the direct supervision or permission of state or federal forest officer, unless it can be established that the setting of such backfire was necessary for saving life or property.

Health and Safety Code 41801 can apply to local responsibility areas (cities, fire districts, counties, etc.). It states: Nothing in this article shall be construed as limiting the authority granted under other provisions of law to any public officer to set or permit a fire when such a fire is, in his/her opinion, necessary for any of the following purposes:

- ❒ The prevention of a fire hazard, which cannot be abated by any other means.
- ❒ The instruction of public employees in the methods of fighting fire.
- ❒ The instruction of employees in methods of fighting fire, when such a fire is set, pursuant to permit, on property used for industrial purposes.
- ❒ The setting of backfires necessary to save life or valuable property pursuant to Section 4426 of the Public Resources Code.

The incident commander, regardless of the size or magnitude of a wildfire incident has the overall authority and responsibility for all incident command operations. There will be circumstances that, due to political, jurisdictional, department policy, or other reasons, require a higher level of authority to approve the decision to backfire or burnout. If you are requesting approval from a higher authority, be prepared to provide information that supports your request. This information should include:

- ❒ Size-up
- ❒ Resources needed
- ❒ Long range impacts/risks
- ❒ Established escape routes and safety zones
- ❒ Identified anchor and termination points
- ❒ Established radio communication network
- ❒ Overall safety of personnel and equipment

Firing Principles

Backfire is defined as, "A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column."

Burning out is defined as, "Setting fire inside a control line to consume fuel between the edge of the fire and the control line."

During normal firing operations, there are Firing Observers, Ignition Team, Holding Team, Mop-up Team, and reserves. While conducting I-Zone, defensive firing you will not have the resources or time to set up a normal firing operation. As a minimum in I-Zone, defensive firing you will need attack lines deployed for holding and mop-up operations, LCES and someone to light the fire. Utilize natural and constructed barriers by firing off a wet line or scratch line. A common error is lighting more fireline than you can control. Utilizing adjoining resources and leapfrogging from structure to structure will increase your chances for success. Identify hazards and problem areas such as:

- ❒ Switchbacks
- ❒ Heavy fuels
- ❒ Structure configuration
- ❒ Utilities
- ❒ LPG tanks

Timing is critical. If your fire is too late, you have probably created more of a problem than you had in the first place. If it is too early, the fire may become the new target for suppression activity. The objective is to remove fuels to minimize the threat to structures.

The firing operation must account for all personnel, civilians, animals, and adjoining resources. Successful firing operations depend on a constant evaluation process to allow for changing conditions. Post firing evaluations will play an important role in honing skills and teaching others.

Burned Zones

Burned zones are a sufficient width to protect structures and minimize the damage from the encroaching fire. A guideline is to develop a minimum burned zone four times the average flame length of the main fire. You will need more in strong winds and steep slopes. In a defensive mode, you will only have time to remove some fuel before the fire arrives.

Safety

To be effective and safe, a firing operation must be well planned, organized, staffed, directed, controlled, and evaluated. It must be based on the realities of the fire environment and of the resources available.

GROUP ACTIVITY 6-2-1

TITLE: Urban Interface Tactical Deployment

TIME FRAME: 3:00

MATERIALS NEEDED:

- ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Page 11-15
- ICS Form 201 Incident Briefing Form (1 per group)
- North County fire response map
- Easel paper and easel
- Colored marker pens (black, blue, red and orange)
- Pencils

INTRODUCTION: The activity is based on the Park Fire in California. The incident is an initial attack fire with a high dispatch. This activity will provide you an opportunity to assume the role of the first-in company officer to manage and tactically deploy your assigned resources.

DIRECTIONS:

1. The exercise is based on an urban interface fire.
2. The incident is an initial attack during a high dispatch.
3. You are the first-in company officer/IC and must develop a plan and tactically deploy the resources assigned.

The exercise is in two parts.

4. In Part 1, you respond to the fire and arrive on-scene.
   - You give a report on conditions and present your plan.
5. In Part 2, after reviewing any threatened structures (from the slides), you develop a structure protection plan and give a briefing to the arriving Battalion Chief using an ICS 201 Incident Briefing Form.
   - To enhance your presentation, make an Incident Sketch Map on easel paper using ICS map symbology from page 11-15 of the FOG.
6. You have 15 minutes to complete Part 1
7. You have 30 minutes to complete Part 2.
8. Be prepared to present your findings to the class.

THE SCENE

The exercise is based on an urban interface fire in the North County Fire District in north San Diego County. The incident is an initial attack during a high dispatch and you are the first-in company officer/IC.

The fire started at the north end of the Live Oak County Park in the Live Oak Creek riparian and is only accessible by foot. The fire is still in the creek bottom, but is moving to the bottom of a hill with structures at the top of the ridge. There is a CDF hand crew working in the park and after reporting the fire to CDF dispatch (Monte Vista) they tooled up and started hiking into the fire. Upon the crew's arrival at the fire's origin, they started constructing a fireline on the right flank of the fire. The resident at 2466 Reche Road called North County Fire Dispatch and reported the fire had started moving towards his residence. It is a hot Santa Ana condition with winds 15-25 mph.

The goal for each group is to assume command, tactically deploy resources to protect structures, and prepare for the briefing with the Battalion Chief.

ON-SCENE CONDITIONS

It is 1330, May 21. The region has been experiencing a Santa Ana east wind weather pattern and multiple fires are burning in the area. Due to the fire activity, local fire-fighting resources are at drawdown levels. The temperature is 86°F, relative humidity is 21%, and the wind is SE at 15-25 mph. A MACS Group (Multi-Agency Coordination System) is currently setting priorities for the fires in the region, and the Park Fire is listed as a new initial attack fire. The fuels are heavy in Live Oak Creek but light flashy fuels and typical landscaping surrounds the homes.

RESOURCE STATUS

North County Fire District		ETA
• BC 1105		30 minutes
• ME 1112	Type I (your engine)	On-scene
• E 1114	Type I	1 minute
• ME 1111	Type I	2 minutes
• E 1115	Type I	2 minutes

North County Fire District requested mutual aid with CDF and the following resources are responding:

CDF Resources	ETA
• ST 3300C B-3317, E-3360, E-3371, E-3361, E-3377, E-3379	3 minutes
• ST 3301G HC-RBW4, HC-RBW1	3 minutes
• Dozer 3341	5 minutes
• AA-330 AT-162, AT-70, COP-301, COP-304	2 minutes

Five more engines and another hand crew have been dispatched, but will not arrive before the Battalion Chief.

PART 1

The slides start with you turning on the Reche Road extension driving towards 2466 Reche Road. You have arrived at 2466 Reche Road and this is the first look at the fire. Give a report on conditions and develop your plan.

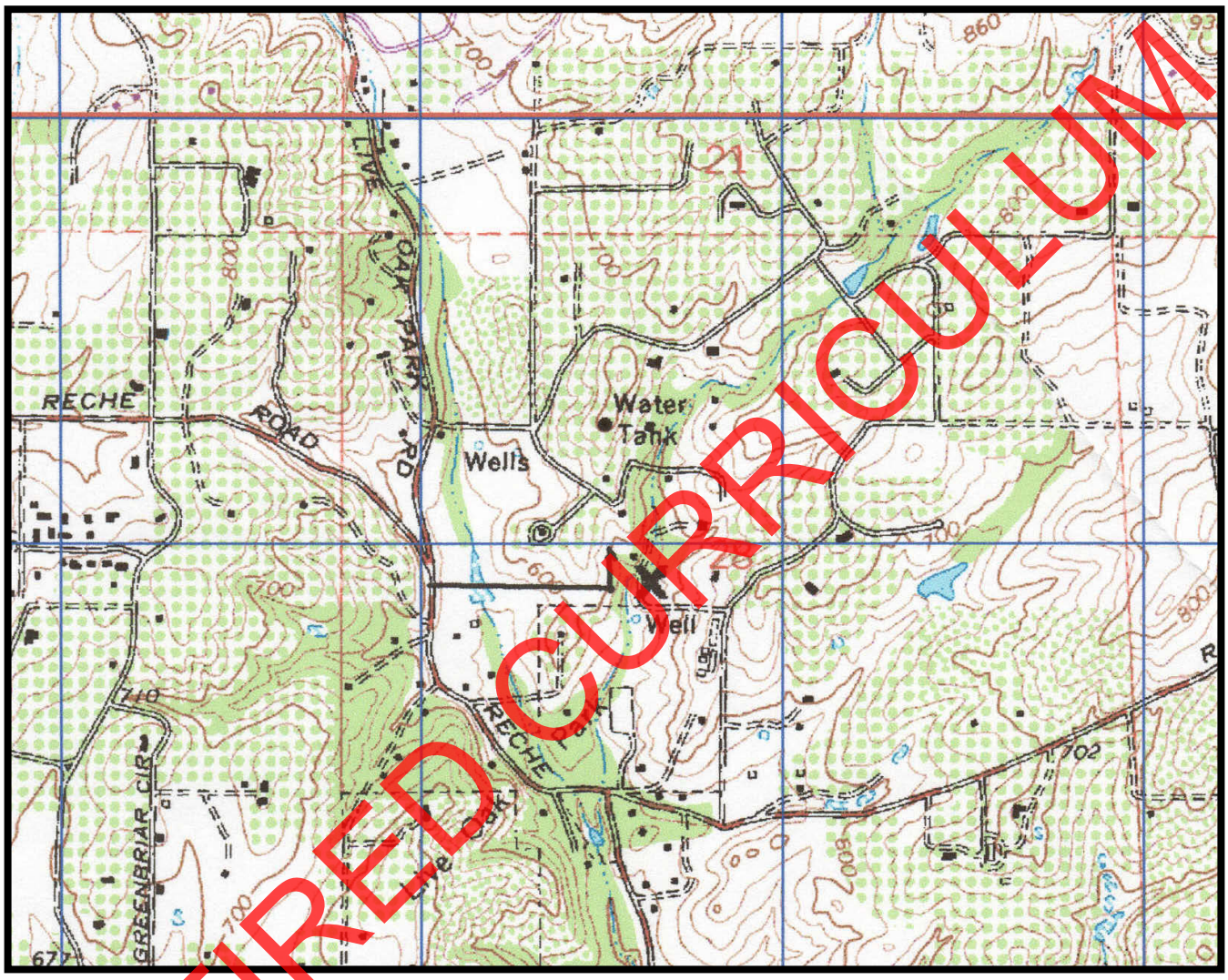
1. What was your report on conditions?
2. What is your plan?
3. What additional resources did you order?
4. What organization did you put in place?
5. Other considerations?

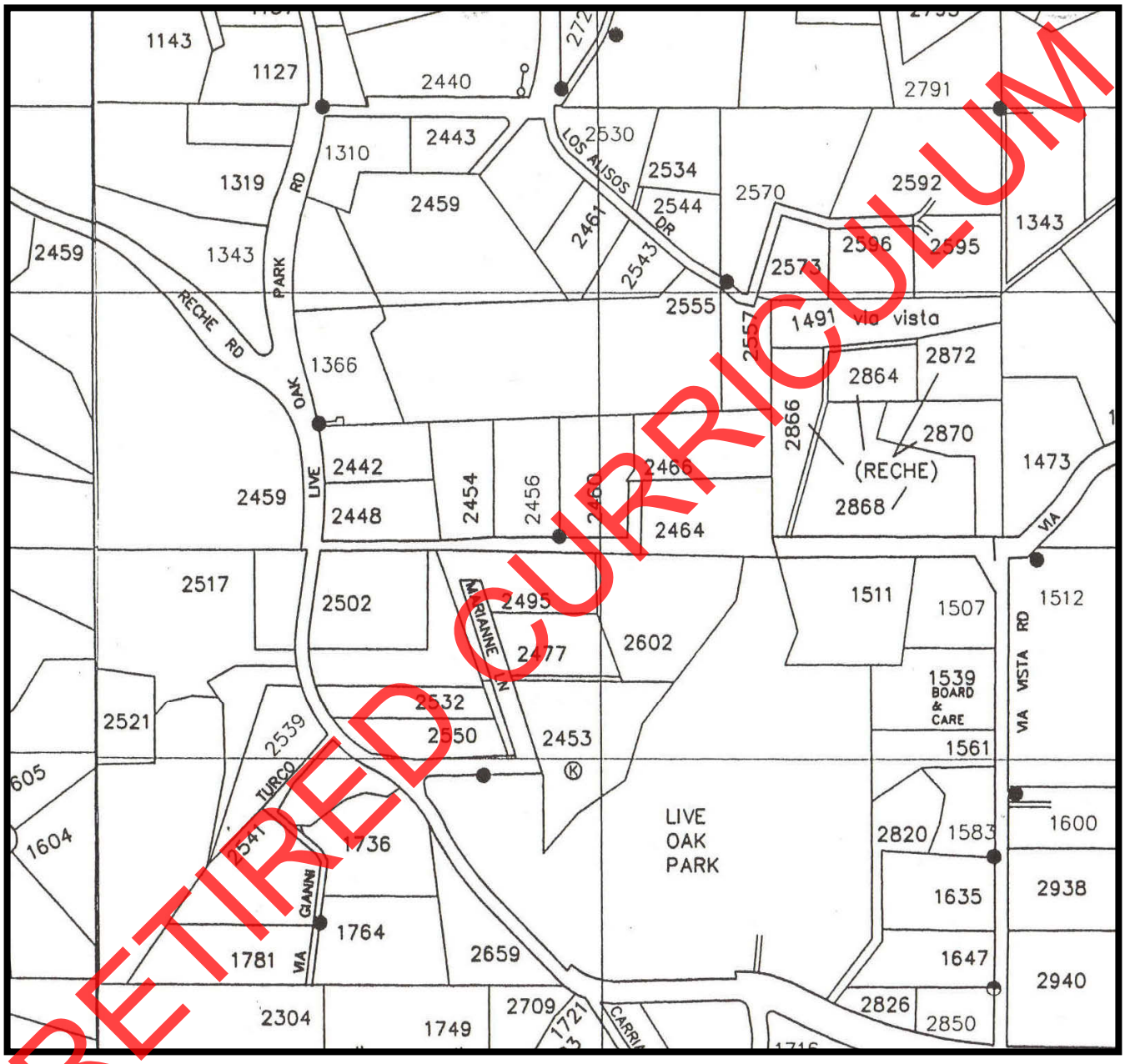
PART 2

The slides start at 2466 Reche Road, travel back down the Reche Road extension, north on Live Oak Park Road, and then east on Los Alisos Drive back towards the origin of the fire. The slides will show you the structures threatened.

Develop an Incident Sketch Map on easel paper using ICS map symbology from page 10-10 of the FOG. Answer the following questions.

1. What was your structure protection plan?
2. What were the directives for your assignments? List directives for each assignment given.
3. What controls were put in place?
4. What reference materials were used?
5. What documentation was used in the exercise?
6. Other considerations?





Topic 6-3: Post-incident Operations

Student information for this topic can also be found in the Fireline Handbook, NWCG (NFES 0065), 2004 Edition, Chapter 6, ICS 420-1 Field Operations Guide, FIRESCOPE, 2004 Edition, Chapters 1, 8, and 11, and Incident Response Pocket Guide, NWCG (NFES 1077), 2004 Edition, Page 17.

We have all heard how the job is not done until everything is cleaned and put away. In urban interface fires, this old saying holds true. Mop-up and patrol is a vital function to the assignment. All hot spots will need to be extinguished and the area will need to be safe for the residents before they are allowed to return to the area. The same principles for salvage and overhaul in structure fires will need to be performed. Pay particular attention to salvaging as many family valuables as possible.

Extent of Commitment

The extent of commitment will vary with every situation. Some of the most valid criticism on major fire incidents has centered on the property damage that occurred after the main fire had passed. Successful structure protection requires that the company officer make the commitment to stay with the structure until such time that all the fire exposure hazards have been abated. You will want to do a complete check for fire extension. Limit mop-up to structural threats.

As you go about the business of protecting structures, your action will be dictated by all of the factors that have been previously discussed. At some point, you will have to determine the results and the affects of your actions. Many times an effective structure protection effort will allow the company officer to change tactics from defensive to offensive. This option should be considered as a part of the ongoing size-up of the situation.

The extent of commitment will depend on the size of the incident, number of structures, available resources, and mop-up and rehab periods.

Mop-up

Mop-up in and around all structures will be 100% complete before residents are allowed to return. Some mop-up considerations include:

- ❒ Extinguish all hot spots
- ❒ Salvage as many personal belongs as possible
- ❒ Use hand tools to move material during extinguishment

Figure 6-3-1: Mop-up

- ❒ Check for any fire extension
- ❒ Inspect any unstable buildings for hazards

  VVVV. Flag any unsafe areas

  WWWW. Report location for building inspector to evaluate
- ❒ Report any property damage

Figure 6-3-2: Patrol

Patrol

Drive your assigned area and look for hot spots. Mobility is critical during mop-up in order to patrol all of your assigned area. Changing your driving pattern will allow you a three-dimensional look to see areas you may have missed while driving the other direction. Get out of the apparatus and patrol on foot any areas not visible from the apparatus.

Demobilization

Demobilization actually begins upon assignment and you should be preparing for demobilization throughout your assignment. The last thing you want to happen when it is your time to demob is to have something you should have already taken care of delaying your return home.

Daily Checks

- ❒ Apparatus

  XXXX. Lights

  YYYY. Windshield wipers

  ZZZZ. Tires

  AAAAA. Horn

  BBBBB. Any other item listed on the vehicle demobilization form that the mechanics will check before they release you
- ❒ Supply

  CCCCC. Assign someone on your engine the responsibility of supply

  DDDDD. Document all supplies checked out

  17. Keep track of what will need to be returned to the Supply Unit
- ❒ Documentation

  EEEEE. Complete the Unit/Activity Log (ICS 214) and your timecard daily

  18. Time cards can be very difficult to fill out at the end of the incident

  FFFFF. If you have a liaison assigned to the incident, make contact with that person to find out what other forms will be necessary

❒ Communications

GGGGG. Reprogram all of the radios

HHHHH. Turn in any equipment issued to you for this incident

Anticipate problems before the demob process starts and have a plan to solve them. For example, if you lost or damaged some equipment at the incident and you cannot get it replaced, you will need documentation explaining what was lost/damaged and why it was not replaced before leaving the incident. The Demobilization Unit Leader is responsible for demobilization and would be your contact for the process. You will need to get an ICS Form 221 (Demobilization Form) once you have been identified as excess and available for demobilization. Inspect the form to verify all the information is correct. Return the form to the Demob Unit Leader and tell him or her your estimated time of departure and arrival at home base. Factor in stops along the way for food and rest. Once you arrive at the station, your time will stop once you make your apparatus response ready. Check-in with your dispatch center and give them your release time and estimated time of arrival.

Post-incident Analysis/Briefing

Debrief your personnel to assess logistical and emotional needs. Urban interface fires can create a tremendous amount of distress because of the personal losses involved. Monitor your personnel for distress effects and seek care as necessary. Review your actions regarding your personnel and document any concerns and logistical needs.

Assign a travel frequency and remind all personnel of minimizing radio traffic to essential traffic only. The travel plan should be the most direct route home. It may have to be changed, at times, to deal with traffic or other considerations in order to make it the quickest way home. This is a time when everyone is tired and you need to ensure everyone is rested and fit to travel safely.

This is a good time to remind everyone of a job well done and your expectation that they maintain a professional attitude while they travel home. When you return to the station, make your supervisor aware of any equipment that was damaged, lost, or needed for future incidents.

Evaluation

Make the post-incident analysis a positive event. All personnel will get evaluations and you will need to get evaluations from your supervisor. Reaffirm the good job each fire fighter performed. Encourage their comments, but do not allow them to get personal. Minimize any criticism from fire fighters and facilitate the subject into a general discussion for positive change. Make recommendations for future training needs. Find out if there is a Training Tech Specialist on the incident and advise of your engine company or strike team/task force needs. Coordinate this evaluation process with your training officer. If you have disciplinary problems, make sure you document the problem, suggestions on how to remedy the situation and given adequate time to correct the situation.

Case Study 1: The Calabasas Fire

Foreword

On October 22, 1996, an event occurred at a fire incident that resulted in injuries to several fire fighters. The name of this incident is the "Calabasas Incident." An analysis team was formed to learn the facts related to the event. The team was also to identify areas where improvements in training, operations, and administrative procedures that might help fire agencies understand the events that occurred and prevent similar recurrence.

Several unique events added to the significance of the incident and these events, along with other factors, suggest that additional emphasis is needed in training and reinforcing previously established procedures, directions, and guidelines. These needs are identified in the report.

The team was formed jointly between the County of Los Angeles Fire Department (LAC), Los Angeles City Fire Department (LFD), Glendale Fire Department (GLN), and the California Department of Forestry and Fire Protection (CDF). The LAC was designated as the lead agency due to the incident having occurred in the County of Los Angeles jurisdiction.

This report will discuss the events leading up to and following the entrapments of the members of the various companies who were victims of this incident. The circumstances involving the various entrapments occurred almost simultaneously. They each occurred less than 1000 feet apart. The exact events affecting each were different however, and this report will describe the various operations within the one major event, that being the rapid increase in the intensity of the fire, which caught all involved by surprise.

Entrapment: A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or have been compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near-misses." As defined by the National Coordinating Group in Fire Entrapment Investigation and Review Guidelines.

Narrative

Introduction

On October 21, 1996, at approximately 1035 hours, arcing electrical power lines located by the Ventura Freeway at Los Virgenes Road in Calabasas started a fire in dry grass. An augmented brush assignment was dispatched by the LAC. The first unit on-scene reported a ¼-½ acre fire burning in medium brush, uphill, and with heavy winds. Rotary and fixed wing air units were used on the initial attack. The fire escaped initial containment efforts and moved to the south toward the ocean. Additional resources were requested and began to arrive in force by early afternoon. At approximately 1800 hours, the fire had burned to Pacific Coast Highway. Later in the evening the winds diminished, but continued to blow throughout the night. The speed of the fire's advance also diminished. However, it mushroomed to the east and west of the areas where it approached the ocean endangering many properties along Pacific Coast Highway neighborhoods.

Corral Canyon

Corral Canyon Road runs north from Pacific Coast Highway from a section of the coast that runs east and west. It is a very narrow two-lane road with many turns that generally follows a ridgeline on the western side of Corral Canyon. It has three areas of structures: several groupings along the coast, a tract of about 113 homes one and one half miles north of the ocean, called Malibu Hills, and a tract of about 80 homes about three miles north of the ocean, called Malibu Bowl.

The fire burned all afternoon and evening on October 21, 1996 on the eastern slopes of Corral Canyon. The fire burned downhill with the wind and made occasional runs back uphill, but remained primarily on the eastern slopes. It also made several serious runs in Piuma and Latigo Canyons threatening structures in those areas adjacent to Corral Canyon. Fire equipment was assigned to the areas where the fire was most threatening. Six strike teams under a Division Supervisor, each consisting of five Type 1 Engines and a Leader, were assigned to protect the houses in Corral Canyon should the fire come in that direction. Three Strike Teams were assigned in the Malibu Bowl tract, two were on the road approaching the tract, and one was assigned to the Malibu Hills tract. One of the strike teams in the Malibu Bowl tract was reassigned to Latigo Canyon during the night. All of Corral Canyon was designated as one division within the Incident Command System.

By the next morning, October 22, 1996, the fire had begun to move slowly back up the slope away from the ocean, against the wind. At the Plans briefing at 0600, the Incident Command staff noted that the fire area generally designated as Corral Canyon, and most specifically in the area of the Malibu Bowl portion of Corral Canyon, had a high potential for serious fire behavior. A large contingent of air support was assigned to pretreat the area that had not yet burned in Corral Canyon.

The incident objectives were to slow the fire's approach to the area in the event the wind continued to move the fire toward the upper tracts of homes from the northeast direction. If the wind changed and began to blow from the ocean as predicted, the fire's advance on the floor of the canyon would be slowed by the chemical and water pretreatment.

Late in the morning, at approximately 1100 hours, the northeast wind stopped and many people observed that the smoke from the fire was going almost straight up. A spot fire was observed on the western slope of Corral Canyon below the Malibu Bowl tract. Air units quickly attacked the spot fire. Very steep slopes and large amounts of unburned and dead fuel fed its progress up the canyon. The fire was advancing along the bottom of the canyon, making runs upslope, and spotting ahead of itself as it advanced.

Malibu Hills Tract

The Malibu Hills tract was generally on the opposite side of the western ridge of Corral Canyon and was only briefly threatened by the fire. The Division Supervisor assigned a LFD strike team to structure protection for this tract. Corral Canyon Road was heavily congested with many civilian vehicles, news vehicles, service trucks, and fire apparatus in this area. In addition, vehicles from the Malibu Bowl tract had to traverse this area to move to Pacific Coast Highway. The fire did not damage the Malibu Hills tract.

A pre-attack plan had been prepared and distributed for the tract, which defined a need for 20 fire engines to defend the tract from an approaching fire.

Malibu Bowl Tract

The Malibu Bowl tract overlooks Corral Canyon with a direct view to the ocean. A steeply sloped bowl (80% slope) had to be traversed by traffic along Corral Canyon Road to approach the Malibu Bowl tract. Corral Canyon Road split approximately half way across the bowl with the main road continuing further up-canyon and Newell Road bearing off to the east across the bowl toward houses in the tract. Most of the road across the bowl is midslope approximately 600 feet above the bottom of the bowl. Newell Road to Corral Canyon was the predominant route into and out of the tract for most residents. However, an alternate route was available further up Corral Canyon Road.

The terrain around the Malibu Bowl tract consisted of a very steep slope in the bowl that faced predominantly south to southeast as it went around away from the tract. This bowl had several smaller chimneys within it. The eastern side of the housing tract toward the main Corral Canyon was a gentler slope but still uphill at the tract. The hillside continued beyond the tract with some houses on the top of the hill. Most of the tract was midslope on a hill. The brush clearance varied considerably from very good to poor. The entire bowl was full of medium to heavy brush 4-6 feet deep right up to the side of the road. The native vegetation was not cleared along Corral Canyon Road and Newell Road from the saddle area south of the junction of Corral Canyon Road and Newell Road to the entrapment locations of LFD Engine 4, 10, and 17. Vegetation clearance from the access roadways in the Malibu Bowl area did not comply with the County of Los Angeles fire code in several areas. A prefire plan had been prepared and distributed for this tract, which called for a commitment of 20 engines.

The protection of the Malibu Bowl tract was set up in late afternoon of October 21, 1996. The plan was developed on the basis that the fire, as it approached the position of the fire fighters, would be driven by a wind from the northeast and would progress across the bottom of the canyon floor. It would move toward the houses located on the east side of the tract. A strike team was set up along the eastern edge of the tract to protect the houses that were determined to be most vulnerable to a fire approaching from that direction. A second and a third strike team were set up at various locations in the tract to protect in case of spot fires in the heavily wooded tract. One of these strike teams was reassigned to another division of the incident during the night. Only 10 engines were left in place, when the fire approached the next day.

One of the two strike teams was in place along the outer edge of the tract and had assigned engine companies specific sectors and houses to protect. GLN Engine 24 was assigned 2050 Newell, Burbank (BRK) Engine 16 was assigned 2004 and 2008 Newell, Pasadena (PAS) Engine 36 was assigned 1966 Newell, BRK Engine 14 was assigned to houses at the end of Newell and PAS Engine 31 was assigned in reserve. The home at 2006 Newell was determined to be indefensible as it was further down midslope, in a stand of trees with no brush clearance, and personnel had no way of establishing a safe escape route or safety zone.

The structure at 2050 Newell, which was assigned to GLN Engine 24, was on a point at the top of a ridge. It directly overlooked the large bowl area to its south toward the ocean. Two 1½" hoselines were placed around the house with one nozzle located on the patio to the rear of the house and the other, one level below the patio on a point of land. Escape routes were identified following the hoselines and a safety zone was established at the street. The approximate distance from the nozzle to the safety zone was 230 feet up a moderately sloped dirt and gravel path. A relatively safe area was reached at about 170 feet. The engine was placed on the street next to the driveway entrance and near a hydrant. Water pressure was about 200 pounds and volume seemed adequate. The structures at 2004 and 2008 were assigned to BRK

Engine 16. LAC fire suppression hand crews had cleared the brush for a width of 10-15 feet below these structures. Several hoselines were placed next to the houses and the brush was pretreated with water from the area cleared by the hand crews. The apparatus was placed between the two addresses in a driveway.

The other Strike Team in the tract was LAC Strike Team 1103 which had dispersed throughout the remainder of the tract to be able to respond to where the fire threatened most. One of the engines was at 1966 Newell and the remainders were at the top of the tract near Corral Canyon Road.

Communications

The Communications Plan for the Incident called for Command to be on LAC Command 3 and the Division to utilize Tactical NIFC Channel Three (168.050). Communications between the Division and the Strike Teams was on LAC Tactical 1. Camp Crews were operating on the crew net, Command 7 Direct. Each strike team was operating internally on their own channels (GLN on Red 5 Direct, LFD on their 22 or 23, LAC on Tactical 1). Communications occurred on Tactical 1 and Command 7 Direct. Neither LFD nor GLN were monitoring these frequencies at the company level and were not familiar with the Communications Plan for the incident. At the company level both GLN and LFD units were not familiar with the Communications Plan for the incident.

Approaching Fire

Fire fighters assigned to protect the houses in the tract watched the fire all morning from various vantage points. They observed the fire as it spotted south of the Malibu Bowl tract and prepared themselves to control the fire with their preplanned strategies. As the fire approached the tract coming up Corral Canyon from the south, the fire fighters staffed their hoselines.

The entire bowl area approaching the Malibu Bowl tract was a potential hazard. Many news, civilian, and fire vehicles were located on the road in this location and they were endangered throughout the time the fire approached the road.

The south facing hillside in the bowl had been preheated by the sun, was full of brush including sage and sumac, intermixed with die back, and was very steep, an 80% slope. The hazards of each of these factors individually were recognized, but the combination, along with the tremendous intensity of the fire was not recognized by the companies facing the fire. At 1225 hours, the fire was reported by the Helicopter Coordinator to be active in the base of the bowl area and building in intensity.

Strike Team 1202A Operations

The GLN Strike Team Leader assigned to the protection of the houses on the edge of the tract, and therefore, the first to defend against the fire, requested assistance as the fire approached. The Captain of GLN Engine 24 called for another company to support his position. He was advised by his Strike Team Leader that no other companies were immediately available.

The fire approached the Malibu Bowl tract from the east, running upslope on the east aspect of Corral Canyon towards 2004, 2006 and 2008 Newell Road. These structures were protected by BRK Engine 16 and PAS Engine 31. Hoselines were extended and the native vegetation was wet down between the structures and the advancing flame front. This tactic was not effective in stopping or slowing the approaching fire front. In the same time frame, GLN Engine 24 was attempting to apply a hose stream on the eucalyptus trees from a location above the structure located at 2006 Newell Road. This tactic was ineffective due to the long reach required and the winds generated by the fire. A LAC Fire Crew

Superintendent had walked out to the ridge near 2006 Newell Road to observe the advancing fire. He was contacted by radio from his lookout, which was positioned in the saddle area on Corral Canyon Road to the southwest. The lookout told him to get out; the fire was coming hard and fast. The Superintendent fired out in front of the advancing fire trying to buy time and space for the fire fighters and the structures. He escaped to the east passing Engine 16 and Engine 31 fire fighters. He ordered them to leave their position. This position was overrun by fire as they left. The Fire Crew Superintendent was not aware of Engine 24's personnel position on the hill above. BRK Engine 16 and PAS Engine 31 staffed hoselines and, along with an engine deck gun, successfully protected the houses at 2004 and 2008 Newell. The house further out on the point at 2006, which had been previously identified as indefensible, was engulfed in flames shortly after the fire reached the eucalyptus trees.

PAS Engine 36 was next engaged at 1966 Newell. The house they were protecting had excellent brush clearance. However, the personnel of the company chose to take refuge in the swimming pool to avoid the heat of the fire. They were successful in protecting their assigned structures. BRK Engine 14 was also protecting a structure where the advancing fire was knocked down by a helicopter before it reached the structure.

GLN Engine 24 was putting water on the brush and hillside below their position on the point. This was consistent with their plan from the previous day. They had planned to protect the house from a fire, which approached their location from the east. As the fire swept into the eucalyptus trees above the house at 2006 Newell and began to engulf the house, it was still primarily outside of the bowl area below Engine 24's location. There was, however, smoke beginning to come out of the center of the bottom of the bowl area indicating the fire had spread into the area below Engine 24 and was now imperiling everyone else that was above the bowl. Engine 24 personnel continued to operate the 1½" hoseline on the fire. They had some indication the fire was active below them because they could hear it, but could not see its activity through the thick brush about 40 to 50 feet below their location. The fire then began to spot in various points in the bowl including a large area across the bowl from Engine 24 and several small spots below the house. Engine 24's Captain then felt a blast of heat followed by a rain of embers on their position. He ordered his personnel to abandon their hoseline and to run up the primary designated escape route. He left following one fire fighter. The other fire fighter held his position for a few more seconds to cover the escape route, which then closed behind the Captain and first fire fighter. He dropped the nozzle and followed them through the smoke and fire up the escape route. They did not consider deploying their fire shelters.

The Captain, along with the fire fighter who had stayed with the nozzle, emerged from the smoke and heat at the top of the escape route near the house. The other fire fighter emerged from the smoke between 15 and 20 seconds later. He obviously was seriously burned: All three of Engine 24's personnel then retreated to the safety of the street.

The engineer of Engine 24 continued to pump his apparatus throughout the event. He was protected by two walls and a distance of about 15 feet to the edge of the bowl. As the fire rolled over him, he staffed his personal protection hoseline and knocked down fire in the bushes and trees next to his position.

Of the two possible escape routes that had been predesignated, one had become unsafe because of the unanticipated intensity and speed of the fire. The fire first came at Engine 24 from the east side cutting off the shorter escape route (which was anticipated), then up the middle and overhead making the route up the stairs to the safety of the house untenable. The third and designated primary escape route was clear

for the first person, but became hazardous as the second and third persons ran up its path. It was not anticipated that the fire would come this direction with the speed and intensity that it did after cutting off the other escape routes.

Strike Team 1103A Operations

LAC Strike Team 1103A was also assigned to the Malibu Bowl tract and was working with the GLN Strike Team Leader to coordinate protection for the houses in the tract. LAC Engine 3 from Strike Team 1103A was located near 1966 Newell and assisted in the protection of houses in that area as the fire approached. When the GLN Strike Team Leader requested help at 1225 hours, Strike Team 1103A Leader sent LAC Engine 25 to assist Engine 24. From a higher area of the tract Engine 25 traveled down Corral Canyon Road, traveled across Newell Road on a midslope road to assist Engine 24. Engine 25 encountered civilian vehicles at Corral Canyon Road and Newell Road and the Captain directed the vehicles out of the area. The company proceeded across Newell Road and reached the other side near Engine 24 just as the fire jumped the road at the intersection of Corral Canyon Road and Newell Road. His direction to the civilians probably saved their lives.

As Engine 25 entered the intersection of Newell Road and Fairside Way, they encountered more civilian traffic, which blocked the road. The Captain attempted to move the traffic out of the way so that his engine and the ones now stacking up behind him could get to safety and assist in the protection of the threatened houses. He eventually got the car blocking the road to move and his engine moved through, followed by LFD Engine 17. The crew of Engine 25 went to work to extinguish fires in the area and assist injured fire fighters.

LAC Engine 96 was also directed by Strike Team 1103A Leader to assist at BRK Engine 16's location. They came down Fairside Way and attempted to set up at Newell Road and Fairside Way, but were driven back up Fairside Way by the heat of the fire. They set up to protect houses in the area above Newell Road and on Fairside Way and extended lines around houses above their location. A civilian vehicle partially parked on their supply line, however, they had sufficient water to control the fire spread in their area.

The two other engines in Strike Team 1103A successfully protected houses in the upper areas of the tract by deploying hoselines and using Class A foam.

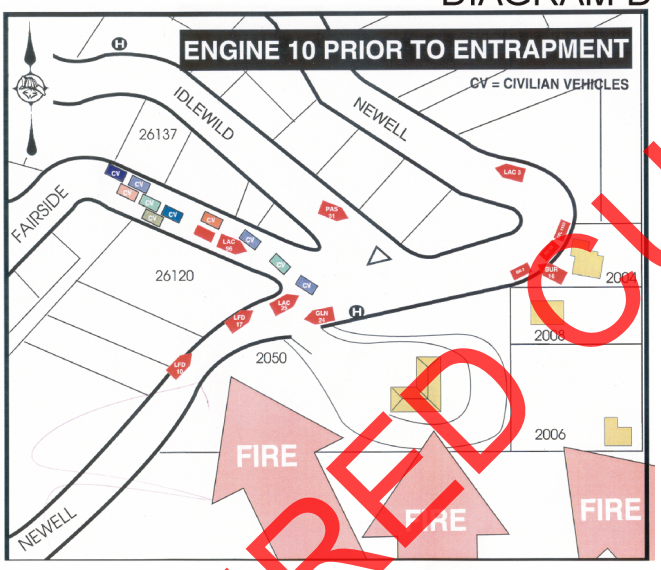
Strike Team 1001A Operations

LFD Strike Team 1001A was returning from the Incident Staging area to their assignment protecting homes in the Malibu Hills tract when they observed a large column of smoke and were requested by another LFD Strike Team Leader to respond to the Malibu Bowl tract. As they arrived at the edge of the bowl opposite the Malibu Bowl tract, Strike Team Leader 1001A was directed by the Division Supervisor to proceed across Newell Road with half the Strike Team to assist with structure protection in the tract. The other half was assigned to keep the fire from jumping Corral Canyon Road.

The 1001A Strike Team Leader did not consider the exposure of the road or observe the fire conditions below it prior to sending his companies across. Both the 1002A Strike Team Leader and the 1075A Strike Team Leader, who were located in the area of the start of the bowl, had previously reviewed the safety of the situation and knew the potential hazards of the road.

Three of the companies from Strike Team 1001A started up Corral Canyon Road to Newell Road. The first company, LFD Engine 17, was delayed by LAC Engine 25 who, as previously stated, was moving civilians and civilian automobiles from the intersection so they could make the turn Engine 17 started across Newell close behind Engine 25. They stopped at the opposite end of Newell just behind Engine 25 who had been blocked by another civilian vehicle. They notified Engine 25 of their presence by use of the air horn, but Engine 25 was blocked and could not move. The fire then blew up over their Engine with an explosive force. The Engine 17 Captain held his brush jacket against his window to cut down on the radiated heat. The Captain-side fire fighter climbed over the engine compartment for relief from the intense heat of the fire, which by then was engulfing the road behind them and impinging on the rear of their apparatus. The Engine 17 Captain saw in his side mirror that LFD Engine 10 behind them was being overrun by the fire. LAC Engine 25 moved ahead again and Engine 17 moved out of direct fire contact past GLN Engine 24. As soon as they were able to make it to safety, LFD Engine 17 moved as quickly as possible to pull a line back to rescue the personnel of Engine 10 behind them (See Diagram D). The second 1001A Strike Team engine to start across the bowl road was LFD Engine 10. Engine 10 followed about 50-75 feet behind Engine 17, due to smoke and poor visibility. The engineer from Engine 10 was dressed in his blue work shirt and brush pants and had not taken an opportunity to put on his safety equipment. The rest of the company was dressed in full safety equipment. Engine 10 got through the intersection of Corral Canyon Road and Newell Road quickly and was moving across the Newell Road section of the road when it was hit by the main body of the fire. The engineer attempted to keep the apparatus as close to the base of the cut bank as possible but eventually was forced to come to a stop because Engine 17 had stopped in front of them. After the apparatus was stopped, the vehicle engine stalled from ingesting the heavy smoke. The Captain-side fire fighter on Engine 10 jumped over the engine compartment and attempted to deploy his fire shelter. However, he lost the shelter in the smoke and heat and was unable to find it again. The driver-side fire fighter successfully opened his shelter in his jump seat. The engineer tried to deploy his shelter, but could not open it because of the extreme heat on his ungloved hands. He joined the fire fighter in the jump seat area under the partially deployed shelter and was additionally covered by the body of the other fire fighter who then pulled the shelter over the three of them. The Captain slid over to the driver's seat and attempted to restart the engine. He was unable to do so. He then exited the cab on the engineer's side and joined the remainder of his crew under the shelter. He was only able to get his upper body under the shelter. He radioed from under the shelter that they were being overrun and that he had burned personnel. He also requested an air ambulance, and water drops on his position. During this time, he was able to calm his personnel. The Captain again returned to the driver's seat and attempted to restart the engine.

DIAGRAM D



Flames were wrapping around the vehicle windshield. It would still not start, so he returned to his personnel under the shelter. Engine 17 personnel arrived with a hoseline after an estimated three minutes of entrapment. The Engine 10 engineer received serious burns. The Captain-side fire fighter received minor burns. The other fire fighter and the Captain were in heavily layered personal protective equipment, used a fire shelter as a shield, and received only minor injuries. The Captain suffered smoke inhalation.

The third engine in Strike Team 1001A which was on its way to Newell Road was LFD Engine 4. Engine 4 proceeded to the Corral Canyon and Newell Road intersection and stopped next to a hydrant as they missed the order from Strike Team Leader 1001A. The fire then overran the intersection and Engine 4 attempted to escape further up Corral Canyon, but stalled almost immediately due to extreme heat and smoke conditions. The engine restarted and Engine 4 was able to escape up Corral Canyon. Three members of the company were later treated for smoke inhalation.

The fourth and fifth engines in the Strike Team were LFD Engines 20 and 21. Both these engines were positioning to keep the fire from jumping Corral Canyon Road when the fire jumped over the road ahead of them with reported 200-foot flame lengths. They both retreated to the saddle entrance of the bowl road with their Strike Team Leader.

Strike Teams 1002A, 1003A and 1075A Operations

Strike Teams 1002A and 1075A were located in the saddle area where Corral Canyon Road opens to become a midslope road over a bowl. Culver City Strike Team 1075A, with engines from Culver City, Santa Monica, and Beverly Hills was assigned to support a Camp Crew that was doing a minor firing operation. LFD Strike Team 1003A was assigned structure protection at the Malibu Hills tract and eventually was involved with the medical treatment of the injured fire fighters and coordination of the helispot. LFD Strike Team 1002A was assigned to protect structures in the Malibu Bowl tract and was preparing to move to the houses when the fire blew across the road cutting off their access to the tract. They eventually participated in the medical treatment of the injured fire fighters.

Medical Treatment and Evacuation

When the fire fighters from Engine 24 reached their Safety Zone, they were met by the Branch Director who was surveying the area. The Branch Director treated the most seriously burned fire fighter in his car and transported him to Strike Team 1002A's location across the Bowl for further medical treatment. He then continued to arrange for an emergency helispot along Corral Canyon Road near the Malibu Hills tract. The Branch Director requested an Air Squad directly through the Helicopter Coordinator.

The area Safety Officer then arrived at Engine 24's location and recognized the burns to the second fire fighter on Engine 24. The Safety Officer transported the second GLN fire fighter to the emergency helispot.

The personnel from Engine 10 were rescued by the crews of Engine 17, Engine 20, and Engine 33 who had come to their aid. As they approached Engine 17's location, they were able to commandeer a civilian vehicle, which they used for transportation to the emergency helispot. The LFD Strike Team Leaders arranged directly through LFD Operations Control Division (OCD) for LFD Fire 1 to evacuate their injured fire fighters. This was a very hazardous operation because of the continued presence of fixed wing aircraft and heavy helicopters that were involved in fire fighting activities in the area near the emergency helispot.

All injured personnel from GLN Engine 24 and LFD Engine 10 were transported by LFD Fire 1 and LAC Air Squad 8 to UCLA Medical Center for immediate treatment. Four were subsequently transferred to Sherman Oaks Burn Center for more specific treatment for their burns. It is estimated that all the injured fire fighters were at UCLA Medical Center within 50 minutes from the time of the injuries.

Findings

The findings listed in this report are supported by interviews, witness statements, physical evidence, standard forms, and other information that are held in the Calabasas Entrapment Analysis File.

Environmental

- ❒ The fuel below the entrapment area consisted of Blue Sage and California Sage. The fire burned in a Northern Forest Fire Laboratory (NFFL) Model 4 fuel type (brush)
- ❒ Below the entrapment area, the slopes were 75%-80%.
- ❒ Temperatures at the entrapment site were 72°F.
- ❒ Relative humidity at the entrapment site was 14%.
- ❒ Spot weather forecasts indicated that north winds would decrease during the day and might be replaced by onshore winds in the afternoon near the coast.
- ❒ The area involved in the incident partially burned in the 1982 Dayton Canyon Fire.
- ❒ Live fuel moistures were extremely low and below the 15-year average for live fuel moistures in the Malibu area.
- ❒ The slope below GLN Engine 24's location was primarily a south aspect. The slope below LFD Engine 10 and 17's entrapment site was primarily a southeast aspect.
- ❒ There were three "chimneys" within the bowl area.
- ❒ Brush clearance (both ornamental and native) around structures in the Malibu Bowl area was not in full compliance with the County of Los Angeles fire code.
- ❒ Brush clearance along access roadways did not comply with the County of Los Angeles fire codes.
- ❒ Access roadways in the Malibu Bowl area do not comply with current County of Los Angeles minimum requirements (existing nonconforming).

Management

- ❒ The incident began on October 21, 1996 at 1035 hours, near the 101 Freeway east of Las Virgenes Road.
- ❒ LAC Incident Management Team 3 was in command of the fire.
- ❒ Division Z encompassed Corral Canyon from Pacific Coast Highway to Mesa Peak Motorway, a distance of approximately 5 miles.
- ❒ The IAP indicated Division Z had five Type 1 Engine Strike Teams.
- ❒ In addition, Division Z also had Strike Team 1202A assigned to the Malibu Bowl area, one L.A. County long crew and a dozer team. One field observer and one safety officer had just arrived in the Malibu Bowl area at the time the fire became active.

- ❒ Day Division Z Supervisor assumed command of Division Z from night Division Z at approximately 0830, October 22, 1996.
- ❒ Branch II arrived at BRK Engine 16's location just before the entrapment. Day Operations had observed the Malibu Bowl area 30 minutes before entrapment.
- ❒ GLN Engine 24's Captain had approximately one hour of rest after he stopped observing the fire on October 22, 1996.
- ❒ GLN Engine 24's Captain had also worked a 24-hour shift on the 20th of October and had performed emergency work during sleep hours.
- ❒ GLN Engine 24's Captain had 2 years experience as a USFS Engine fire fighter.
- ❒ The fire was not visible directly below GLN Engine 24's position.
- ❒ GLN Engine 24's Captain was aware of the fire's approximate location, directly below them.
- ❒ GLN Engine 24's Captain had observed from 26120 Fairside Road, the fire's build up in the Bowl.
- ❒ There was a written medical evacuation plan, ICS Form 206, Page H-52.
- ❒ The medical evacuation plan was not followed in regards to the notification procedure.
- ❒ Medical evacuation was accomplished in a timely manner.
- ❒ Dedicated lookouts were not assigned in Division Z.
- ❒ GLN Engine 24's Captain identified two safety zones and two escape routes.
- ❒ GLN Engine 24's Captain performed a PPE safety inspection just before the entrapment.
- ❒ GLN Engine 24's crew complied with GLN PPE requirements. Engine 24's crew was wearing approved wildland PPE.
- ❒ County of Los Angeles Fire Department Wildland Pre-Attack Information Plans indicated a need for 20 Engines in the Malibu Bowl housing tract. Only two strike teams (10 fire engines) of Type 1 Engines (1103A and 1202A) were in place in the Malibu Bowl before the entrapments occurred.
- ❒ County of Los Angeles Fire Department Wildland Pre-Attack Information Plans indicated 20 Engines for the Malibu Hills housing tract also in Division Z.
- ❒ Calabasas Incident resource order requested Chief Officers for Overhead.

Controls

Organizational System

- ❒ The span of control for the Operation's Chief, Branch II Director & Division Z Supervisor was within ICS guidelines.
- ❒ The large geographic size of Division Z made operations difficult. The assignment of six engine strike teams (30 fire engines) and two hand crews were at the limit of the span of control guidelines. In the operational period following the entrapments, this area was divided into two divisions.

City of Glendale Fire Department

- ❒ Strike Team 1202A consisted of five Type 1 Engines and a Battalion Chief vehicle.
- ❒ There were four members assigned to GLN Engine 24.
- ❒ Strike Teams 1103A and 1202A were deployed in the Malibu Bowl area.

- ❒ Strike Team 1202A's span of control was within the ICS guidelines.
- ❒ The fire in the bottom of the canyon was not visible to GLN Engine 24's crew.
- ❒ Approximately 45 minutes passed until the most critically burned fire fighter arrived at UCLA Medical Center.

Los Angeles City, Fire Department

- ❒ Three LFD Strike Teams of Type 1 Engines were assigned to Division Z.
- ❒ Strike Team 1001A consisted of five Type 1 Engines and a Battalion Chief vehicle.
- ❒ Strike Team 1002A was on Corral Canyon Road approximately 1800 feet south of the entrapment area.

Incident Command and Control Issues

- ❒ There was no mandatory evacuation of the Malibu Bowl residential area on October 22, 1996. Civilian access to the Malibu Hills and Malibu Bowl areas was restricted to residents of the area only.
- ❒ There was no control of civilian vehicles on Corral Canyon Road between the Malibu Hills residential area and the Malibu Bowl residential area. Residents, media, and utility crews were allowed unrestricted access to this area.
- ❒ When fire activity increased in the Malibu Bowl area, a number of civilians who had been in their houses for several hours, attempted to evacuate the area. This movement of civilian vehicles hindered fire-fighting operations once the fire became reactive.
- ❒ Several civilian onlookers were parked at Corral Can Road and Newell Road. These civilians were directed out of the area by LAC Engine 25 approximately 2 minutes was entrapped at that general location.

Communications

- ❒ The radio communications plan for the first day of the Calabasas Incident was listed in the first Incident Action Plan. The tactical channel was LAC Tac 1 (154.430).
- ❒ The radio communication plan for the October 22, 1996, 0600-1800 hours operational period (second day) changed the Division Z tactical channel to VHF Bendix-King Channel 3 (168.050). This new communication plan was listed in the IAP distributed during the morning Operations Briefing. This change in the tactical channel caused some confusion among LFD personnel who were issued loaner hand held radios.
- ❒ Division Z tactical radio traffic appears to have continued on LAC Tac 1 after 0600 hours on October 22, 1996. This was not consistent with the communication plan in the IAP that designated NIFC 168.050 as the correct tactical channel for the day.
- ❒ Communication on the tactical channel in use before the entrapment was not a problem. After the aggressive run uphill by the fire, the communications system was overloaded. Many radio messages were not acknowledged.
- ❒ Strike Team 1202A Leader was unaware the tactical channel had changed from White 1 (154.430) to VHF Bendix-King Channel 3 (168.050) at 0600 hours on October 22, 1996.
- ❒ At the time of the entrapments, LAC Command frequency Blue-3 was essentially out-of-service, due to an open microphone.

- ❒ There was confusion among LFD Strike Team Leaders on how to use the hand held radios issued to them by LAC.
- ❒ LFD Strike Team 1001A and 1002A were each using a different 800 MHZ channel (22 and 23). The Strike Team Leaders could not easily communicate with each other by radio when the entrapments occurred.
- ❒ GLN Engine 24 had both UHF and VHF hand held radios available. At the time of the entrapment, GLN Engine 24's Captain carried only the UHF radio that monitored a GLN TAC frequency.
- ❒ Interference from radio stations transmitting from Mexico became a problem on October 23, 1996 when additional radio repeaters were installed in the general area of the Calabasas Incident. This interference was not a factor in the entrapments.
- ❒ Personnel

City of Glendale Fire Department Personnel

Engine 24	Member 1, Age 38:	minor burn
	Member 2, Age 46:	no injuries
	Member 3, Age 52:	major burns
	Member 4, Age 42:	moderate burns

- ❒ Three members of GLN Engine 24 were entrapped while escaping to their safety zone.
- ❒ All personnel had training in shelter deployment. However, no training was conducted in deploying fire shelters in simulated wind conditions and dynamic deployment in the 1996 calendar year.
- ❒ This was the first entrapment situation for all members of Strike Team 1202A.
- ❒ Members of Strike Team 1202A had been assigned to the Calabasas Incident for approximately 24 hours, at the time of entrapment.
- ❒ The uninjured members of Strike Team 1202A remained on duty after the entrapment and were demobilized at approximately 2100 hours on October 22, 1996.
- ❒ Engine 24 Captain had 16 years job seniority, 5 years in rank, and 2 years as a USFS Engine fire fighter.
- ❒ The Strike Team Leader of Strike Team 1202A had been a Battalion Chief for twenty months. This was his first assignment as a Strike Team Leader at a wildland incident.
- ❒ Strike Team Leader 1202A had completed Strike Team Leader training offered by the Burbank Fire Department in September 1996.
- ❒ Scientific analysis of PPE belonging to the critically burned fire fighter revealed: "The best fit of the observed data and burn patterns indicates brief flame contact off the ground with a longer exposure on the ground."

Los Angeles City Fire Department Personnel

Engine 10	Member 5, Age 38:	smoke inhalation
	Member 6, Age 42:	burns
	Member 7, Age 29:	burns
	Member 8, Age 30:	smoke inhalation

Engine 4	Member 9, Age 41:	smoke inhalation
	Member 10, Age 43:	smoke inhalation
	Member 11, Age 26:	smoke inhalation
	Member 12, Age 31:	no injuries

- ❒ Four members of LFD Engine 17 were entrapped on their apparatus, but not injured.
- ❒ All LFD personnel on Strike Team 1001A had not been trained in the deployment of fire shelters under simulated wind conditions and dynamic deployment in the 1996 calendar year.
- ❒ Two members of Strike Team 1001A had previous wildland fire fighting experience with a hand crew for the U.S. Forest Service or County of Los Angeles Fire Department. These two members were the only members on Strike Team 1001 to immediately recognize the danger when they drove north of the "saddle" area on Corral Canyon Road.
- ❒ Members of Strike Team 1001A had been assigned to the Calabasas Incident for approximately 27 hours at the time of the entrapment.
- ❒ The uninjured members of Strike Team 1001A remained on duty after the entrapment and were relieved at approximately 1000 hours on October 23, 1996.
- ❒ The Engine Captains in Strike Team 1001A had from 1½-13½ years seniority in their rank.
- ❒ The Strike Team Leader of Strike Team 1001A has been a Battalion Chief for eighteen months. He was not assigned to a wildland area. This was his fourth assignment as a Strike Team Leader, at a wildland incident.
- ❒ Strike Team 1001A Leader had completed Division Supervisor training offered by the U.S. Forest Service, in 1995.

Other Command Positions

- ❒ The County of Los Angeles Fire Department, Los Angeles City Fire Department, Glendale Fire Department, and California Department of Forestry and Fire Protection have no experience-based requirement for overhead positions in wildland fires.

Equipment

City of Glendale Fire Department

- ❒ All members were wearing full wildland personal protective equipment as specified in GLN Training Bulletins.
- ❒ Fire shelters carried by Engine 24 personnel complied with USFS specifications.
- ❒ None of the Engine 24 personnel deployed their fire shelters.
- ❒ Analysis of PPE belonging to the critically burned fire fighter concluded: "Overall, the Nomex and other protective clothing and equipment, all functioned within their designed limitations and helped to reduce burn injury."

Los Angeles City Fire Department

- ❒ Not all members of Strike Team 1001A were wearing their personal protective equipment.
- ❒ Some members of Strike Team 1001A wore a mix of wildland and structure fire personal protective equipment.

- ❒ Three members of LFD Engine 10 attempted to deploy their fire shelters. Only one was successful at opening the shelter.
- ❒ All members of Strike Team 1001A had fire shelters available for their use.
- ❒ One fire fighter on LFD Engine 10 utilized his fire shelter as a shield. Ultimately all members of LFD Engine 10 took refuge under this fire shelter.
- ❒ The engineer on LFD Engine 10 attempted to deploy his fire shelter, but was unsuccessful. This fire shelter was later used by personnel from LFD Engine 17 to shield the engineer from LFD Engine 10, as he was escorted on Newell Road.
- ❒ One fire fighter on LFD Engine 10 attempted to deploy his fire shelter, but had it accidentally knocked from his hands.
- ❒ The Captain on LFD Engine 10 was unable to find his fire shelter, as he prepared to exit the cab.
- ❒ Many members of Strike Team 1001A wore fire fighting hoods instead of their helmet shrouds. Personal protective equipment functioned within designed limits.
- ❒ The apparatus on Strike Team 1001A were a mix of fully enclosed and partially enclosed Type 1 Engines. Engines 17, 10, and 4 were partially enclosed apparatus. Engines 20 and 21 were fully enclosed apparatus.
- ❒ LFD Engine 10 sustained approximately $30,000 damage because of the entrapment. The cab area was not breached and the vehicle was road worthy.
- ❒ LFD Engine 17 sustained approximately $5,000 damage because of the entrapment. The damage was confined primarily to the equipment on the right rear of the apparatus.
- ❒ A Strike Team Leader was operating in a vehicle with a right front window broken and missing. This allowed heat, smoke, and embers to enter the vehicle. Repair was available through Ground Support Unit.

Medical Evacuation and Emergency Medical Service Operations

- ❒ The six members of GLN Engine 24 and LFD Engine 10 were injured at approximately 1244 hours on October 22, 1996. These two separate incidents occurred within the same event. The initial medical treatment and transportation of the injured members is summarized below.

GLN Engine 24 Injuries

- ❒ GLN Engine 24 members were given first care when they exited north of 2050 Newell Road, near PAS Engine 31. This area was chosen because it provided a safe haven to administer care to the more seriously burned fire fighter. All of the personal protective gear from the critically burned GLN fire fighter was removed at this location and saline solution was poured over him by members of GLN Engine 24. The other less seriously burned GLN fire fighter was neither treated nor transported at this time, because his injuries were not immediately apparent to those around him.
- ❒ Branch II Director and his fire fighter/paramedic driver transported the critically burned GLN fire fighter off the hill, to a cut out parking area, approximately one-quarter mile south of the Corral Canyon Road and Newell Road intersection. LFD EMTs and paramedics removed his remaining clothing, applied additional saline and wrapped him in sheets. He was placed back in Branch H's sedan and transported to Corral Canyon Road and Seabreeze Drive for air evacuation. En route, a LFD paramedic rode with him, took his vitals, and administered oxygen. At the helispot, LFD paramedic

Engine 47 was standing by and initiated paramedic intervention. LFD paramedics attempted to establish base station contact several times, but were unsuccessful. Several attempts by cellular phone also failed, and UCLA Medical Center was finally contacted by LFD Dispatch Center and advised to stand by to receive the burned fire fighters. The critically burned GLN fire fighter was loaded into LFD Helicopter Number 1 (Fire 1) with the paramedics from LFD paramedic Engine 47 and transported to UCLA Medical Center. The critically burned GLN fire fighter was stabilized at UCLA and then transferred to Sherman Oaks Burn Center.

- ❒ At the time the critically burned GLN fire fighter was being treated on Corral Canyon, four injured LFD fire fighters were being prepared for transportation to the helispot for evacuation by helicopter. While the four LFD members were being treated at Newell Road and Fairside Road, a LAC Safety Officer (Safety 8) found the second injured GLN fire fighter and put him in his Safety Officer's van. The LAC Safety Officer gave the injured fire fighter some saline and a towel to help cool the burn. The LAC Safety Officer left the area of Newell Road and Fairside Road just before the civilian van with the LFD fire fighters. The LAC Safety Officer transported the second injured GLN fire fighter to the helispot at Corral Canyon Road and Sea Breeze Road, where an I.V. was established, oxygen administered and he was prepared for helicopter transport to UCLA Medical Center. The second injured GLN fire fighter was placed on LAC paramedic Air Squad 8, with the two remaining LFD fire fighters. All three injured members arrived at UCLA Medical Center by 1336 hours. The two GLN and one LFD fire fighters were eventually transferred to Sherman Oaks-Grossman Burn Center later the same day.

LFD Engine 10 Injuries

- ❒ Burns immediately occurred as soon as the Engine 10 engineer exited the cab to deploy a shelter. Other members covered the engineer with their bodies and shielded the engineer with a partially deployed shelter. Water was applied to burns during the entrapment. All four members huddled together in the jump seat under the shelter. From the entrapment site, they were assisted by other fire fighters to a safe area at the intersection of Newell Road and Fairside Road. They were treated with saline solution and wrapped in sheets.
- ❒ From this location, they were led to a civilian owned van and loaded for transportation down the hill. The van owner had given permission to use the van for this purpose. Two LFD paramedics from LFD Engine 33 arrived and rode to the helicopter-landing site with the four injured fire fighters. At the landing site, they were triaged and given additional paramedic treatment. The two most seriously burned LFD members were loaded into LFD Fire 1, along with the critically burned GLN fire fighter, and then transported to UCLA Medical Center.

Prehospital Care Trauma Protocols

- ❒ The decision was made to transport the critically burned GLN fire fighter to UCLA Medical Center due to his seriously compromised airway. The second group of victims on Air Squad 8 was transported to UCLA Medical Center to maintain continuity of care as the UCLA Medical Center Emergency Room could handle all six members. UCLA Medical Center was contacted by the flight paramedics, before arrival of both air ambulances.
- ❒ The Medical Plan in the IAP for this operational period (0600-1800 hours, October 22, 1996), indicated UCLA Medical Center as the closest trauma center. County of Los Angeles prehospital care trauma protocols were followed in ensuring the care of the personnel injured during this incident.

Medical Evacuation and Emergency Medical Service Operations (Times are approximate)

1244 Radio transmission heard on TAC 1, Strike Team 1001A Leader requesting an Air Ambulance.

1246 LAC Air Squad 8 self dispatches from Camp 8, after overhearing radio transmission.

1251 LAC Air Squad 8 lands on a clearing west of dedicated helispot (71-A) in Malibu Bowl area. Made contact with LAC Engine 27. LAC Air Squad 8 attempted to contact LFD Fire 1 with no success. LFD helicopter Fire 1 dispatched to Corral Canyon Road and Sea breeze for helicopter transport.

1300 LAC Air Squad 8 lifted off and followed LFD Fire 1 down Corral Canyon Road and saw LFD Fire 1 land at a helispot near Sea Breeze and Corral Canyon road.

1310 LFD Fire 1 left helispot with three victims. LAC Air Squad 8 landed and began loading additional victims.

1323 LFD Fire 1 landed at UCLA Medical Center and shut down.

1325 LAC Air Squad 8 left helispot for UCLA Medical Center.

1327 LAC Air Squad 8 contacted UCLA Medical Center and was ordered to transport all victims to that facility.

1336 LAC Air Squad 8 landed at UCLA Medical Center and shut down.

1541 LAC Air Squad 8 lifted off to transfer one GLN fire fighter to Sherman Oaks Burn Center.

1550 LAC Air Squad 8 arrived at Sherman Oaks Burn Center.

1623 LFD Fire 1 transferred one GLN fire fighter and one LFD fire fighter to Sherman Oaks Burn Center.

1624 LAC Air Squad 8 lifted off to return nurse to UCLA Medical Center.

Injuries and Personal Protective Equipment

Note: Refer to diagrams and photos for each member.

GLN Member 1

❒ GLN Member 1 wore brush pants over work pants, brush jacket over a short sleeve T-shirt, helmet with ear flaps down, goggles and gloves. GLN Member 1 was able to escape complete entrapment by running 170 feet in less than 30 seconds with fire impinging from the left side and from behind. Injury sustained: small second-degree spot on the left side of neck. GLN Member 1 did not feel the need to deploy his shelter.

GLN Member 2

❒ GLN Member 2 was not entrapped.

GLN Member 3

❒ GLN Member 3 wore brush pants over work pants, brush jacket over a long sleeve T-shirt, helmet with ear flaps up, fire fighting hood around neck, goggles, bandana, and gloves.

❒ GLN Member 3 was able to exit the entrapment area (170 feet in less than 40 seconds) but sustained burns to 70% of the body. GLN Member 3 did not deploy shelter.

❒ GLN Member 3's cotton bandana burned through. Cotton chars at 475°F and auto ignites at 750°F. Nomex chars at 824°F and auto ignites at 1300°F. A long sleeve T-shirt under a brush jacket with

substantial flame impingement on GLN Member 3 failed to prevent serious burns. Double layering from head to toe, reduced the severity of the members burns.

GLN Member 4

- ❒ GLN Member 4 wore brush pants over work pants, brush jacket over a long sleeve T-shirt, helmet over a fire fighting hood, goggles and gloves. GLN Member 4 ran 170 feet in less than 30 seconds with flame and heat impinging on the left side and heat impinging on the left side and from the rear. Injury sustained: Second- and third-degree burns to left elbow, left ear, and left side of face. GLN Member 4 did not deploy shelter. If the fire-fighting hood was not placed on GLN Member 4, a substantial increase in facial and ear burns would have occurred.

LFD Member 5

- ❒ LFD Member 5 wore turnout pants over work pants, brush jacket over work shirt, long sleeve T-shirt and a short sleeve T-shirt, helmet over a fire fighting hood, goggles, and eyeglasses.
- ❒ LFD Member 5 was able to exit the cab, check on crew, re-enter cab to start engine, return to crew under shelter, and exit shelter to check the environment. LFD Member 5 used body to protect the crew while sharing the shelter. No injuries were sustained. LFD Member 5 was able to continue functioning during the entrapment due to layering and use of some structure fire fighting clothing.

LFD Member 6

- ❒ LFD Member 6 wore brush pants over work pants and a short sleeve T-shirt. LFD Member 6 could not deploy a shelter due to instantaneous burns upon exiting cab. LFD Member 6 huddled with other crewmembers under a single shelter in a jump seat. LFD Member 6 sustained second- and third-degree burns to both arms below the short sleeve line. LFD Member 6 also received second-degree burns to spots on the neck and back.

LFD Member 7

- ❒ LFD Member 7 wore brush pants over work pants, brush jacket over a long sleeve T-shirt over two short sleeve T-shirts, helmet with shroud over fire fighting hood. LFD Member 7 retreated to unexposed jump seat, shielded other members with his own body under a single shelter. LFD Member 7 sustained 2nd and third-degree burns to upper back, left elbow, forehead, and ears.

LFD Member 8

- ❒ LFD Member 8 wore brush pants over work pants, brush jacket over work shirt over long sleeve T-shirt and short sleeve T-shirt, helmet with shroud, eyeglasses, and gloves. LFD Member 8 opened a fire shelter and partially deployed it. LFD Member 8 stayed in jump seat while other crewmembers huddled on top under one shelter. LFD Member 8 sustained minor smoke inhalation. Long sleeve T-shirts provided additional protection for LFD Members 5, 7, and 8 during their entrapment.

LFD Members 9, 10, and 11

- ❒ LFD Members 9, 10, and 11 were placed off duty with smoke inhalation injuries. At the time their injuries were incurred, they were not wearing respiratory protection. These injuries occurred during structure and rescue operations immediately after the entrapment. There are no photographs of LFD members 9, 10, and 11's PPE included in this report.

Case Study 2: The Concow Fire

Rescue Burn Incident
Butte Unit/Coast Cascade Region
CDF Green Sheet/California Department of Forestry and Fire Protection
Report: September 20, 2000

Summary

On Wednesday, September 20, 2000 at approximately 0225 hours, a CDF/Butte County fire engine was participating in structure protection operations on a wildland fire and was involved in a burnover incident resulting in injuries to a CDF Fire Captain. A civilian died when she was trapped in her home that burned. The Captain was burned as he attempted to rescue the civilian.

Conditions

The structure was a single wood frame; wood sided dwelling with an aluminum roof. A detached garage was connected to the house by a roof, creating a breezeway of about 5 feet. The garage was used for storage and provided a heavy fuel load and excellent fuel bed on the fire side of the structure. The structure sat on top of a knoll, with gentle slopes on the fire side with pasture and star thistle. The fire was driven down a hillside of heavy fuel (gray pine, manzanita, probably over 90 tons per acre) until it crossed Stagecoach Lane. At this point, the fire was driven by the now heated winds across the field of star thistle and into the structure.

Weather

The temperature was about 84°F and relative humidity about 27%. The wind speed was unknown, but estimated by ground forces as strong gusts to 20 mph or greater. Flames and smoke were blowing the fire horizontally along ground level. Winds shifted from the east and south.

Sequence of Events

During the course of structure protection operations, Butte County Engine 71, staffed with a CDF Fire Captain and Fire Fighter 1, responded to a structure on Stagecoach Lane in order to protect the structure and the resident therein. E-71 was backed in at the structure, two 200-foot 1½" hoselines were deployed and charged, and contact was made with the occupant. As the fire approached, the wind pushed a sheet of flames towards the structure near ground level. Wind shifts brought fire to the structure from multiple directions. Heavy fuels to the sides and rear of the house, including manzanita and live oak, contributed to direct flame impingement of the house. The garage ignited and rapidly became heavily involved, sending fire into the attic of the house. The Captain determined that it was necessary to take the occupant in the engine and evacuate the area. The Captain instructed the fire fighter to disconnect the hoselines and take the engine out of pump, while he (the Captain) went into the structure and got the occupant. When the Captain contacted the occupant, she refused to leave the structure without her three dogs. After failing in his efforts to convince the occupant to leave without the dogs, the Captain assisted her in looking for and retrieving the dogs. Upon leaving the structure, the Captain and the occupant encountered heavy wind driven flames, heat, and smoke conditions.

They retreated into the structure, which was now on fire in both the attic and interior. Fire conditions quickly worsened inside the structure and the Captain attempted to persuade the occupant to follow him back to the engine. Heat and smoke conditions forced both of them to floor level, and rollover conditions were occurring, blocking exit by the doors. They retreated to the back bedroom, with a window above the bed as the only viable exit. The occupant was lying against a bed, and appeared to have been affected by fire gases. She was unable to assist with her own rescue, and it was impossible for the Captain to force or drag her across the bed and through the window. The Captain continued his rescue efforts until being burned and it became apparent that rescue of the occupant would be impossible. For him to remain inside the structure any longer would result in his own death. He then exited through the window, jumping head first through the flames.

After the Captain exited, the structure rapidly progressed to full involvement and eventually burned completely to the ground. The Captain made it into the cab of the engine, where the fire fighter had found refuge. The engine was moved into the burned over pasture area as a safety zone, and the crew remained there until help arrived.

The fire fighter was not injured. The Captain sustained burns to his hands, face, and back.

Injuries

The Captain sustained burns to his hands, face, and back, totaling approximately 5% first- and second-degree burns. Full wildland personal protective equipment was in use, including gloves. In addition, the Captain was wearing a medical style facemask over his mouth and nose.

The facemask sustained damage on its exterior surfaces, and was in good condition on its interior, indicating that use of the mask may have reduced potentially serious injuries to the Captain's airway.

Burn injuries to the Captain's back include a legible "C" and "F" which appear to have resulted from the "CDF" lettering on his uniform T-shirt. (The "D" was covered by web gear.) A second "F" from the word "FIRE" was also legibly burned in his back.

Damage

Visual inspection of the engine revealed minor damage, including to a fabric hose bed cover and tread damage to one tire along an exterior tread edge consistent with contact with the hot ground.

Safety Issues for Review

- ❒ The position of the engine and deployment of lines was consistent with standard I-Zone operations.
- ❒ The use of a facemask, while not approved or issued safety gear, appears to have significantly reduced the injuries to the Captain, especially to his airway.
- ❒ It appears the type of ink used in the printing of the blue CDF uniform T-shirt may have contributed to the burn injuries on the Captain's back, resulting in burns in the legible shape of the lettering of the T-shirt.

Case Study 3: The Devil Fire

Santa Clara Complex
Wildland Fire Entrapment/Fire Shelter Deployment Review
California Northern Region
CDF Green Sheet/California Department of Forestry and Fire Protection
Report: August 29, 2003

Summary

On August 29, 2003, at approximately 0115 hours, three CDF Inmate Conservation Camp Fire Crews, two dozers (one local government and one private), and two CDF overhead personnel became entrapped on the Devil Fire within the Santa Clara Complex while conducting a holding operation. Due to the entrapment, fifty-three fire shelters were successfully deployed, and two dozer operators took refuge in their enclosed cabs. During the deployment, two CDF employees and one inmate received second-degree burns. The burns were no larger than ½ inch in diameter. All personnel were treated and release back to the incident by the Disaster Medical Assistance Team (DMAT) later that day.

Conditions

General Location

- ❒ Seven miles SE of Livermore, Alameda County
- ❒ Latitude N 37 degrees 28.854, Longitude W 121 degrees 32.845

Fuels

- ❒ Point of origin-Fuel Model 3 [Grass and Oak Woodland, with scattered Pine]
- ❒ Deployment Site-Fuel Model 4 [Chamise, Manzanita, Scrub Oak, and scattered Pine]
  - Heights of 8-14 feet
  - 30 to 50 years old
- ❒ Live Fuel Moistures-69%-76%. Based on nearby Remote Automated Weather Stations (RAWS) Rose Peak and Mt. Hamilton
- ❒ Dead Fuel Moistures (Rose Peak RAWS) 10 hour and 100 hour fuel @ 5; 1000 fuel @ 9

Topography

- ❒ Elevation at deployment site: 3,700 feet
- ❒ Western slope (east aspect) had slopes of 73%-80%, below deployment
- ❒ Site going into the drainage to the west (Eylar Canyon)
- ❒ Eastern drainage (west aspect) below deployment site averaged 63%
- ❒ Deployment site had a slope of 20%, located along a ridge line, then dropped off to 40%-60%

Weather

A fairly weak, small-scale, low-pressure trough moved through and across Northern California, increasing the depth and inland spread of the marine layer. The area over the Devil Fire began to experience

subsidence (descending air layers). Subsidence decreases relative humidity above the marine layer. The marine layer rose to approximately 2,500 feet. As the evening progressed, the relative humidity values above 3,000 feet were measured in the 25%-30% range. After midnight, the humidity dropped to a range of 14%-20%. There was also a wind shift from a westerly direction to a north-northwest flow. Relative humidity values of 6% were documented at 0100 hours at DP10. RAWS data indicates that humidity values ranged from 5%-9% just prior to the time of deployment.

Fire Behavior

The observed fire behavior during most of the evening was described as being moderate to low intensity in the grass, making short uphill runs toward Division H/I. When the winds changed from a westerly direction to a more north-northwest, it aligned itself with the orientation of Eylar Canyon. This was also accompanied by the lowering of humidity. The flame lengths were observed to be 30-50 feet, until the fire reached the brush model having slopes of 70%-80%. Flame lengths then increased to 100 feet, over a 2-3 minute period. Spot fires were observed to be over ¼ mile ahead of the fire. When the fire established itself on the east side of Division H/I, it also started making strong runs up toward the deployment site. The main fire created an "indraft" which drew the fire on the east side of Division H/I toward the main fire. This indraft assisted the fire fighters. When they were burning along the western perimeter of their deployment site, it drew their fire into the main fire creating a bigger buffer along the deployment site.

Using weather from on-site observations and RAWS data, a BEHAVE 2 provided the following as a recreation of the fire condition in and around the deployment site using an average slope of 70% and a midflame wind speed of 8 mph in Fuel Model 4:

- ❒ Rate of Spread: 284 chains/hour, or 18,744 feet/hour
- ❒ Flame Lengths: 40 feet
- ❒ Heat per Unit Area: 2,856 (btu/f2)
- ❒ Fireline Intensity: 14,889 (btu/ft/sec)

Sequence of Events

On August 28, 2003, four CDF Fire Crews were assigned to Division K on the Devil Fire. This fire was one of six fires in the Santa Clara Complex. During the early evening hours of August 28, 2003, all four crews were reassigned to Division H/I, to assist in a planned firing operation. All four crews were to report to Drop Point 5 (DP5). One of the crew-carrying vehicles (CCV) sustained two flat tires while en route, delaying arrival at their assigned destination. The other three crews arrived at DP5, tooled-up and began hiking, southward toward DP10, to their assigned location. They were going to provide 'holding support' for the firing operation. The last remaining crew, the one with the flat tires, arrived at DP5 sometime later.

The firing operation for Division H/I began at DP10 and started north toward DP5. The intent was to have a backing fire go down the western aspect into the canyon drainage. The main fire was backing down the eastern aspect into the same drainage.

Shortly after midnight, the FC-B at DP5 saw that the main fire had become active along the eastern aspect. At approximately the same time, the firing operation (DP10 to DP5) was terminated because they could not get a clean burn, nor could they sustain any burning. At approximately the same time, the main

backing fire on the east aspect crossed over to the west aspect and entered the brush model. The main fire activity continued to increase significantly in the drainage below and west of the fireline, and began to make some hard upslope runs toward the three Fire Crews along Division H/I. The FC-B at DP5 reported the fire was bumping the fireline just south of DP5, and that flame lengths over 100 feet were lying over the fireline.

The three Fire Crews, along Division H/I, tied in with two dozers that had been assigned to that Division all day. About this time, the fire jumped the fireline into the drainage, east of the fireline south of DP5. The dozers began to enlarge a small open area that had fuels lighter than the surrounding area. The FC-Bs became aware of a significant indraft effect, and they began a firing operation along the western slope of the soon-to-be deployment site. As the fire intensity continued to increase, the firing operation was carried all around the perimeter of the 'deployment site'.

The FC-Bs instructed the inmates to remove the fire shelters from their carrying cases, and to get rid of their chainsaws, chainsaw fuel, and fusees. The dozers placed themselves in front of the advancing main fire, shielding the crews with their blades. The command to deploy behind the dozers was given, and all inmates were accounted for before the FC-Bs entered their shelters. There were fifty-three fire shelters deployed, and both dozer operators remained in their enclosed cabs. The deployment lasted for 10-15 minutes.

Once the fire front had passed, the FC-Bs assessed the outside conditions and gave the command to exit the fire shelters. The FC-Bs conducted a head-count for complete accountability. All personnel were assessed for burns, injuries, and any other medical or physical condition. The fire crews then moved down up to DP5 where the engine company personnel, along with the FC-Bs, provided necessary medical treatment. The fire crews and dozer operators were then transported to the Santa Clara Complex Incident Base for medical evaluation and treatment by the DMAT.

All personnel were released back to the incident later that day.

Injuries/Damages

Three fire fighters: two CDF Fire Captains and one inmate sustained second-degree burns, none larger than ½" in diameter. No damage was done to the two dozers.

Safety Issues for Review

Intelligence and Information Sharing:

Post dedicated lookouts, field observers, at minimum, someone qualified who can describe the fire behavior/fire weather components. Lack of a lookout was a primary casual factor of this incident.

Training

Continual safety training, such as: Preparedness Exercises and drills resulted in a "Text Book" live fire shelter deployment prevented a potential disaster. All personnel were alert, calm, had clear thoughts, acted decisively, gave clear instructions which were understood, and control was maintained throughout the deployment. There was constant accountability of those personnel involved in the deployment throughout the incident.

Web Gear

Three inmates had difficulty in deploying their fire shelters when the shelters became entangled around their tool sharpening file, which extended above their web gear upper side pouch, or extended beyond their back pack closure flap. **Web gear needs to be streamlined to prevent it from becoming entangled with the fire shelter, with special attention given to files, and other protruding items.** Carry only the essentials needed to sustain at least a 24-hour shift.

Accountability

Maintain span-of-control and oversight of personnel assigned. FCs and dozer operators remained in verbal and visual contact with each other throughout preparation for and the actual deployment.

LCES, Standard Fire Orders, 18 Situations that shout "Watch Out"

Review the basics of wildland fire fighting safety on a frequent basis. Provide for safety first after reviewing the Fire Orders; ensure LCES is in place.

Incident Issues for Review

Critical incident stress management must be established early and the opportunity to have a debriefing made available within 48 hours.

Burn kits and first aid kits shall be inspected on a frequent and periodic basis, and carried with the crew when travel times to CCVs are lengthy. (Note: all kits, both first aid and burn, were in very good condition, and available at the accident site).

Case Study 4: The Eagle Fire

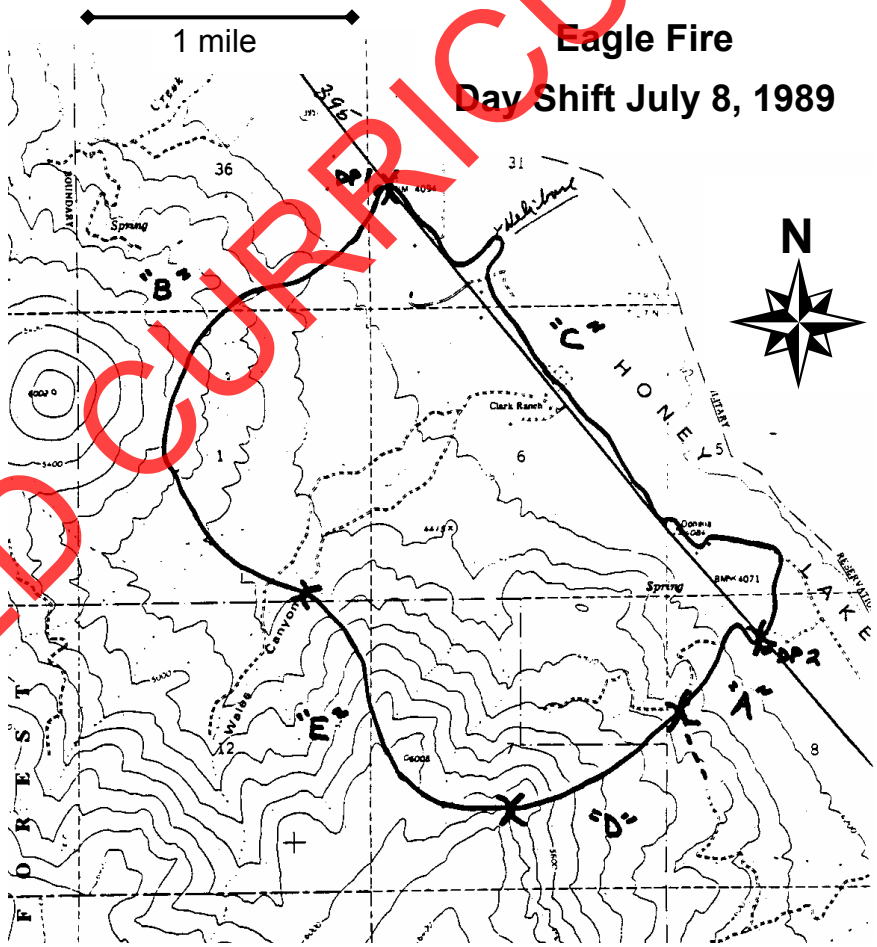
Summary Report
Burn Injuries to FF #1, FF #2, FF #3, and FF #4
Shelter Deployment of FF #5
Lassen/Modoc Unit
California Department of Forestry and Fire Protection
Report: November 15, 1994

Summary

On July 7, 1989 at approximately 1427 hours, a vegetation fire was reported 5 miles south of Janesville in the Lassen/Modoc Unit. This fire was located on the west side of Highway 395. During the first few hours, the fire burned actively along and adjacent to Highway 395 in both north and south directions; extreme fire behavior was experienced primarily due to erratic wind conditions.

On the morning of July 8, the fire behavior conditions were moderate; as the day progressed, fire activity increased and the behavior again became extreme.

At approximately 1430 hours, Engine 2387 was traveling southbound on Highway 395 toward the southeast portion of the fire when they observed a spot fire on the east side of the highway; they initiated a 1½" hose lay down the bank. This crew was joined shortly by Engines 4474 and 2379. A total of five fire fighters were working on the spot and had achieved knockdown at which time a large fire whirl developed on the west side of the highway. Rapidly increasing in size and intensity, the whirl crossed the road and in the ensuing blow-up, four of the fire fighters sustained serious burn injuries.



Fireline Conditions

Fuel

Fuel in the area of the spot fire and where injuries were sustained consisted of scattered big sage 2-4 feet tall intermixed with discontinuous 12-18 inches tall herbaceous annual and perennial grasses and forbs consisting of great basin wild rye, cheat grass, tumble mustard, and fiddle neck (Fuel Model 2).

Fuel on the west side of Highway 395 transitions to 6-8 feet high bitterbrush on lower slopes (Fuel Model 6) then to a mostly Jeffrey pine conifer stand with frequent areas of dense reproduction associated with occasional concentrations of light-slash loading (Fuel Models 9 and 10).

Fuel Moisture

- ❒ 1 hour: 2%
- ❒ 10 hour: 5%
- ❒ 100 hour: 4%
- ❒ 1,000 hour: 8%

Topography

The fire burned between Highway 395 (elevation 4,100 feet) and the top of the Diamond Range escarpment (elevation 6,400 feet). This 2,300-foot elevation change occurs within a distance of approximately 1½ miles. Just east of the fire lies Honey Lake, covering more than 40,000 acres.

The accident site was at the base of the Diamond Range escarpment on Highway 395. From the toe of the highway fill slope to Honey Lake, the ground slopes 0-3%. The general aspect is classified as open along Highway 395 east to Honey Lake and northeast on the slopes towards the Diamond Range escarpment.

Weather

A critical fire weather pattern existed, whereby strong westerly winds were occurring over the ridges. As the large desert area of Nevada and Utah heat up, a low forms drawing in the low level air. As air flows into the low, it allows the westerly winds aloft to surface in a Foehn wind type similar to the Santa Ana winds of Southern California or the north winds in the Northern Sacramento Valley.

As the local winds flow from Honey Lake, across green meadow areas, reach the warmer slopes, they begin lifting and where they meet the surfacing westerlies a situation encouraging erratic and accelerated wind conditions and horizontal vortexes (fire whirls) is created. Adding fire generated winds and heat to this natural phenomenon serves to intensify these conditions.

Observed Weather

- ❒ Temperature: 94°F - 97°F
- ❒ Relative humidity: 11%-13%
- ❒ Local winds: Up slope 4-8 mph
- ❒ Gradient winds: Westerly 8-17 mph

Fire Behavior

By midmorning, crews were forced to abandon mop-up activities and retreat to safety zones as the fire became active and overran control and containment lines. Wind shear and eddy development were common which occasionally generated into fire whirls. This scenario continued and advanced downslope in response to differential surface heating. By midday to early afternoon, fire behavior was characterized by upslope runs in response to local or thermal winds followed by a downslope run with a rapid rate of spread, crowning and spotting in response to the surfacing gradient westerly.

As the fire approached Highway 395, an intense downhill run occurred with flame lengths approximated at 20-35 feet in 6-8 feet bitterbrush. From this fire front, a fire whirl developed just west of Highway 395. The whirl moved easterly, centered itself on Highway 395 then moved southwesterly adjacent to highway then across the highway in a south easterly direction intercepting the escape route of the injured fire fighters. This event takes approximately 17 seconds from the time the whirl forms to when it reaches the area of the fire fighters' retreat. The whirl left a scorch mark on the pavement measured at 95 feet. Visual estimates placed the height at approximately 200 feet with an estimated velocity, by a meteorologist, of around 100 mph.

As the whirl resided on and near Highway 395, it was launching a multitude of firebrands onto the east side of the highway. As it crossed the highway, it hurled a wall of fire into the area. During the time it centered on the highway, moved southerly then across the highway it had run out of fuel. Consequently, when it reached the fuel on the east side of the highway it existed only in the form of a massive swirling windstorm. This situation was short lived, however as the whirl began to react with the numerous spot fires which had become established. The loss of fuel and subsequently diminished fire in the whirl for that very short period of time seemingly accounted for the fire fighters not being even more seriously injured.

Sequence of Events

At approximately 1430 hours, Engine 2387 had been directed to meet other engines along the highway, at the southeast corner of the fire, to assist with structure protection. En route to this assignment, the FC noted that the main fire was burning to the west of Highway 395 and detected a spot in the grass to the east side of the highway. The FC decided to take action on the spot and directed FFs #1 and #2 to start a 1½" hose lay on direct attack. At about this time, a SFR-I, Strike Team Leader 9442-C, observed the spot and directed two engines in his strike team to take action on the spot (the FC is not at the scene of the spot when it is observed by the SFR-I). Engine 2379 FAE and FF #5 went to assist with the hose lay. Engine 4474 arrived on-scene after the hose lay had been initiated by the E-2387 crew. E-4474 FAE directed FFs #2 and #3 to go down the hose lay to assist the others. Flame length was estimated by the attack crew to be approximately 24" in the continuous fuel described above. Another engine pulled between Engine 2387 and Engine who had come from the south, made a "U" turn and backed into the area. E-4479 FAE instructed his crew to pull a reel line to attack another spot south of the one already being controlled.

The efforts to pick up the spot were being met with success. As the second 100-foot length of hose was connected and charged, burning conditions increased substantially on the west side of the highway and E-4479 FAE directed his crew to return to the engine before they had become led to the effort, E-4479's FAE then moved his engine to the south.

The main fire swept toward the road and a large fire whirl developed west of the highway across from the engines.

Engine 4474 started to back south the FAE started to announce over the PA for the fire fighters on the hose lay to "Run to the south, follow my voice."

The FC was standing next to his engine when the whirl hit the road. He was unable to get into the cab of his engine due to the extreme winds and blowing flames, and was forced to grip the 1½" discharge on the side of the engine in order to keep from being blown off his feet.

When the blow-up occurred, the fire fighters working the hose lay were cut off from their engines when the flames and heat blew across the highway. FF #5 jumped the fence and ran east to Old Highway 395 where he deployed his fire shelter, he was not injured. FFs #1 and #2 retreated south after abandoning a live hose lay; they were immediately thrown and rolled by high winds. FF #1 attempted to deploy his shelter, however it was blown from his hands. FF #2 tried to deploy his shelter but the melting shelter pouch stuck to his gloves. FFs #3 and #4 retreated through the green in a more southwesterly direction; both of them were also thrown and rolled by the wind, FF #2 lost her helmet when the force of the wind broke the chinstrap.

FFs #1 and #2 worked their way to the roadway and assisted each other up the embankment. FFs #3 and #4 were separated from each other and arrived at the road independently. The fire fighters were placed on engines, removed from immediate threat and first aid treatment was started. FF #5 walked through the burn to the road after the fire had passed.

After treatment at the scene by CDF and paramedic ambulance personnel, all four of the burn victims were flown by two CDF helicopters to the Chico Burn Center, with paramedics in attendance en route.

Injuries

- ❒ FF #1: 45% second- and third-degree burns
- ❒ FF #2: 10% second-degree and 5% third-degree burns
- ❒ FF #3: 5% second-degree burns
- ❒ FF #4: 3.5% second-degree burns

Damage

Damage to fire apparatus was limited to minor distortion of plastic reflectors on the side of Engine 2387.

Cause of Accident

The fire fighters were burned after being overrun by fire, when unstable weather conditions accompanied by unseasonably dry fuels and low humidity created major downhill runs and developed a fire whirl.

The fire whirl that crossed the road adjacent to the location of the fire fighters on the hose lay left a scorch on the pavement that measured 95 feet across and the height was estimated at approximately 200 feet. Wind velocity is estimated in the 100-mph range.

Case Study 5: The Kentucky Fire

Two Volunteer Fire Fighters Die while Fighting a Wildland Fire - Kentucky

Summary

On April 6, 1999, two male volunteer fire fighters (the victims), 28 and 30 years old, died while trying to escape a wildland fire burning in hardwood leaf litter. The victims were part of a 10-person, initial-attack fire fighting crew from a local volunteer fire department. After the crew arrived at the fire scene, about 1647 hours, the incident command post was established. The Incident Commander (IC) directed the crew to put on their wildland personal protective equipment and then designated a Crew Leader (CL) to oversee line construction operations. A plan of attack was discussed and the CL, along with six fire fighters, walked into the forest adjacent to a natural water drain (hollow) where the fire was burning. The CL and fire fighters began clearing vegetation, creating a fireline of about 2-3 acres of hardwood litter under a dormant hardwood overstory at the fire site. The fireline was being established on the left flank of the hollow adjacent to the fire. Creating the fireline, the fire fighters formed a single-file line with the two victims leading. The two victims were using a rake and leaf blower to clear the fireline. As the fireline was being constructed, several spot fires were breaking over the line, and various members of the crew, except the victims, doubled back and reconstructed the fireline. As the fire grew in intensity and spot fires continued to break over the fireline, the two victims became separated from the rest of the crew. The fire, still growing in intensity, moved rapidly up the hollow, and the CL gave the order, by radio, to pull back. One of the victims, equipped with a radio, acknowledged the order and indicated that he and the other victim would pull back. Shortly thereafter, around 1725 hours, the same victim radioed that they had both been burned. This was the last radio transmission heard from the victims. Evidence at the incident site suggests that as the fire began to grow in intensity and move up the hollow, the victims tried to run up the hollow ahead of the fire. As the victims ran farther up the hollow, the terrain became steep (approximately a 45-degree slope), and the fire continued to intensify due to gusting winds and the chimney effect created by the terrain in the hollow. The victims' bodies were later found about 100 yards from the top of the ridge, where they were pronounced dead. NIOSH investigators conclude that, to minimize similar occurrences, fire departments engaged in wildland fire fighting should:

- ❒ Provide fire fighters with wildland PPE that is NFPA 1997 compliant and monitor to ensure its use.
- ❒ Equip fire fighters with approved fire shelters and provide training on the proper deployment of the fire shelter at least annually with periodic refresher courses during the year
- ❒ Utilize National Weather Service (NWS) Fire WX Forecasters for all fire weather predictions and immediately share with all personnel all information about significant fire behavior events (e.g., long-range spotting, torching, spotting, and fire whirls)
- ❒ Learn, communicate, and follow the Standard Fire Orders as developed by the National Wildfire Coordinating Group (NWCG)

Introduction

On April 6, 1999, two male volunteer fire fighters, ages 28 and 30 years old, died while fighting a wildland fire. The two fire fighters, both members of a volunteer fire department responding to the wildland fire, were constructing a fireline when the fire intensified. Since the fire blocked their escape

route, they tried to run up a hollow ahead of the fire. However, due to the rapid flame spread and steep terrain, the two fire fighters were killed trying to escape. On April 27, 1999, two Safety and Occupational Health Specialists from NIOSH, Division of Safety Research, investigated the incident. They conducted interviews with representatives from the Kentucky Division of Forestry, the Chief, and the Assistant Chief of the fire department (Incident Commander the day of the fire), Crew Leader, and other members of the crew involved in the incident. The incident site was visited and the fire scene photographed. Copies of witness statements, death certificates, dispatch records, daily records, training records, and a map of the fire scene were obtained. The volunteer fire department involved in the incident serves a population of 3,000 in a geographic area of 50 square miles and is comprised of approximately 25 volunteer fire fighters. As required by the State, a new volunteer fire fighter must complete 20 hours of training before responding to any emergency activity. This training includes administration and organization, safety, fire behavior, extinguishers, personal protective equipment, forcible entry, ropes, ladders, fire hose/nozzles/appliances, fire control, ventilation, salvage, overhaul, fire investigation, and driver's training. In addition to the 20 hours of training completed by new volunteer fire fighters, the State requires 58 elective hours of training to complete certification. The 20 hours of training can be applied to the required 58 hours of training. During 1998, the victims had completed 118 and 119 hours of training. This training included: Safety training, fire alarm and communication, fire behavior, portable extinguishers, PPE, ventilation, ropes, ladders, fire control, salvage, overhaul, emergency medical care, rescue, responder to hazmat incidents, fire prevention/public fire education, emergency and disaster planning, fire investigation, pumper operations and maintenance, fire hose/nozzles/appliances, and driver training.

Although a neighboring volunteer fire department and fire fighters from the Kentucky State Forestry Division were involved in this fire, only the events involving the crew and the victims will be discussed.

Investigation

On April 6, 1999, at 1635 hours, a wildland fire was reported to the Kentucky State Forestry Division (KSFD). The fire was believed to have been started when a landowner was burning (clearing out) a fence line and the fire escaped his control. The fire quickly spread into the adjacent hardwood forest of oak, maple, poplar, etc. The weather conditions affecting the fire growth included relative humidity at 25%-30%, ambient air temperature between 70°F and 80°F, and winds from the west to northwest at 12-20 mph and gusting to 40 mph. In addition, the fire was located in a drain (a hollow), with a steep slope of about 45 degrees.

The KSFD dispatched a local volunteer fire department, which was the first responding unit, arriving at the fire scene at 1647 hours. The unit consisted of an Incident Commander, a Crew Leader, and eight fire fighters. The IC immediately established command and discussed the fire attack with the CL who was directed to oversee the fire fighting operations. The IC also instructed the fire fighters to put on their wildland personal protective equipment, which consisted of structural fire fighting helmets, leather gloves, and brush coats. Additionally, the victims were wearing Nomex® shirts and cotton blue jeans. Note: Fire shelters were not available for any of the fire fighting crew. After the fire attack was discussed, two fire fighters remained near the Engine to provided structural protection at a nearby house while the CL and the remaining six fire fighters moved into the forest. The fire fighters started constructing a fireline adjacent to the hollow. At this time, the fire had burned about 3 acres of privately owned forestland. Eventually about 153 acres were burned, including about 75 acres of National Forest. Equipment used by

the crew consisted of three radios (held by the IC, CL, and one victim), rakes, and leaf blowers. The two victims were positioned in front of the remaining crew, on the left flank of the hollow, while they constructed their part of the fireline. As the fire moved toward the fireline, gusts of wind caused the fire to jump the line. When this occurred, part of the crew except the victims, doubled back and reconstructed the fireline. The need to reconstruct the fireline occurred several times. The other members of the crew continued to reconstruct the line, while the victims moved farther up the hollow away from the other fire fighters.

In the interim, the IC made radio contact with the Chief from the neighboring fire department that was working the right flank of the fire. They discussed wind conditions; the wind was changing direction and picking up. At this time, the IC called the KSFD weather station for an update on the current weather conditions. After being put on hold for 2-3 minutes, the IC canceled the call. About this time, the victim with the radio called to advise the IC that his leaf blower was out of gas. Shortly thereafter, in about 2-3 minutes, the winds starting gusting causing the fire to move rapidly up the hollow. In addition, a number of fire whirls were witnessed by several members of the crew. (A fire whirl is a spinning column of ascending hot air and gases that rises from a fire and carries aloft smoke, debris, and flame. A fire whirl may range from a foot or two in diameter to small tornadoes in size and intensity.) As the fire intensified, the CL used his radio to order everyone to pull back. The victim with the radio acknowledged the order and indicated that he and the other victim would pull back. A minute or two later he transmitted the message that he and the other victim had been burned. This was the last radio transmission heard from the victims. The IC ordered everyone to the command post so a head count could be taken. After taking a head count and talking with the fire fighters for 1-2 minutes, the IC directed everyone to stay in the burned-over area to search for the victims. Evidence at the incident site suggests that as the fire began to grow in intensity and rapidly move up the hollow, the victims tried to run up the hollow ahead of the fire. The farther the victims ran up the hollow, the steeper the terrain became (approximately a 45 percent slope). Gusting winds and the chimney effect created by the topography caused the fire to continue to intensify. Eventually, the fire overtook the victims. Their bodies were later found about 100 yards from the top of the ridge, where they were pronounced dead.

Cause of Death

The cause of death for both victims was listed by the coroner as asphyxia due to environmental oxygen deprivation, smoke inhalation, and acute carbon monoxide poisoning.

Case Study 6: The Lauder Fire

Summary Report
Fatality of FF #1
Burns To Copter 102 FC, FF #2, FF #3, and FF #4
Mendocino Unit
California Department of Forestry and Fire Protection
Report: September 29, 1987

On September 29, 1987, at approximately 1005 hours, Helitack Crew 102 was overrun by fire while working on the Lauder Fire. This accident resulted in the death of FF #1 and the burns of Copter 102 FC, FF #2, FF #3, and FF #4.

Fireline Conditions

Fuel

The fire burned in a young (60-year-old) timber stand of Douglas fir, black oak, madrone, and understory ceanothus and manzanita. This site burned severely approximately 60 years ago as reported by Mendocino National Forest employees. This old burn is evident from the standing punky Douglas fir snags and a large number of down rotten Douglas fir logs. There were ample ladder fuels on the site. The general canopy height was about 10 feet above the ground with many areas having canopy down to the ground level. In many places, the understory brush was dying and or dead after being shaded out by the overstory.

Fuels on this site can best be described as an understory litter fuel with a live fuel component and a significant amount of 10-, 100- and 1,000-hour dead fuel. The litter layer was the primary fuel carrying the forward spread of the fire. The larger dead fuels and the live fuels added to the total heat load and the longer burnout time. The fluffy uncompacted black oak leaf litter layer varied in depth from less than an inch to 4 inches.

Weather

California was under a stable high-pressure ridge before, during, and after the fire. This high-pressure cell was characterized by high temperatures (90°F-100°F) low humidity and mild southeasterly winds. Nighttime inversions were not deep enough to affect the burn site. Sea breeze intrusion did not affect the site under this high-pressure pattern.

With weather readings obtained from an observer on the left flank at the time of the accident, nearby NFDRS weather stations, observations of the pilots, and readings taken during the investigation, the weather at the accident was determined to be:

- ❒ Temperature: 78°F-82°F, midrange 80°F
- ❒ Dew Point: 34°F-36°F, midrange 35°F
- ❒ Relative Humidity: 18%-22%, midrange 20%
- ❒ Wind: Partially sheltered, SE 2-5 mph, midrange 3-4 mph
- ❒ State of Weather: Clear

Winds are variable, ranging from calm to gusts of 7-9 mph, with shifts in direction of 90°F from the prevailing direction.

Topography

The fire was on the mid to upper third of an east facing slope. The base of the fire was at 3800 feet on a slope that ranged from 2200 feet in Dashiell Creek to 4804 feet at the ridge top. The shelter deployment site was near the 4200-foot elevation. Slopes varied from 40% near the bottom of the fire to 70%-75% on the upper slopes.

The slopes were 45%-50% at the shelter deployment site with slopes of 70% + below and above the deployment site. The slope was about 65% 15 feet below the deployment site and increased to over 70% 50 feet below the deployment site.

The general face of the mid-slope was fairly flat. There are numerous small (5-15 feet deep) gullies along the slope that acted as natural chimneys. These gullies did not always continue to the ridge, many of them would stop mid-slope.

Sequence of Events

At approximately 0720 hours, Copter 102 arrived on the Lauder incident with a FC and 4 fire fighters. At this point, the fire had extended to approximately 20 acres in heavy vegetation on an extremely steep east-facing slope in a canyon oriented north to south. The crew was unloaded in a small clearing below the base of the fire. Copter 102 FC led the crew to the right flank of the fire. At this time, the suppression efforts on the right flank were progressing with moderate success and consisted of a hose lay operation, dozer line construction, and some hand line construction efforts by engine company crews. The fire behavior at this point was moderate.

As the Helitack Crew proceeded to travel up the right flank of the fire, Copter 101 Crew arrived and deployed personnel on the ridge top above the fire. By this time, the Kneeland Helitack (C 102) Crew had reached an area beyond the dozer line and hose lay on the right flank and was proceeding to hot spot above the engine crews. During this period, bucket drop operations were taking place by Copter 102 and an air operation had begun under the direction of Air Attack 110 utilizing the copters and air tankers.

As the crew from Copter 102 proceeded up the right flank, moderate changes in weather conditions were noted by others on the fire and the fire was making a few minor runs to the ridge top. The Copter 101 FC requested by radio that Helitack Crew 102 join him on the ridge top. As the crew proceeded up the right flank toward the top in unburned fuel, they noticed a small flare-up below them. With the flare-up, the crew became extremely concerned for their safety. Their escape route had been overrun by the fire. It was much too hazardous and difficult to try to cross the brush field to get further into the green, and the FC told them their escape would be into the burn. The first flare-up was followed shortly by a significant increased activity described as 20-foot flame lengths and a "wall of fire" just below their position.

The crew entered the burn approximately 70-80 feet in a southeasterly direction. Because of large, burning old downed logs and the intense heat, they turned back momentarily and deployed their shelters in a small opening. The heat was much too intense and all received burns before shelters were deployed. All had difficulty in deploying shelters because of burns on their hands.

A message was broadcast that the crew was in trouble and needed water drops. The pilot of Copter 102 overheard the message and began dropping water on the crew. After several water drops from Copter 102, air tankers began dropping retardant on and below them.

Rescue efforts were begun by units at the scene and additional helicopters were ordered for medical evacuation.

All injured were removed from the hillside by long lines from the two Coast Guard helicopters and transported to a nearby mill site for medical stabilization before transporting to the Chico Burn Center by Advanced Life Support Helicopter. The last burn victim was removed from the accident site by 1314 hours.

Case Study 7: The Old Topanga Fire

Summary Report
Fireline Injuries of 1 Fire Captain, 1 Fire Apparatus Engineer, and 2 Fire Fighters
Los Angeles County
San Bernardino Unit
California Department of Forestry and Fire Protection
Report: November 2, 1993

Summary

At approximately 1130 hours, November 2, 1993, a major brush fire occurred in the Malibu area of Los Angeles County. At roughly 1500 hours, CDF Engine 2179 was assaulted by heat and smoke from an uphill run of fire. The members of the crew suffered burns and smoke inhalation as they were forced to abandon their positions and seek refuge. The four-member engine company used various means to seek refuge from the fire including their fire engine, a residence, and fire shelters. The Fire Captain received serious burns to his back, nose, and elbows. The FAE and one fire fighter received minor burns to the face. One fire fighter suffered smoke inhalation. The Model 12 engine was destroyed when airborne-embers ignited a pile of "out-of-county" bags stowed on the build-up of the engine.

Fireline Conditions

Fuel

Type

The area around the accident site was a nearly continuous cover of medium to heavy brush. Grass was present as available fuel, but not continuous.

The area directly around the structure and driveway had been cleared of most flammable vegetation. Ornamental shrubbery and a few scattered pine trees were within 30 feet of the house.

Loading

Fuel loading was estimated to be 25-40 tons/acre.

Ratio

The live-to-dead fuel ratio was estimated to be 75%-80% live fuel.

Topography

Terrain

The area in which the fire developed is a well-defined, north-south oriented bowl-like drainage called Carbon Canyon.

Elevation

Elevations in the area directly adjacent (north and west) to the fire accident site ranged from 1200-1300 feet.

Aspect

Slopes face all aspects in the canyon, however the area near the accident site was generally a west-facing slope.

Slope

The area in and around the accident site had slopes between 30 and 50%.

Weather

Weather observations taken a one-quarter mile north of the accident site at approximately 1643 hours on November 2, 1993, were as follows:

- ❒ Dry bulb temperature: 79°F
- ❒ Wet bulb temperature: 52°F
- ❒ Relative humidity: 10%
- ❒ Wind speed and direction: 10-15 mph north (from the north)
- ❒ Estimates for dead fuel moistures ranged from 4%-6%

Fire Behavior

At the time of the accident, the fire was approximately 8,000 acres and was being pushed by Santa Ana winds. In Carbon Canyon, the fire had been wind driven to a point below E2179's position. The fire had burned into a chimney that was sheltered from the wind. The combination of sheltering and pre-heating caused the fire to race uphill in the chimney.

Based on burn indicators, victim's statements and physical evidence, it seems likely winds were between 15 and 20 mph which produced flame lengths of 30 feet.

Sequence of Events

On November 2, at approximately 1400 hours, Engine 2179, an element of ST 9251C, was assigned to structure protection duty on the Old Topanga Fire in Los Angeles County. E2179 backed down a driveway to a position that facilitated an immediate escape. One 100-foot length of 1½" hose was laid for an engine protection line. A 300-foot 1½" hoseline was laid for structure protection. The engine motor was left running and the vehicle was unchocked.

The FAE was approximately 150 yards below E2179 checking out another structure. One FF was positioned at the nozzle of the structure protection line, the FC and other FF was positioned approximately 30 feet to the rear of E2179 with the engine protection line.

The fire had burned its way into a wind-protected chimney that allowed heat and smoke to be channeled uphill. The FAE saw the fire advancing and retreated to the residence. Reaching the west end of the residence, he joined the FF on the structure protection hose. The hose ruptured and the FAE ran into the house. The FF ran to the east end of the house and deployed his shelter. Both of them received first-degree burns on their faces and suffered smoke inhalation.

Heat and smoke reached the FC and FF at the rear of the engine. They abandoned the hoseline and ran to the engine. They were showered with firebrands and extreme heat and smoke. The FF followed the FC to the right side of the engine and entered the cab. The FC ran around the front of the engine and attempted

to enter the cab through the driver's door. The driver's door did not open and he immediately ran back around the front of the engine and entered the cab through the right front door. At some point, the engine protection hoseline ruptured. The FC opened a fire shelter and pressed it against the windows as a shield against the radiant heat. He then told the FF he thought his back had been burned.

The FAE and FF exited the house through the garage door and met the FC and other FF in the driveway. The FC had opened another shelter and had it draped over himself to shield against the heat and flying embers. The four returned to the garage where they poured water on the FC's back and shoulders and radioed for assistance.

A small fire was observed in the "out-of-county" bags that had been stowed on the deck of the build-up behind the cab. During the "firestorm," both hoses had ruptured. The pump was running and it only took a few short minutes to empty the water tank on E2179. They tried several times to put the fire out in the out-of-county bags. They used fire extinguishers, a water cooler, and buckets unsuccessfully. By this time, the fire had extended into the cab.

Assistance-arrived and extinguished the fire in the engine and an attic fire in the structure. An unidentified L.A. County Battalion Chief arranged transportation and L.A. County Fire Air Squad 9 airlifted the FC and FAE to the Sherman Oaks Burn Center. The L. A. County Incident Safety Officer arrived at the scene and determined that one FF should be given medical attention also and arranged transportation to the Sherman Oaks Burn Center via L. A., County Sheriff's Air Rescue 5. Later in the day, the other FF became nauseous and began to exhibit symptoms of respirator irritation. He was transported by ground ambulance to Westlake Hospital and later transported to the Sherman Oaks Burn Center to rejoin his crew.

Case Study 8: The Pechanga Fire

Summary Report
Riverside Unit
California Department of Forestry and Fire Protection
Report: August 2, 2000

Summary

On August 2, 2000 at approximately 1520 hours, the crew of CDF Engine 2382 was burned when the structure that they were protecting was overrun by fire. They were assigned to the Woodchuck Structure Protection Group on the Pechanga Fire (RRU-48329). The Fire Apparatus Engineer and three (3) fire fighters had moved to the front (north) of the garage where they were burned when flames being pushed by 45-50 mile per hour winds rolled over the entire roof and around the sides of the single story light wood frame garage. They were attempting to take refuge inside the structure when the door at the northwest corner of the building jammed and they were unable to get inside; direct flame impingement caught them in the lee side eddy of the building for 10-15 seconds. The engine company left the structure, took refuge in their secondary safety zones, and suffered no further injuries.

They received immediate burn injury treatment at the scene and were transported to Arrowhead Burn Center via ground and air ambulance. Both air cleaners on the CDF Model #9 engine caught fire, causing the main and auxiliary pump engine to stop. Engine 2382 suffered only superficial body/paint heat damage.

Conditions

The fire location is in Riverside County 6 miles southeast of the City of Temecula. The accident occurred on Division Cat the end of "Lucky U" Road, off Woodchuck Campground Road, south of Highway 79.

Garage

The structure is located at the "bullnose" end of ridge on a graded flat bare dirt landing that is approximately 250 feet by 100 feet in size. The garage is approximately 24' x 40' with older, light wood frame construction, wood siding, and composition shingle roof. . The south side of the garage was located 10 feet from the boundary of the Aqua Tibia Wilderness area of the Cleveland National Forest. Thirty feet of brush on the slope below the garage was removed by a CDF Chamberlain Creek Fire Crew earlier the same day. The garage door was checked earlier in the day by the CDF Fire Crew Captain and was swinging freely at that time.

Fuel

Wildland fuel was fuel model 4 mixed brush (chamiso, ceanothus, and manzanita) 45-50 tons per acre and 80+ years old. Live fuel moisture was measured at 53%-61%. One hour dead fuel moisture was estimated at 6%. Both of these are critical stages for this fuel type. The area to the west and north had already burned; the only unburned fuel is in the drainage south and east of the garage.

Topography

The flat landing was surrounded on the south and east side by steep, deep drainages. The south facing aspect slope averaged 69-84%. The east facing aspect slope was approximately 107-142 %. The fire was pushed by a subsiding wind and essentially followed the drainage down slope.

Weather

- ❒ Temperature: 86-90°F
- ❒ Relative Humidity: 30%-40%
- ❒ Wind: West-southwest 10-12 mph (prior to thunder cell formation), very typical for this area at this time of day. Thunderstorms predicted and observed over fire area.

Sequence of Events

At 1430 hours, a rapidly building thunder cell started building east of the fire, and was accompanied by a dissipating cell south of the fire. Winds accelerated at the accident site and became west-southwest 45-50 mph. Fire fighters mentioned that smoke started to come down on top of them and visibility decreased significantly. At 1455 hours, the Division C Line Safety Officer (LSO) issued an advisory for certain tactical resources to move to safety zones or prepare for structure protection because of the thunder cell forming.

Engine 2382

As a result of the LSO's advisory, Engine 2382 was instructed by the STL to return to the landing to protect the structure. The STL accompanied them to this site. They had both been to this site earlier in the day supporting a hose lay operation. The engine company prepped the structure, placed a charged a 1½" hoseline on each side of garage, positioned apparatus in a safe location, and posted lookouts to observe fire spread. Fire was spreading rapidly down the drainage from the southwest with flame lengths of up to 100 feet. The fire then made a run at their position up the south-facing slope below the garage. They were attempting to take refuge inside the structure. The door they had planned to use was on the lee side (opposite side from fire spread) of the structure. The door to the building jammed even with two of them "putting their shoulders to the door", they were unable to get inside; direct flame impingement caught them in the lee side eddy of the building for 10-15 seconds. The STL said that, " the flames rolled over the top of the building like water flowing over a rock in a river" and hit the back of the fire engine parked forty feet away. One of the fire fighters also said that, "the flames coming around the building were like a hand sweeping around the corner."

The engine company had prepped the structure and had been inside the door less than 20 minutes before the burn over, the door swung freely at that time. It is apparent that the wind "racked" the building sufficiently to jam the door in a closed position. Composition shingles were blown loose from the building and "pelted" the STL vehicle parked 50 feet north of the garage.

The crew of E-2382 left the garage area and took refuge in their designated secondary safety zones. Two went inside a private van parked on the landing and deployed a fire shelter. The other two took refuge and deployed the fire curtains in the crew compartment of the Model # 9 fire engine.

Injuries

All four members suffered burn injuries that were preliminarily assessed as serious burns. CDF Burn treatment protocols were followed at the scene and during transportation to the burn center. All four members were treated with serious burn protocols and transported via ground and air ambulances to Arrowhead Burn Center in Colton, California.

Personal protective equipment (PPE) appeared to work very effectively in reducing the extent of burn injuries. Nylon web gear worn by engine company members did melt and ignite.

Case Study 9: The South Canyon Fire

USFS Report of the South Canyon Fire Accident Investigation Team - August 17, 1994

The Incident

On July 2, 1994, during a year of drought and at a time of low humidity and record high temperatures, lightning ignited a fire 7 miles west of Glenwood Springs, Colorado. The fire was reported to the Bureau of Land Management on July 3 as being in South Canyon, but later reports placed it near the base of Storm King Mountain. The fire began on a ridge, which was paralleled by two canyons or deep drainages, called in this report the east and west drainages. In its early stages, the fire burned in the pinyon juniper fuel type and was thought to have little potential for spread.

Dry lightning storms had started 40 new fires in the Bureau of Land Management's (BLM) Grand Junction District in the two days before the South Canyon fire started, requiring the District to set priorities for initial attack. Highest priority was given to fires threatening life, residences, structures, utilities, and to fires with the greatest potential for spread. All initial attack fire-fighting resources on the Grand Junction District were committed to the highest priority fires. In response to a request from the Grand Junction District, the Garfield County Sheriff's Office and White River National Forest monitored the South Canyon Fire.

Over the next 2 days the South Canyon Fire increased in size, the public expressed more concern about it, and some initial attack resources were assigned. On the afternoon of July 4, the district sent two engines. Arriving at 6:30 p.m. at the base of the ridge near Interstate 70, the crew sized up the fire but decided to wait until morning to hike to the fire and begin fire-fighting efforts.

The next morning, a seven-person BLM/Forest Service crew hiked 2½ hours to the fire, cleared a helicopter landing area (Helispot 1) and started building a fireline on its southwest side. During the day, an air tanker dropped retardant on the fire. In the evening, the crew left the fire to repair their chainsaws. Shortly thereafter, eight smokejumpers parachuted to the fire and received instructions from the Incident Commander to continue constructing the fireline. The fire had crossed the original fireline, so they began a second fireline from Helispot 1, downhill on the east side of the ridge. After midnight, they abandoned this work due to the darkness and the hazards of rolling rocks.

On the morning of July 6, the BLM/Forest Service crew returned to the fire and worked with the smokejumpers to clear a second helicopter landing area (Helispot 2). Later that morning eight more smokejumpers parachuted to the fire and were assigned to build the fireline on the west flank. Later, ten Prineville Interagency Hotshot Crewmembers arrived, and nine joined the smokejumpers in line construction. Upon arrival, the remaining members of the hotshot crew were sent to help reinforce the fireline on the ridge top.

At 3:20 p.m., a dry cold front moved into the fire area. As winds and fire activity increased, the fire made several rapid runs with 100-flame lengths within the existing burn. At 4:00 p.m., the fire crossed the bottom of the west drainage and spread up the drainage on the west side. It soon spotted back across the drainage to the east side beneath the fire fighters and moved onto steep slopes and into dense, highly flammable Gambel oak. Within seconds, a wall of flame raced up the hill toward the fire fighters on the west flank fireline. Failing to outrun the flames, 12 fire fighters perished. Two helitack crewmembers on

top of the ridge also died when they tried to outrun the fire to the northwest. The remaining 35 fire fighters survived by escaping out the east drainage or seeking a safety area and deploying their fire shelters.

The Investigation

Within 3 hours of the blowup, an interagency team was forming to investigate the entrapment on the South Canyon fire. The team first met on the evening of July 7. Team members were given their assignments, and the team presented a charter to the Chief of the USDA Forest Service and the Director of the Bureau of Land Management. BLM's Arizona State Director was designated team leader.

In the next few days, the team investigated the fire and fatality sites and began a series of 70 interviews with witnesses. In addition, the team met once or twice a day to discuss progress, clarify assignments, plan their report, and review their findings. On July 22, with the interviews and much of the investigation report completed, the team adjourned. The following week some team members met in Phoenix, Arizona to complete work on the incident overview. On August 9-11, the team reconvened to review a draft of the completed report in preparation for its publication.

Case Study 10: The Thirtymile Fire

Synopsis

The Thirtymile Fire (Incident #103) began on July 9, 2001, because of an abandoned cooking fire during a period of high to extreme fire danger. In the days leading up to the incident, fire danger indicators were building toward record-setting levels. Several other fires were burning on the Okanogan-Wenatchee National Forest at the time the Thirtymile Fire began, including the Libby South Fire, approximately 40 miles south. The Libby South Fire had grown to about 1,000 acres and, because it was threatening homes, had become a major focus of the forest's fire suppression efforts.

The Chewuch River drainage, where the fire began, is a steep-walled canyon running southwest to northeast. A low-pressure system was bringing a weak southwest airflow over the general vicinity. Although no wind events dominated the day's weather, the canyon and the gradient winds were in alignment.

The Thirtymile Fire started in a riparian zone next to the Chewuch River. Although the initial assessment of this fire from the air late on July 9th indicated its potential to become large, fire managers and those on the ground generally perceived it as a mop-up operation. It was a series of spot fires, with much of the general area unburned. In fact, today, much of the forest near the origin remains unburned and intact. However, the adjacent area, and particularly the area up-canyon where the fire spread, burned intensely.

Fire fighters from the Methow Valley Ranger District were assigned to initial attack. They were relieved by the Entiat Hotshots who continued the initial attack effort. This was the first change of command on the incident. The Entiat IHC had been working other fires and were tired when they arrived. The Incident Commander (IC) changed again in the midmorning hours of July 10th, as the NWR #6 crew arrived. Part of this crew was dispatched in the middle of the night with little or no sleep. With the midmorning change, incident command responsibilities were shared between the IC and a trainee. The IC maintained collateral duties as the Crew Boss.

The tactical suppression decision was to utilize pumps and hose as the means for control, but the water handling system was ineffective and a tactical change to construct handline was made. In the deep duff layers, and with the amount of downed fuel, construction of handline was hard. Spot fires and perimeter growth developed faster than the on site fire fighters could contain.

About midday, two civilians drove by the fire up the canyon to the Thirtymile Campground. There was air support in the afternoon of July 10th, but the helicopter was delayed for several hours in providing support to the incident, partially due to a lack of clearance related to Endangered Species Act issues.

At midafternoon on July 10th, the Thirtymile Fire made a large run up the east slope above the Chewuch River. The IC, IC trainee, and the District AFMO acknowledged that they had lost the fire and that initial attack actions had failed. There was no direction from either the unit fire program managers on site and/or the IC to disengage, modify tactics, reestablish command, or re-evaluate safe practices (including the selection of safety zones and escape routes). The overall situation was not reassessed for its potential. Even though the fire situation had significantly changed, fire fighters continued tactics that were no longer viable.

Two engines arrived on-scene and proceeded up the road without checking in and without receiving a briefing. At the request of one of the engine supervisors, fire fighters moved up the canyon to assist the engine in working spot fires. In this area, the fire had left the riparian zone and was in a drier habitat type, where fire potential was much greater. Combined with the rising temperatures and falling humidity, fire behavior increased considerably.

The fire fighters assisting the engine crew with spot fires were up-canyon and in front of the main fire, in the direction of the fire's spread. Their only escape route was the road. Between their location and the head of the main fire, the road became perpendicular to the direction of fire spread. It was here that the fire crossed the road and cut off the escape route. Fourteen fire fighters and two civilians were trapped. Others had barely escaped as the fire crossed the bend in the road. Because of the drier fuel type, high intensity crowning developed, and the rate of spread picked up significantly.

The 14 fire fighters retreated up-canyon to an area they believed safe. Rockslides with only sparse fuels, the road, the river, and a sandbar provided a survivable environment. There was time to prepare for deployment, however, little preparation occurred. Shortly thereafter, two civilians trying to leave the area met the fire fighters on the road.

Several of the fire fighters were worried, yet there was not a collective sense of urgency to prepare for an impending crisis. Fire fighters loosely formed into two groups; one on the road and the other on the rock scree. The IC tried to get the fire fighters sitting on the rocks to move to the road, but it is not known if they heard his directive. Several fire fighters were anticipating watching the fire burn around them. Some were taking photographs. Few of the fire fighters seemed to recognize they were in a life-threatening situation until the fire's heat suddenly hit their location and overwhelmed them. It was only then that they tried to quickly get into their fire shelters, as the command to deploy was given. No one deployed on the sandbar. Several went into the fire shelters with their packs on (contrary to established procedure), and one was without gloves.

Of the six fire fighters who deployed on the rock scree, four perished. The ten others on the road below survived, including the two civilians that shared a shelter with one of the fire fighters.

Despite the high fire danger and numerous compounding factors and accumulating events that characterized the Thirtymile Fire, the fatalities were preventable. At several points in the growth of this fire, decisions could have been made and actions taken that could have avoided this tragedy.

This Management Evaluation Report examines the causal factors that contributed to this accident, some of which were found throughout the incident. The display of the causal factors and the phases in which they were evident, illustrates the compounding effects of these actions. These have clear and significant implications in terms of management oversight and supervisory control, at the preparedness phase, the initial action phase, and the transition phase. It also clearly illustrates that fire fighter safety is influenced by individual behavior. Tragically, all ten of the Standard Fire Orders were overlooked, ignored, or violated and critical time was wasted waiting for the fire and the danger to pass.

Causal Factors

A causal factor is any behavior or omission that starts or sustains an accident occurrence. For this investigation, the causal factors have been classified as either significant or influencing. They have been

identified from the four categories of Factual Report findings (environment, equipment, people, and management).

The causal factors on the Thirtymile Fire are interrelated, and it is difficult to point to one causal factor or one finding as the most important Additionally, several causal factors were identified from more than one phase of the incident. The five phases of the incident were determined to be:

1. Preparedness (Wildland and Prescribed Fire Management Policy; Implementation Procedures and Reference Guide; August, 1998; (WPFMP))

   "Activities that lead to a safe, efficient, and cost-effective fire management program in support of land and resource management objectives through appropriate planning and coordination."

   Examples include: activities done in preparation for fire season such as annual refresher training, work capacity testing, review of plans and guides, as well as fire equipment and personnel readiness checks.

2. Initial Attack (WPFMP)

   "An aggressive suppression action consistent with fire fighter and public safety and values to be protected."

   These are the actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

3. Transition (from the Fireline Handbook, NWCG Handbook 3, PMS 410-1; pages 18 and 24)

   Transition to the next level of management is expected and required when it becomes apparent that the assigned resources will not meet containment objectives in the expected time frames and/or the fire escalates to another level of complexity.

4. Entrapment (Glossary of Wildland Fire Terminology; NWCG, 1995; (GWFT))

   "An entrapment is a situation where personnel are unexpectedly caught in a fire behavior related, life threatening position where planned escape routes or safety zones are absent, inadequate, or have been compromised. An entrapment mayor may not include deployment of a fire shelter for its intended purpose."

5. Fire Shelter Deployment (GWFT)

   "The removing of the fire shelter from its case and using it properly for protection against fire."

Significant Causal Factors

The causal factors determined to be significant in this management evaluation report are listed below with identified finding category and incident phase, in relative order.

- ❒ Inadequate safety consideration (management)
  - *Phases of the incident: preparedness, initial attack, transition, entrapment, and deployment*
  - The safety considerations were not appropriate to respond to the current, potential, and subsequent fire conditions on this incident. All 10 of the Standard Fire Orders and 10 of the 18 Watch Out Situations were violated or disregarded during the incident.
- ❒ Lack of situational awareness/inaccurate assessment (management)
  - *Phases of the incident: preparedness, initial attack, transition, entrapment, and deployment*

- At critical points throughout the incident the lack of situational awareness by key incident, district and forest personnel led to inaccurate assessments of fuels, fire behavior, and fire potential.

❒ Fatigue (management)
- *Phases of the incident: preparedness, initial attack, transition, entrapment, and deployment*
- Work/rest cycles for incident and fire program management personnel, both at the forest and district levels were disregarded resulting in mental fatigue. This significantly degraded the vigilance and decision-making ability of those involved.

❒ Command and control (management)
- *Phases of the incident: preparedness, initial attack, transition, entrapment, and deployment*
- Failure to maintain clear command and control resulted in poor risk management and inhibited decisive actions, which contributed to the entrapment and deployment of shelters.

❒ Strategy, tactics, and transition (management)
- *Phases of the incident: initial attack and transition*
- The suppression strategy did not adequately consider objectives, fuels, fire behavior, and fire potential, nor the capability, availability and condition of the suppression resources. This led to the selection of tactics that could not succeed. As the fire complexity changed significantly and initial attack was unsuccessful, there was not a corresponding change in strategy or tactics.

❒ Fire behavior (environment)
- *Phases of the incident: preparedness, entrapment, and deployment*
- A variety of environment factors supported the development of a crown fire, growing from a few acres to several thousand acres on the day of the accident:
  - Valley bottom and slope fuels were dense with abundant ladder fuels.
  - The moisture content of the fuels was at historically low levels.
  - The combination of extremely low relative humidity, high temperature, and atmospheric instability created weather conditions conducive to the rapid movement, growth, and intensity of the fire at the times of entrapment and deployment.

❒ Failure in road closure and area evacuation (management)
- *Phase of the incident: initial attack*
- The entrapment of two civilians was due to the failure to close the road and to subsequently evacuate the upper valley in a timely fashion.

❒ Management intervention (people)
- *Phase of the incident: transition*
- There were missed opportunities for intervention by management personnel on this incident. Leadership's failure to respond to concerns and observations by key individuals exacerbated circumstances that led to the entrapment.

❒ Lack of escape routes and safety zones (people)
- *Phase of the incident: entrapment*
- Given the rapidly increasing fire intensity and changing fire situation, adequate consideration was not given to identifying escape routes and safety zones.

- ❒ Failure to prepare for deployment (people)
  - *Phase of the incident: deployment*
  - Leadership of the entrapped fire fighters failed to utilize available time and resources to coordinate and prepare crewmembers and civilians for shelter deployment.
- ❒ Deployment site selection (equipment/people)
  - *Phase of the incident: deployment*
  - Site selection for the deployment of the shelters above the road contributed to the four fatalities. The rocky nature of the deployment site made it difficult to seal out the superheated air. The large size and the arrangement of the rocks made it difficult to fully deploy the shelters.
- ❒ Personal protective equipment (equipment/people)
  - *Phase of the incident: deployment*
  - The improper use of personal protective equipment (PPE) contributed to injuries. Three people occupied one shelter. This exceeded the design capacity (although providing shelter protection of the two civilians was appropriate and justified by the emergency). One crewmember and the two civilians did not have gloves; other crewmembers did not wear their gloves. Some of the line gear that was left close to the shelters ignited, and there was burning vegetation close to and under the shelters.
- ❒ Sudden up-canyon extreme fire behavior (environment)
  - *Phase of the incident: deployment*
  - The dense forest and the strong fire-induced winds on the eastern canyon wall contributed to intense spotting, causing the fire on the canyon floor to intensify suddenly and surge over the deployment area.
- ❒ Heat from fire (environment)
  - *Phase of the incident: deployment*
  - The fatalities were caused by inhalation of superheated air and exposure to high levels of radiant and convective heat. The presence of burnable fuels around and under the chosen deployment sites also contributed to the fatalities and injuries. The higher temperatures of the rock scree slope made conditions worse for deployment than conditions on the road.

Influencing Factors

The causal factors determined to be influencing by the Accident Review Board are listed below with identified finding category and phase of the incident.

- ❒ Over-extension of fire service personnel (management)
  - *Phase of the incident: preparedness*
  - Unit personnel were over-extended. Although weather and fuel conditions were near historic highs and there was significant fire activity on the forest, additional fire program management personnel and additional initial and extended attack resources were not readily available.
- ❒ Development of crew cohesion (management)
  - *Phase of the incident: preparedness and deployment*

- There were a number of issues that limited the development of crew cohesion for the northwest Regular #6 crew. These included: collateral duties of command, fatigue, incident complexity, lack of opportunity to work together, and management effectiveness.

❒ Ineffective water operations (equipment/people)
- *Phase of the incident: preparedness and initial attack*
- Water operations, both aerial and ground based, were ineffective, or delayed during the initial suppression actions.

❒ Helicopter delay (management)
- *Phase of the incident: preparedness and initial attack*
- Assignment of a helicopter to the incident was delayed. This may have reduced the effectiveness of suppression actions. The lack of a clear process and determination of responsibilities to deal with Endangered Species Act issues contributed in part to this delay, as did dispatch actions and confusion associated with availability.

❒ Organizational relationships (management)
- *Phase of the incident: initial attack, transition, entrapment and deployment*
- Unclear organization relationships among forest, ranger district and incident personnel reduced management effectiveness on the incident.

Summary of Causal Factors

In the late afternoon of July 10, 2001, the Thirtymile Fire on the Okanogan National Forest resulted in the fatalities of four fire fighters and serious injuries. This resulted from the entrapment of 14 fire fighters and 2 civilians, and their subsequent deployment of 14 fire shelters. The investigation identified a number of interconnected probable causes that must be addressed by the USDA Forest Service. Understanding the probable causes and taking all possible action to prevent similar happenings in the future is a critical concern for not only the Forest Service, but also for other federal, state, and local government fire suppression organizations who must learn from these unfortunate and tragic happenings.

Intrinsic to forest, brush, and grass fires are many potential hazards and risks. Ensuring that fire fighters are properly trained, and that policies, orders, and procedures are followed is the only way an organization like the Forest Service can deal with those hazards and risks. Over the years, lessons in how to safely fight forest fires have been learned and have resulted in new technology, fire organization improvements, availability of protective equipment, and expanded knowledge of fire science. These lessons have culminated in the last decade with major development and revision of federal wildland fire policy and a significant increased emphasis in fire fighter and public safety. Unfortunately, increasingly dangerous fire conditions and expanded complexity of dealing with human factors such as leadership, experience, accountability, complacency, and fatigue continued to offer troubling challenges.

The lessons to be learned as a result of the fatalities on the Thirtymile Fire in July 2001 are mostly about what was not done that should have been done. There were many opportunities to prevent these fatalities. Accepted fire fighting safety procedures were not followed. As a result, four fire fighters lost their lives.

The most basic fact is that the four fatalities occurred because of inhalation of superheated air as a fast moving forest fire burned over fourteen fire fighters and two civilians.

The fatalities and several injuries all occurred during, or shortly after, deployment of fire shelters. Failure to deploy before conditions completely deteriorated, failure to move to the most desirable deployment location on the road, and failure to deploy using the proper techniques, significantly contributed to the fatalities and injuries.

Twelve people are likely alive today because of fire shelter availability. However, four people died while attempting to gain protection. There had been a considerable length of time, approximately thirty minutes, to improve the likelihood of survival during deployment for all sixteen entrapped individuals; however, little was done until the very last moments.

The entrapment of 14 fire fighters occurred because of a failure to recognize a rapidly deteriorating fire situation, the placement of fire fighters in a vulnerable position, the lack of communication about critical information, leadership's ineffective control and command of operations, and finally, and most critically, the failure to adhere to safety procedures and standard fire fighting orders.

The entrapment of two civilians occurred because of a delayed closure of a potentially hazardous area and failure to successfully evacuate the valley upriver from the fire. Had the 14 fire fighters not become entrapped, the two civilians likely would have been entrapped without access to fire shelters as the fire moved swiftly through the upper valley. There were no safety zones in the upper valley considering the intensity of the fire in the late afternoon.

The entrapment of fire fighters and civilians was the result of a chain of interrelated events throughout the day, including the failure to recognize the deteriorating conditions and escalating fire activity.

Fatigue of nearly everyone involved on the incident from the time of initial attack to the time of deployment likely contributed significantly to failures in leadership, command, control, proper fire assessment, and size-up, development of strategies and tactics, communication, and use of discretionary time.

The use of water on this fire at critical times was reduced because of an inability to fully utilize available pumps and an extended delay in getting a helicopter to the fire. Confusion and/or lack of clear understanding of processes necessary to deal with endangered species considerations on use of water from the Chewuch River for helicopter dipping contributed to the delay.

Strategies and decisions made on the Thirtymile Fire from initial attack to deployment did not appropriately reflect the extreme fire conditions that existed, nor did those decisions appropriately consider the diversity and complexity of fuel types in the valley bottom. Similarly, features of the valley bottom and the lack of adequate safety zones influenced the outcome.

Available training records confirmed that all key leaders on this incident were trained and qualified for their assignments.

FIRE FATALITY AND NEAR-MISS INVESTIGATION ELEMENT MATRIX

Name of Fire: Case Study #10: Thirtymile Fire			
Fire Behavior	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Fuels			X
Weather			X
Topography			X
Predicted vs. Observed		X	
Environment	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Smoke		X	
Temperature			X
Visibility			X
Slope			X
Other			X
Control Mechanisms	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Span of control		X	
Communications		X	
Ongoing evaluation			X
Firefighting orders			X
Watch outs			X
LCES			X
Downhill guidelines	X		

Involved Personnel Profiles	Did Not Contribute	Influenced	Significant Contribution
Training, qualifications, and physical fitness			X
Operational period, fatigue			X
Attitudes			X
Leadership			X
Experience levels			X
Equipment	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Available			X
Performance/nonperformance		X	
Clothing and equipment			X
Used for intended purpose			X
Incident Management	**Did Not Contribute**	**Influenced**	**Significant Contribution**
Incident objectives			X
Strategy			X
Tactics			X
Safety briefings			X
Major concerns addressed			X
Instructions given			X

Appendix B: Glossary of Terms

1-hr timelag fuels ..... Dead fuels consisting of herbaceous plants or roundwood less than one-quarter inch in diameter. Also included is the uppermost layer of litter on the forest floor.

10-hr timelag fuels ..... Dead fuels consisting of roundwood in the size range of one-quarter inch in diameter and, very roughly, the layer of litter extending from just below the surface to three-quarters of an inch below the surface.

100-hr timelag fuels Dead fuels consisting of roundwood in the size range of 1 to 3 inches in diameter and, very roughly, the forest floor from three-quarters of an inch to 4 inches below the surface.

1,000-hr timelag fuels ..... Dead fuels consisting of roundwood in the size range of 3 to 8 inches in diameter or in the layer of the forest floor more than about 4 inches below the surface or both.

Aerial fuels..... All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

Aerial ignition..... Ignition of fuels by dropping incendiary devices or materials from aircraft.

Air tanker ..... A fixed-wing aircraft equipped to drop fire retardants or suppressants.

Agency..... Any federal, state, or county government organization participating with jurisdictional responsibilities.

Anchor point..... An advantageous location, usually a barrier to fire spread, from which to start building a fireline. An anchor point is used to reduce the chance of fire fighters being flanked by fire.

Area ignition..... Ignition of several individual fires throughout an area, either simultaneously or in rapid succession adding to and influencing the main body of the fire to produce a hot, fast spreading fire condition.

Aspect..... Direction toward which a slope faces.

Backfire..... A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

BehavePlus..... A Windows® based interactive computer program for modeling fuel and fire behavior.

Belt weather kit..... Belt mounted kit with pockets fitted for anemometer, compass, sling psychrometer, slide rule, water bottle, pencils, and record book. Used to take weather observations and provide on-site conditions.

Blow-up..... A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a firestorm. (See Flare-up.)

Brush..... A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low growing trees, usually of a type undesirable for livestock or timber management.

Brush fire..... A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Bucket drops..... The dropping of fire retardants or suppressants from specially designed buckets slung below a helicopter.

Buffer zones..... An area of reduced vegetation that separates wildlands from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such as agriculture, recreation areas, parks, or golf courses.

Burn out..... Setting fire inside a control line to widen it or consume fuel between the edge of the fire and the control line.

Burning conditions..... The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

Burning index..... An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

Burning period..... That part of each 24-hour period when fires spread most rapidly, typically from 10:00 a.m. to sundown.

Candle or candling..... A single tree or a very small clump of trees that is burning from the bottom up.

Cold front ..... The leading edge of a relatively cold air mass that displaces warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, the result may be cloudiness, precipitation, and thunderstorms. If both air masses are dry, no clouds may form. Following the passage of a cold front in the Northern Hemisphere, westerly or northwesterly winds of 15-30 or more miles per hour often continue for 12-24 hours.

Cold trailing ..... A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

Command staff..... The command staff consists of the information officer, safety officer, and liaison officer. They report directly to the incident commander and may have assistants.

Complex ..... Two or more individual incidents located in the same general area, which are assigned to a single incident commander or unified command.

Contain a fire..... A fuel break around the fire has been completed. This break may include natural barriers or manually and/or mechanically constructed line.

Control a fire ..... The complete extinguishment of a fire, including spot fires. Fireline has been strengthened so that flare-ups from within the perimeter of the fire will not break through this line.

Control line..... All built or natural fire barriers and treated fire edge used to control a fire.

Cooperating agency ..... An agency supplying assistance other than direct suppression, rescue, support, or service functions to the incident control effort; e.g., Red Cross, law enforcement agency, telephone company, etc.

Creeping fire..... Fire burning with a low flame and spreading slowly.

Crew boss..... A person in supervisory charge of usually 16 to 21 fire fighters and responsible for their performance, safety, and welfare.

Crown fire (crowning) ..... The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

Curing ..... Drying and browning of herbaceous vegetation or slash.

Dead fuels ..... Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity/precipitation), dry-bulb temperature, and solar radiation.

Defensible space ..... An area either natural or artificial where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Deployment ..... See Fire Shelter Deployment.

Detection ..... The act or system of discovering and locating fires.

Direct attack ..... Any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Dispatch ..... The implementation of a command decision to move a resource or resources from one place to another.

Dispatcher ..... A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

Dispatch center ..... A facility from which resources are directly assigned to an incident.

Division ..... Divisions are used to divide an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the span-of-control of the operations chief. A division is located with the Incident Command System organization between the branch and the task force/strike team.

Dozer ..... Any tracked vehicle with a front-mounted blade used for exposing mineral soil. In 1937, Caterpillar changed designations, eliminating tonnage displacement or horsepower nomenclature in describing the size of a particular dozer. The designations were simplified by using the letter "D," standing for diesel, followed by a number to indicate the size of dozer. The numbers start with 2, being the smallest tractor, through 11, the largest. These designators have been an industry standard for identifying the size of dozers since 1937.

D4 = dozers with a minimum 50 hp rating
D5 = dozers with a minimum 100 hp rating
D6 = dozers with a minimum 100 hp rating
D7 = dozers with a minimum 200 hp rating
D8 = dozers with a minimum 200 hp rating

Dozer line ..... Fireline constructed by the front blade of a dozer.

Dozer Tender ..... Any ground vehicle with personnel capable of maintenance, minor repairs, and limited fueling of dozers.

Drip torch ..... Hand-held device for igniting fires by dripping flaming liquid fuel on the materials to be burned; consists of a fuel fount, burner arm, and igniter. Fuel used is generally a mixture of diesel and gasoline.

Drop zone ..... Target area for air tankers, helitankers, and cargo dropping.

Drought index ..... A number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

Duff ..... The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.

Engine ..... Any ground vehicle providing specified levels of pumping, water and hose capacity.

Engine crew ..... Fire fighters assigned to an engine. The Fireline Handbook defines the minimum crew makeup by engine type.

Entrapment ..... A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near-misses."

Escape route ..... A preplanned and understood route fire fighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, natural rocky area that is large enough to take refuge without being burned. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

Escarpment..... A steep slope or long cliff crossed by erosion or faulting separating two level areas of differing heights.

Extended attack incident..... A wildland fire that has not been contained or controlled by initial attack forces and for which more fire fighting resources are arriving, en route, or being ordered by the initial attack incident commander.

Extended hose lay ..... Hose lays in excess of 600 feet.

Extreme fire behavior..... "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One of more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

Faller ..... A person who fells trees. Also called a sawyer or cutter.

Field observer..... Person responsible to the Situation Unit Leader for collecting and reporting information about an incident obtained from personal observations and interviews.

Fine (light) fuels ..... Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼" diameter and have a time lag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Fingers of a fire ..... The long narrow extensions of a fire projecting from the main body.

Fire behavior ..... The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire behavior forecast..... Prediction of probable fire behavior, usually prepared by a Fire Behavior Officer, in support of fire suppression or prescribed burning operations.

Fire behavior specialist..... A person responsible to the Planning Section Chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather, and topography.

Fire break ..... A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fire cache..... A supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

Fire crew ..... An organized group of fire fighters under the leadership of a crew leader or other designated official.

Fire danger ..... The resultant descriptor of the combination of both constant and variable factors that affect the initiation, spread, and difficulty of control of wildfires on an area.

Fire danger rating..... A system that integrates the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an area's protection needs.

Fire-fighting resources ..... All people and major items of equipment that can or potentially could be assigned to fires.

Fire front..... The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire intensity..... A general term relating to the heat energy released by a fire.

Fireline ..... A linear fire barrier that is scraped or dug to mineral soil.

Fire load ..... The number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

Fire perimeter ..... The entire outer edge or boundary of a fire.

Fire season ..... 1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities. 2) A legally enacted time during which burning activities are regulated by state or local authority.

Fire shelter ..... An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life-threatening situations, as a last resort.

Fire shelter deployment ..... The removing of a fire shelter from its case and using it as protection against fire.

Fire storm ..... Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

Fire triangle ..... Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire weather ..... Weather conditions that influence fire ignition, behavior, and suppression.

Fire weather watch ..... A term used by fire weather forecasters to notify using agencies, usually 24-72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

Fire whirl ..... Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to more than 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

Flame height ..... The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

Flame length ..... The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

Flaming front ..... The zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone, combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front. Also called fire front.

Flanks of a fire ..... The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

Flare-up ..... Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

Flash fuels ..... Fuels such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash, that ignite readily and are consumed rapidly when dry. Also called fine fuels.

Forb ..... A broad-leaved herb, other than a grass, growing in a field, prairie, or meadow.

Fuel ..... Combustible material. Includes, vegetation, such as grass, leaves, ground litter, plants, shrubs and trees, that feed a fire. (See Surface Fuels.)

Fuel bed ..... An array of fuels usually constructed with specific loading, depth, and particle size to meet experimental requirements; also, commonly used to describe the fuel composition in natural settings.

Fuel class ..... A group of fuels possessing common characteristics. Dead fuels are grouped according to their timelag (1-, 10-, 100-, or 1,000-hr) and live fuels are grouped by whether they are herbaceous (annual or perennial) or woody.

Fuel loading ..... The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.

Fuel model ..... Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel moisture (fuel moisture content) ..... The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212°F.

Fuel reduction ..... Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Fuel type ..... An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Fusee ..... A colored flare designed as a railway warning device and widely used to ignite suppression and prescription fires.

General staff ..... The group of incident management personnel reporting to the incident commander. They may each have a deputy, as needed. Staff consists of Operations Section Chief, Planning Section Chief, Logistics Section Chief, and Finance/Administration Section Chief.

Geographic area ..... A political boundary designated by the wildland fire protection agencies, where these agencies work together in the coordination and effective utilization

Ground fuel ..... All combustible materials below the surface litter, including duff, tree or shrub roots, punchy wood, peat, and sawdust, which normally support a glowing combustion without flame.

Haines index ..... An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

Handline ..... A fireline built with hand tools.

Hazard reduction ..... Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

Head of a fire ..... The side of the fire having the fastest rate of spread.

Head pressure ..... The pressure exerted by the vertical height of a column of water; expressed in feet.

Heavy fuels ..... Fuels of large diameter such as snags, logs, large limb wood, that ignite and are consumed more slowly than flash fuels.

Helibase..... The main location within the general incident area for parking, fueling, maintaining, and loading helicopters. The helibase is usually located at or near the incident base.

Helispot ..... A temporary landing spot for helicopters.

Helitack..... The use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fireline during the initial stages of a fire.

Helitack crew..... A group of fire fighters trained in the technical and logistical use of helicopters for fire suppression.

Holding actions..... Planned actions required to achieve wildland prescribed fire management objectives. These actions have specific implementation timeframes for fire use actions but can have less sensitive implementation demands for suppression actions.

Holding resources ..... Fire fighting personnel and equipment assigned to do all required fire suppression work following fireline construction but generally not including extensive mop-up.

Hose lay..... Arrangement of connected lengths of fire hose and accessories on the ground, beginning at the first pumping unit and ending at the point of water delivery.

Hotshot crew..... A highly trained fire crew used mainly to build fireline by hand.

Hotspot..... A particular active part of a fire.

Hotspotting ..... Reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat, generally the first step in prompt control, with emphasis on first priorities.

Ignition crew..... Fire fighting personnel and equipment assigned to perform a firing objective, using fire to ignite and reinforce control lines during a firing operation.

Incident ..... A human-caused or natural occurrence, such as wildland fire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural resources.

Incident Command Post (ICP) ..... Location at which primary command functions are executed. The ICP may be co-located with the incident base or other incident facilities.

Incident Command System (ICS)..... The combination of facilities, equipment, personnel, procedure and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

Incident Commander..... Individual responsible for the management of all incident operations at the incident site.

Incident Management Team (IMT) ... The incident commander and appropriate general or command staff personnel assigned to manage an incident.

Incident objectives ..... Statements of guidance and direction necessary for the selection of appropriate strategies and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed.

Initial attack ..... The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

Job hazard analysis..... This analysis of a project is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions and the required safety equipment to ensure public and employee safety.

Knock down..... To reduce the flame or heat on the more vigorously burning parts of a fire edge.

Ladder fuels..... Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning.

Large fire ..... 1) For statistical purposes, a fire burning more than a specified area of land e.g., 300 acres. 2) A fire burning with a size and intensity such that its behavior is determined by interaction between its own convection column and weather conditions above the surface.

Lead plane ..... Aircraft with pilot used to make dry runs over the target area to check wing and smoke conditions and topography and to lead air tankers to targets and supervise their drops.

Light (fine) fuels ..... Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼" diameter and have a time lag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Litter ..... Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer, composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

Live fuels ..... Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

Mineral soil ..... Soil layers below the predominantly organic horizons; soil with little combustible material.

Mobilization ..... The process and procedures used by all organizations, federal, state and local for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

Mop-up ..... To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they will not roll downhill.

Mutual aid agreement ..... Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

National fire danger rating system (NFDRS) ..... A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

National Wildfire Coordinating Group (NWCG) ..... A group formed under the direction of the Secretaries of Agriculture and the Interior and comprised of representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service and Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildland fire activities and provide a forum to discuss, recommend action, or resolve issues and problems of substantive nature. NWCG is the certifying body for all courses in the National Fire Curriculum.

Nomex® ..... Trade name for a fire resistant synthetic material used in the manufacturing of flight suits and pants and shirts used by fire fighters.

Normal fire season ..... 1) A season when weather, fire danger, and number and distribution of fires are about average. 2) Period of the year that normally comprises the fire season.

Operations branch director ..... Person under the direction of the operations section chief who is responsible for implementing that portion of the incident action plan appropriate to the branch.

Operational period ..... The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not more than 24 hours.

Overhead ..... People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

Pack test ..... Used to determine the aerobic capacity of fire suppression and support personnel and assign physical fitness scores. The test consists of walking a specified distance, with or without a weighted pack, in a predetermined period of time, with altitude corrections.

Peak fire season ..... That period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

Personnel protective equipment (PPE) ..... All fire fighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working. PPE includes, but is not limited to: 8-inch high-laced leather boots with lug soles, fire shelter, hard hat with chin strap, goggles, ear plugs, fire-resistive shirts and trousers, leather gloves and individual first aid kits.

Preparedness ..... Condition or degree of being ready to cope with a potential fire situation

Project fire ..... A fire of such size or complexity that a large organization and prolonged activity is required to suppress it.

Pulaski ..... A combination chopping and trenching tool, which combines a single-bitted axe-blade with a narrow adze-like trenching blade fitted to a straight handle. Useful for grubbing or trenching in duff and matted roots. Well-balanced for chopping.

Rate of spread (ROS) ..... The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

Reburn ..... The burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; an area that has reburned.

Red flag warning ..... Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

Rehabilitation ..... The activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

Relative humidity (RH) ..... The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

Remote automatic weather station (RAWS) ..... An apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which the data is re-transmitted to an earth-receiving station for use in the National Fire Danger Rating System.

Resources ..... 1) Personnel, equipment, services and supplies available, or potentially available, for assignment to incidents. 2) The natural resources of an area, such as timber, crass, watershed values, recreation values, and wildlife habitat.

Resource order ..... An order placed for fire fighting or support resources.

Retardant ..... A substance or chemical agent that reduces the flammability of combustibles.

Riparian ..... Relating to the banks of a natural course of water.

Roundwood ..... Boles, stems, or limbs of wood material; that portion of the deal wildland fuel, which is roughly cylindrical in shape.

Run (of a fire) ..... The rapid advance of the head of a fire with a marked change in fireline intensity and rate of spread from that noted before and after the advance.

Running ..... A rapidly spreading surface fire with a well-defined head.

Safety zone ..... An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone nearby allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas that can be used with relative safety by fire fighters and their equipment in the event of a blowup in the vicinity.

Scratch line ..... An unfinished preliminary fireline hastily established or built as an emergency measure to check the spread of fire.

Single resource ..... An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

Size-up ..... To evaluate a fire to determine a course of action for fire suppression.

Slash ..... Debris left after logging, pruning, thinning, or brush cutting; includes logs, chips, bark, branches, stumps and broken understory trees or brush.

Slope ..... The rise or fall in terrain measured in feet per 100 feet of horizontal distance measurement, expressed as a percentage.

Slop-over ..... A fire edge that crosses a control line or natural barrier intended to contain the fire.

Smoldering fire ..... A fire burning without flame and barely spreading.

Snag ..... A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

Spot fire ..... A fire ignited outside the perimeter of the main fire by flying sparks or embers.

Spot weather forecast ..... A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

Spotting ..... Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Staffing level ..... The basis for decision support for daily staffing of initial attack resources and other activities; a level of readiness and an indicator of daily preparedness.

Staging area ..... Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three-minute available basis. Staging areas are managed by the operations section.

Strategy ..... The science and art of command as applied to the overall planning and conduct of an incident.

Strike team ..... Specified combinations of the same kind and type of resources, with common communications, and a leader.

Strike Team Leader (STL) ..... Person responsible to a division/group supervisor for performing tactical assignments given to the strike team.

Suppressant ..... An agent, such as water or foam, used to extinguish the flaming and glowing phases of combustion when direction applied to burning fuels.

Suppression ..... All the work of extinguishing or containing a fire, beginning with its discovery.

Surface fuels ..... Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

Swamper ..... (1) A worker who assists fallers and/or sawyers by clearing away brush, limbs, and small trees. Carries fuel, oil and tools and watches for dangerous situations. (2) A worker on a dozer crew who pulls winch line, helps maintain equipment, etc., to speed suppression work on a fire.

Tactics ..... Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

Timelag ..... The time necessary for a fuel particle to lose approximately 63% of the difference between its initial moisture content and its equilibrium moisture content.

Torching ..... The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

Trigger points ..... A pre-identified or anticipated event that when it occurs initiates a preplanned response.

Two-way radio ..... Radio equipment with transmitters in mobile units on the same frequency as the base station, permitting conversation in two directions using the same frequency in turn.

Type ..... The capability of a fire fighting resource in comparison to another type. Type 1 usually means a greater capability due to power, size, or capacity.

Uncontrolled fire ..... Any fire which threatens to destroy life, property, or natural resources, and

Underburn ..... A fire that consumes surface fuels but not trees or shrubs. (See Surface Fuels.)

Water tender ..... A ground vehicle capable of transporting specified quantities of water.

Wet line ..... A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

Wildland fire ..... Any nonstructure fire, other than prescribed fire, that occurs in the wildland.

Wildland/urban interface ..... The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wind vectors ..... Wind directions used to calculate fire behavior.

Appendix C: ICS Forms

The following ICS forms have been referenced throughout this student supplement. Your instructor has additional copies when they are needed for student activities.

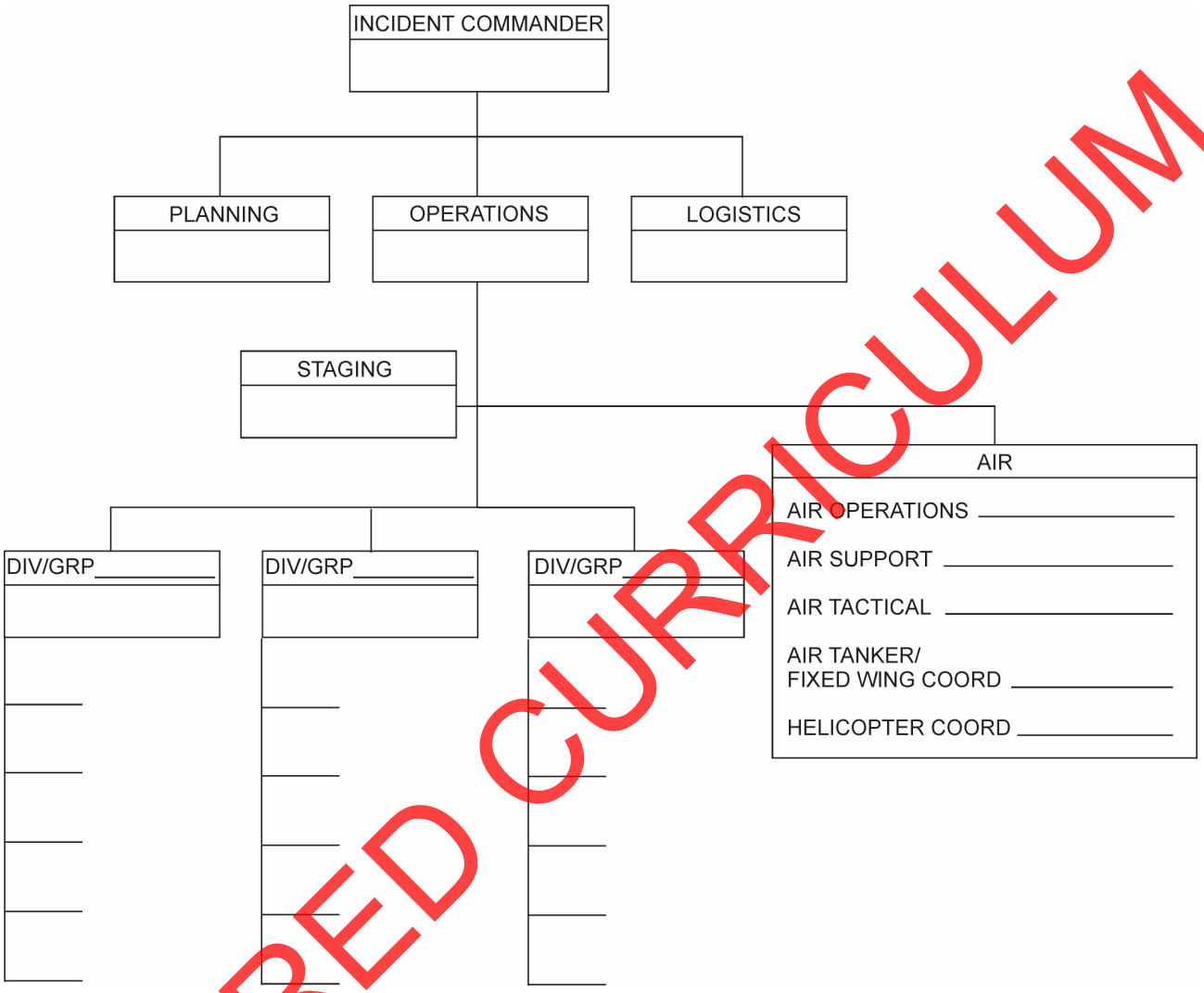
INCIDENT BRIEFING	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

4. MAP SKETCH

ICS 201 5-94	PAGE 1	8. PREPARED BY (Name and Position)

7. SUMMARY OF CURRENT OBJECTIVES AND ACTIONS
CURRENT OBJECTIVES:
CURRENT ACTIONS:

6. CURRENT ORGANIZATION



7. RESOURCES SUMMARY				
RESOURCES ORDERED	RESOURCE IDENTIFICATION	ETA	ON SCENE ✓	LOCATION/ASSIGNMENT

OBJECTIVES ICS 202	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

4. OPERATIONAL PERIOD (Date/Time):

5. OVERALL INCIDENT OBJECTIVE:

6. OBJECTIVES FOR THIS OPERATIONAL PERIOD:

7. WEATHER FORECAST FOR OPERATIONAL PERIOD:

8. GENERAL/SAFETY MESSAGE:

9. ATTACHMENTS (✓IF ATTACHED)

❒ ORGANIZATION LIST (ICS 203) ❒ MEDICAL PLAN (ICS 206) ❒ _____

❒ ASSIGNMENT LISTS (ICS 204) ❒ INCIDENT MAP ❒ _____

❒ COMMUNICATIONS PLAN (ICS 205) ❒ TRAFFIC PLAN ❒

ICS 202 5-94	10. PREPARED BY (Planning Section Chief)	11. APPROVED BY (Incident Commander)

ORGANIZATION ASSIGNMENT LIST	ICS 203	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED

5. INCIDENT COMMAND AND STAFF

POSITION	NAME
INCIDENT COMMANDER	
DEPUTY	
SAFETY OFFICER	
INFORMATION OFFICER	
LIAISON OFFICER	

6. AGENCY REPRESENTATIVES

AGENCY	NAME

7. PLANNING SECTION

CHIEF	
DEPUTY	
RESOURCES UNIT	
SITUATION UNIT	
DOCUMENTATION UNIT	
DEMOBILIZATION UNIT	
TECHNICAL SPECIALISTS	

8. LOGISTICS SECTION

CHIEF	
DEPUTY	

a. SUPPORT BRANCH

DIRECTOR	
DEPUTY	
SUPPLY UNIT	
FACILITIES UNIT	
GROUND SUPPORT UNIT	

b. SERVICE BRANCH

DIRECTOR	
DEPUTY	
COMMUNICATIONS UNIT	
MEDICAL UNIT	
FOOD UNIT	

4. OPERATIONAL PERIOD (Date/Time)

9. OPERATIONS SECTION

CHIEF		
DEPUTY		

a. BRANCH I – DIVISION/GROUPS

BRANCH DIRECTOR		
DEPUTY		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		

b. BRANCH II – DIVISIONS/GROUPS

BRANCH DIRECTOR		
DEPUTY		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		

c. BRANCH III – DIVISIONS/GROUPS

BRANCH DIRECTOR		
DEPUTY		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		

d. AIR OPERATIONS BRANCH

AIR OPERATIONS BRANCH DIR.	
DEPUTY	
AIR TACTICAL SUPERVISOR	
AIR SUPPORT SUPERVISOR	
HELICOPTER COORDINATOR	
AIR TANKER/FIXED WING COORD.	

10. FINANCE/ADMINISTRATION SECTION

CHIEF	
DEPUTY	
TIME UNIT	
PROCUREMENT	
COMPENSATION/CLAIMS UNIT	
COST UNIT	

ICS 203 5-94	PREPARED BY (Resources Unit)

1. BRANCH	2. DIVISION/GROUP	**ASSIGNMENT LIST**	**ICS 204 (5-94)**

3. INCIDENT NAME	4. OPERATIONAL PERIOD DATE: TIME:

5. OPERATIONAL PERSONNEL

OPERATIONS CHIEF:		DIVISION/GROUP SUPERVISOR:	
BRANCH DIRECTOR:		AIR TACTICAL SUPERVISOR:	

6. RESOURCES ASSIGNED THIS PERIOD

RESOURCE DESIGNATOR	LEADER	NUMBER PERSONS	TRANS. NEEDED	DROP OFF POINT/TIME	PICK UP POINT/TIME

7. CONTROL ASSIGNMENT(S)

8. SPECIAL INSTRUCTIONS/SAFETY MESSAGE

9. DIVISION/GROUP COMMUNICATION SUMMARY

FUNCTION		FREQ.	SYSTEM	CHAN.	FUNCTION		FREQ,	SYSTEM	CHAN.
COMMAND	LOCAL				SUPPORT	LOCAL			
	REPEAT					REPEAT			
DIV/GROUP TACTICAL					GROUND-TO-AIR				

PREPARED BY (Resource Unit Leader)	APPROVED BY (Planning Section Chief)	DATE	TIME

INCIDENT RADIO COMMUNICATIONS PLAN			1. INCIDENT NAME	2. DATE/TIME PREPARED	3. OPERATIONAL PERIOD DATE/TIME
SYSTEM/CACHE	CHANNEL	FUNCTION	FREQUENCY	ASSIGNMENT	REMARKS
ICS 205 **2-95**		4. PREPARED BY (Communications Unit)			

MEDICAL PLAN ICS 206	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED	4. OPERATIONAL PERIOD

5. INCIDENT MEDICAL AID STATIONS

MEDIAL AID STATIONS	LOCATION	PARAMEDICS?	
		YES	NO

6. TRANSPORTATION

A. AMBULANCE SERVICES

NAME	ADDRESS	PHONE	PARAMEDICS?	
			YES	NO

B. INCIDENT AMBULANCES

NAME	LOCATION	PARAMEDICS?	
		YES	NO

7. HOSPITALS

NAME	ADDRESS	TRAVEL TIME		PHONE	HELIPAD?		BURN CENTER?	
		AIR	GRND		YES	NO	YES	NO

8. MEDICAL EMERGENCY PROCEDURES

ICS 206 5-94	9. PREPARED BY (Medical Unit Leader)	10. REVIEWED BY (Safety Officer)

CHECK-IN LIST ICS 211	1. INCIDENT NAME	2. CHECK-IN LOCATION				3. DATE/TIME
5-94			BASE		CAMP	STAGING AREA
			ICP RESOURCE UNIT			HELIBASE

CHECK-IN INFORMATION

4. LIST PERSONNEL (OVERHEAD) BY AGENCY & NAME -OR- LIST EQUIPMENT BY THE FOLLOWING FORMAT					5.	6.	7.	8.	9. MANIFEST		10.	11.	12.	13.	14.	15.	16.
AGENCY	SINGLE T/F–S/T	KIND	TYPE	ID #/ NAME	ORDER/ REQUEST #	DATE/TIME CHECK-IN	LEADER'S NAME	TOTAL # OF PERSONNEL	YES	NO	CREW WEIGHT OR INDIVIDUAL'S WEIGHT	HOME BASE	DEPARTURE POINT	METHOD OF TRAVEL	INCIDENT ASSIGNMENT	OTHER QUALIFICATIONS	SENT TO RESTAT TIME/INT.

17. Page _____ of _____

18. Prepared by (name and Position). Use back for remarks or comments.

INCIDENT DEMOBILIZATION VEHICLE SAFETY INSPECTION

ICS 212 **2-96**

INCIDENT NAME		ORDER NO.
VEHICLE LICENSE NO.	AGENCY	REG/UNIT
TYPE (ENG., BUS., SEDAN)	ODOMETER	VIN

INSPECTION ITEMS		PASS	FAIL	COMMENTS	
1. Gauges and lights*	See back				
2. Seat belts *	See back				
3. Glass and mirrors*	See back				
4. Wipers and horn*	See back				
5. Engine compartment	See back				
6. Fuel system*	See back				
7. Steering*	See back				
8. Brakes*	See back				
9. Driveline U-joints	Check play				
10. Springs and shocks	See back				
11. Exhaust system*	See back				
12. Frame*	See back				
13. Tire and wheels*	See back				
14. Coupling devices* Emergency exit (buses)					
15. Pump operation					
16. Damaged on incident					
17. Other					

*** = SAFETY ITEM – DO NOT RELEASE UNTIL REPAIRED**

ADDITIONAL COMMENTS:

☐ HOLD FOR REPAIRS		☐ RELEASE	
DATE	TIME	DATE	TIME
INSPECTOR NAME (PRINT)		OPERATOR NAME (PRINT)	
INSPECTOR SIGNATURE		OPERATOR SIGNATURE	

Distribution: ORIGINAL: Inspector COPY 1: Vehicle Operator COPY 2: Incident Documentation Unit

INSPECTION ITEMS

(REF: FEDERAL MOTOR CARRIER SAFETY REGULATIONS)

1. Gauges and Lights	Speedometer inoperative. (Federal Motor Carrier Safety Regulation [FMCSR] 393.82) All required lighting devices, reflectors and electrical equipment must be properly positioned, colored and working. (FMCSR 393.9)
2. Seat belts	Any driver's or right outboard seat belt, missing, or inoperative. (FMCSR 393.93) Passenger carrying has missing or inoperative seat belts in passenger seats (buses excepted).
3. Glass and mirrors	Any windshield crack over 1/4" wide. Any damage 3/4" or greater in diameter. Any 2 damaged areas are closer than 3" to each other. Any crack less than 1/4" wide intersects with any other crack. (FMCSR 393.60) Any crack or discoloration in the windshield area lying within the sweep of the wiper on either side of the windshield. (FMCSR Appendix G, Sub. B) Any required mirror missing. One on each side, firmly attached to the outside of the vehicle, and so located as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. See Exceptions (FMCSR 393.80) Any required mirror broken.
4. Wipers and horn	Wiper blade(s) fail to clean windshield within 1" of windshield sides. (FMCSR 393.78) Horn, missing, inoperative, or fails to give an adequate and reliable warning signal. (FMCSR 393.81)
5. Engine compartment	Low fluid levels Loose or leaking battery Excessive leaks Cracked or deteriorated belts or hoses. Any condition of impending or probable failure.
6. Fuel system	Visible leak at any point. Fuel tank cap missing. Fuel tank not securely attached to vehicle because of loose, broken, or missing mounting bolts/brackets. (FMCSR Appendix G, Sub. B)
7. Steering	Steering wheel does not turn freely, has any spokes cracked, loose spokes or missing parts. Steering lash not within parameters. (FMCSR 393.209) Steering column is not secure. Steering system; any U-joints worn, faulty, or repaired by welding. Steering gear box is loose, cracked or missing mounting bolts. Pitman arm loose. Power steering: any components inoperative. Any loose, broken, or missing parts. Belts frayed, cracked or slipping. Any fluid leaks, fluid reservoir not full. (FMCSR 393.209)
8. Brakes	Brake system has any missing, loose, broken, out of adjustment, or worn out components. Brake system has any air or fluid leaks. (FMCSR Appendix G, Sub. B) Brake system has any other deficiencies as described in FMCSR Appendix G, Sub. B.
9. Driveline U-joints	N/A
10. Springs and shocks	▪ Any U-bolt, spring, spring hanger or any other axle positioning part is cracked, broken, loose or missing resulting in any shifting of an axle from it's normal position. (FMCSR Appendix G, Sub. B)
11. Exhaust	Any leaks at any point forward of or directly below the driver and/or sleeper compartment. Bus exhaust leaks or discharge forward of the rearmost part of the bus in excess of 6' for gasoline powered or 15" for other than gasoline powered, or forward of any door or window designed to be opened on other than gasoline powered bus. (Exception: emergency exit) Any part of the exhaust system so located as would be likely to result in burning, charring, or damaging the wiring, fuel supply, or any combustible part of the vehicle. (FMCSR Appendix G, Sub. B)
12. Frame	Any cracked, broken, loose or sagging frame member. Any loose or missing fasteners including those attaching engine, transmission, steering gear, suspension, body or frame to contact the tire or wheel assemblies. Adjustable axle assemblies with locking pins missing or not engaged. (FMCSR Appendix G, Sub. B)
13. Tires and tread	Tread depth less than 4/32" on steering axle. Less than 2/32" on any other axle. Any body ply or belt material exposed through tread or sidewall. Any tread or sidewall separation. Any cut exposing ply or belt material. Any tire marked "Not for Highway Use." A tube-type radial tire without radial tube stem markings. Any mixing of bias and radial tires on the same axle. Any tire not properly inflated or overloaded. Any bus with recapped tires. (FMCSR Appendix G, Sub. B) Lock or slide rings; any bent, broken, cracked, improperly seated, sprung or mismatched ring(s). Wheels and rims; any cracked or broken or has elongated boltholes. Fasteners (both spoke and disc wheels). Any loose, missing, broken, cracked, stripped, or otherwise ineffective fasteners. Any cracks in welds attaching disc wheel disc to rim. Any crack in welds attaching tubeless demountable rim to adapter. Any welded repair on aluminum wheel(s) on a steering axle or any welded repair other then disc to rim attachment on steel disc wheel(s) on steering axle. (FMCSR Appendix G, Sub. B)

UNIT/ACTIVITY LOG **ICS 214** **5/94**	1. INCIDENT NAME	2. DATE PREPARED	3. TIME PREPARED
4. ORGANIZATION POSITION	5. LEADER NAME	6. OPERATIONAL PERIOD	

7. PERSONNEL ROSTER ASSIGNED		
NAME	ICS POSITION	HOME BASE

8. ACTIVITY LOG (CONTINUE ON REVERSE)	
TIME	MAJOR EVENTS

TIME	MAJOR EVENTS
	9. PREPARED BY (NAME AND POSITION)

LCES ANALYSIS OF TACTICAL APPLICATIONS											OTHER RISK ANALYSIS					
Division/Group	Downhill Fireline	Underslung Fireline	Indirect Fireline	Midslope Fireline	Frontal Assault	Anchor Points	Extreme Conditions Spotting, Wind-driven	Unburned Area	Snags	**LCES Mitigations**	Hazardous Materials	Transportation 1 Hr+	Communication	Structure Protection	Multi-aircraft	**Other Risk Mitigations**
INCIDENT SAFETY ANALYSIS **ICS 215A** **11-93**										1. INCIDENT NAME	2. DATE PREPARED TIME PREPARED					3. OPERATIONAL PERIOD

DEMOBILIZATION CHECKOUT — ICS 221

1. INCIDENT NAME/NUMBER	2. DATE/TIME	3. DEMOB NO.

4. UNIT/PERSONNEL RELEASED

5. TRANSPORTATION TYPE/NO.

6. ACTUAL RELEASE DATE/TIME	7. MANIFEST ☐ Yes ☐ No
_____	NUMBER: _____
8. DESTINATION	9. AGENCY/REGION/AREA NOTIFIED
_____	NAME: _____
_____	DATE: _____

10. UNIT LEADER RESPONSIBLE FOR COLLECTING PERFORMANCE RATING

11. UNIT/PERSONNEL: YOU AND YOUR RESOURCES HAVE BEEN RELEASED SUBJECT TO SIGN-OFF FROM THE FOLLOWING:

(DEMOB UNIT LEADER ✓ APPROPRIATE BOX)

LOGISTICS SECTION

❒ SUPPLY UNIT _____

❒ COMMUNICATIONS UNIT _____

❒ FACILITIES UNIT _____

❒ GROUND SUPPORT UNIT _____

PLANNING SECTION

❒ DOCUMENTATION UNIT _____

FINANCE/ADMINISTRATION SECTION

❒ TIME UNIT _____

OTHER

☐ _____ _____

☐ _____ _____

12. REMARKS

INSTRUCTIONS ON BACK

INSTRUCTIONS FOR COMPLETING THE DEMOBILIZATION CHECKOUT

(ICS FORM 221)

Prior to actual Demob Planning Section (Demob Unit) should check with the Command Staff (Liaison Officer) to determine any agency specific needs related to demob and release. If any, add to line Number 11.

ITEM NUMBER	ITEM TITLE	INSTRUCTIONS
1	Incident Name/Number	Print name and/or number of incident.
2	Date/Time	Enter the date and time prepared.
3	Demob No.	Enter agency request number, order number, or agency demob number if applicable.
4	Unit/Personnel Released	Enter appropriate vehicle or strike team/task force ID number(s) and leader's name or individual overhead or staff personnel being released.
5	Transportation Type/No.	Enter the method and vehicle ID number for transportation back home. Enter "N/A" if own transportation is provided. Additional details should be included in Block 12. Remarks.
6	Actual Release Date/Time	To be completed at the conclusion of demob at the time of actual release from the incident. Would normally be the last item to be completed.
7	Manifest	Mark the appropriate box. If "Yes," enter manifest number. Some agencies require a manifest for air travel.
8	Destination	Enter the location to which the unit or personnel have been released, i.e., area, region, home base, airport, mobilization center, etc.
9	Agency/Region/Area Notified	Identify the agency/region/area notified. Enter the date and time of notification.
10	Unit Leader Responsible for Collecting Performance Rating	Self-explanatory. Note: not all agencies require these ratings.
11	Resource Supervision	Demob Unit Leader will check the box to the left of those units requiring checkout. Identified Unit Leaders will initial to the right to indicate release. Blank boxes are provided for any additional checks as needed, i.e., Safety Officer, Agency Representative, etc.
12	Remarks	Any additional information pertaining to demob or release.

INCIDENT PERSONNEL PERFORMANCE RATING

ICS 225

9/86

INSTRUCTIONS: The immediate job supervisor prepares this form for each subordinate and delivers it to the Planning Section before leaving the incident. Rating will be reviewed with employee who will sign at the bottom.

THIS RATING IS TO BE USED ONLY FOR DETERMINING AN INDIVIDUAL'S PERFORMANCE

1. NAME		2. INCIDENT NAME AND NUMBER	
3. HOME UNIT (ADDRESS)		4. INCIDENT LOCATION (ADDRESS)	
5. INCIDENT POSITION	6. DATE OF ASSIGNMENT FROM: TO:	7. ACRES BURNED	8. FUEL TYPE(S)

9. EVALUATION

Enter an "X" under the appropriate rating number and heading for each category listed. The definition for each rating number follows:

0—Deficient	Does not meet minimum requirements of the individual element. ***Deficiencies must be identified in Block 10: Remarks.***
1—Needs to Improve	Meets some or most of the requirements of the individual element. ***Identify improvement needed in Block 10: Remarks.***
2—Satisfactory	Employee meets all requirements of the individual element.
3—Superior	Employee consistently exceeds the performance requirements.

Rating Factors	Hot Line				Mop-up				Camp				Other (specify)			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
Knowledge of the job																
Ability to obtain performance																
Attitude																
Decisions under stress																
Initiative																
Consideration for personnel welfare																
Obtain necessary equipment and supplies																
Physical ability for the job																
Safety																
Other (specify)																

10. Remarks

11. Employee (signature). This rating has been discussed with me.			12. Date
13. Rated By (signature)	14. Home Unit	15. Incident Position	16. Date

EMERGENCY ACTIVITY RECORD

1. Agency Designator				
State		3 Letter ID		

2. Strike Team/Task Force #							
3 Letter ID			Number				Ltr

3. Incident Order Number					
State		3 Letter ID			Number

4. Incident Request Number				
3 Letter ID			ID	Number

5. Dispatch Information

Incident Name: _____

Reporting Location: _____

To: ☐ Incident ☐ Complex ☐ Mobilization Center (Not Staging Area)

Committed to Incident: Time (24 hr): _____ Date: _____

Return from Incident: Time (24 hr): _____ Date: _____

Redispatched: Time (24 hr): _____ Date: _____

6. Redispatched Information (Start new F-42 if redispatched)

NEW Incident Order Number											
State		3 Letter ID			Number						

NEW Request Number							
3 Letter ID			ID		Number		

7. Overhead Information

ST(TF) Leader / ST(TF) Leader Trainee / Overhead Trainees REQUIRE a separate F-42 and "0" Request Number

☐ Strike Team Leader or Task Force Leader ☐ Strike Team Leader or Task Force Leader (Trainee)

☐ Overhead Position (ICS Title): _____

8. Support Vehicle Information: ST(TF) Leader / Overhead / Support Vehicle

Vehicle Ownership: ☐ Agency ☐ Privately Owned ☐ CDF/OES Vehicle

License or VIN: _____

(Check One Only) ☐ Sedan ☐ Van ☐ Pick-up 2x4 ☐ Pick-up 4x4 ☐ SUV

Other: _____

9. Privately Owned Vehicles Only

Beginning Odometer: _____ Ending Odometer: _____ Total Miles: _____

10. Equipment Resource Information

Unit No.: _____ Radio Call Sign: _____ ☐ CDF/OES Vehicle

Fire Engine or _____ Type: ☐ 1 ☐ 2 ☐ 3 ☐ 4

(i.e., Water Tender, Air Crash Rescue, etc.)

License or VIN/Serial #: _____ Engine Horsepower: _____

11. Personnel Information

Number of Personnel on Apparatus: _____

Name	Classification/Rank	Last 4 Digits of SSN	CDF

12. Comments (Division Assignments, Reassignments, Equipment Breakdowns, Crew Size Change, Etc.)

Date/Time	

13. Responding Agency Information

Agency/Department Name:

Signature: Title:

Printed Name:

14. Incident Information

☐ CDF ☐ USFS ☐ BLM ☐ NPS ☐ OTHER

Time Unit Signature: ICS Position/Title:

Printed Name:

Distribution: WHITE: OES Fire and Rescue, P.O. Box 419047, Rancho Cordova, CA 95741-9047 PINK: Incident Finance Section GOLDENROD: Responding Agency OES F-42

PLEASE PROVIDE EXPLANATION OF ANY CHANGES OR CORRECTIONS, PRINT NAME, TITLE, AND SIGN

Actual form (in triplicate with instructions) available through OES.

FIRE APPARATUS INVENTORY AND RECORD

OES F-157 (Rev 7/2000)

DATE	ASSIGNED DEPARTMENT	LOCATION
ENGINE # OES	LICENSE #	MILEAGE
INCIDENT NAME	REGION	OPERATIONAL AREA

TYPE OF INVENTORY (Check One)

☐ ANNUAL ☐ FIRE ☐ TRANSFER

	ACCOUNTABLE PROPERTY & EQUIPMENT	BOOK	FOR ENGINES	ACTUAL COUNT	SHORT COUNT
1	Adapter, 1½" IPF to 1½" NSM	1	up to 237		
2	Adapter, 1½" PCF to 1½" NSM	1	up to 237		
3	Adapter, 1½" NSF to 1½" PCM	1	up to 237		
4	Adapter, 1½" NSF to 1½" IPM	1	up to 237		
5	Adapter, 5" x 2½", DF Hydrant	1			
6	Adapter, 5" x 4", DF Hydrant	1			
7	Adapter, 5" x 4½", DF Hydrant	1			
8	Axe, Pick head	1			
9	Block, Chock (one each 166 to 237)	2	238 and up		
10	Bracket, Logbook	1	257 and up		
11	Cans, Fuel	2			
12	Cap, 2½" Discharge	5			
13	Chain, Tow 25', with Grab Hooks	1			
14	Clamp, Hose (Hebert)	1			
15	Coupling, 2½", DF	2			
16	Coupling, 2½", DM	2			
17	Cord, Electrical 12/3 Ga. 100'	2			
18	Crank, Hose Reel	1			
19	Cutter, Bolt, 30"	1			
20	Fire Extinguisher, 4# or 5#	1			
21	First Aid Kit	1			
22	Floto Pump, OES #_____	1			
23	Generator, 3500 Kw	1			
24	Hammer, Sledge, 8-10 lb.	2			
25	Hose, 1" x 50', NST	8	up to 252		
26	Hose, 1" x 100', NST	4	253 and up		
27	Hose 1½" x 35', Truck Protection Line	1	253 and up		
28	Hose 1½" x 50', NST	8	up to 199		
29	Hose 1½" x 50', NST	12	201 and up		
30	Hose, 1½" x 100', Forestry	8			
31	Hose, 2½" x 50', NST	20	up to 165		
32	Hose, 2½" x 50', NST	24	166 to 256		
33	Hose, 3" x 50', NST	24	257 and up		
34	Hose, Booster, 1" x 150'				
35	Hose, Hard Suction, 5" x 10'	2			
36	Hose, Soft Suction, 5" x 12'	1			
37	Increaser, 1" IPF to 1½" NSM	1			
38	Intercom Set	1			
39	Ladder, 10' Attic	1			
40	Ladder, 14' Roof	1			
41	Ladder, 24' Extension	1			
42	Lantern, Hand, 12 Volt	1			
43	Logbook with Credit Card	1			
44	Mallet, Rubber	1			
45	Manual, Chassis	1			
46	Manual, Engine	1			
47	Manual, Pump	1			
48	Manual, Transmission	1			
49	McCleod	1			
50	Mount, Ground, Deluge	1	238 and up		
51	Nozzle, 1", Combination	2			
52	Nozzle, 1½", Combination	4	201 to 252		
53	Nozzle, 1½", Combination	5	253 and up		
54	Nozzle, Deluge Set, 1⅜, 1½, 1¾, 2	1			
55	Nozzle, 1½", Foam, Air Aspiration	1			
56	Nozzle, 2½", Fog	1			
57	Nozzle, 2½", Shut-off with Tips	2			

	ACCOUNTABLE PROPERTY & EQUIPMENT	BOOK	FOR ENGINES	ACTUAL COUNT	SHORT COUNT
58	OES Operations/Maintenance Bulletins	1			
59	Pike Pole	1			
60	Plug, 2½" Suction	2			
61	Pulaski	1			
62	Radef Kit				
63	Radio, Hand-held	1			
64	Radio, Mobile, OES #_____	1	Yes ☐	No ☐	
65	Reducer, 1½" NSF to 1" IPM	1			
66	Reducer, 2½" NSF to 1½" NSM	1			
67	Reflector Kit, 3 Unit	1			
68	Rope, ½" x 100'	2			
69	Shovel, Long Handle, Round Point	1			
70	Siamese, 2½"	1			
71	Soft Suction Hose, 2½" x 12'	1			
72	Strainer, Class A Foam	1			
73	Strainer, 5" Suction Hose	1			
74	Strap, Hose and Ladder	4			
75	Wrench, Adjustable Hydrant	2	238 and up		
76	Wrench, Suction Hose Spanner	1			
77	Wrench, Hose Spanner	4			
78	Wrench, Lug with Handle	1			
79	Wye, 2½" NSF x 2 1½" NSM	1			
	US&R INVENTORY				
80	Axe, Flathead	1			
81	Backboard, with 4 Straps	1			
82	Bar, Pinch Point, Pry, 60"	4			
83	Bar, Claw, Wrecking, 3'	2			
84	Belt, Carpenter	2			
85	Blade, Hacksaw, High Speed, Pkg	3			
86	Blanket, Disposable	2			
87	Camming Device	6			
88	Carabiner, Locking "D", 11 mm	12			
89	Chain Saw, with Chain and Tool Kit	1	Yes ☐	No ☐	ID#____
90	Chisel, Cold, 1" x 7⅞"	2			
91	Cribbing and Wedge Kit	1			
92	Edge Protectors	2			
93	Friction Device, Figure 8 or Brake Bar	2			
94	Hacksaw	2			
95	Handsaw, Crosscut, 26"	2			
96	Hammer, Framing, 24 oz.	2			
97	Hammer, Sledge, Short, 3-4 lb.	2			
98	Harness, Commercial	2			
99	Jack, Hydraulic with Handle, 8 Ton	2			
100	Kernmantle, ½" x 150', Static	2			
101	Litter and Complete Prerig	1			
102	Marking Kit, Building	1			
103	Nails, 25# each: 16p, 8p, 16p Duplex	1			
104	Picket, Steel, 1" x 4'	6			
105	Pulley, Rescue, 2" or 4"	3			
106	Shovel, D Handle, Scoop	1			
107	Shovel, Long Handle, Square Point	1			
108	Square, Tri or Speed	2			
109	Strap, Pick Off with D or V Rings	2			
110	Tape, Duct	3			
111	Tape Measure, 25'	2			
112	Trauma Kit	1			
113	Webbing Kit	1			

NOTE ANY EQUIPMENT DAMAGE. RECAP ALL SPECIAL EQUIPMENT CARRIED THAT IS OWNED BY OES.

☐ CORRECT PER ACTUAL COUNT

OES, FIRE & RESCUE BRANCH SIGNATURE TITLE | ASSIGNEE SIGNATURE TITLE

Distribution: ORIGINAL: OES, Rancho Cordova COPY 1: Assignee COPY 2: OES Field Assistant chief