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Forest Service
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File Code: 6700/5100
Route To:

Date: August 3, 2000

Subject: Investigation Report for Engine-73 Incident of May 24, 2000

To: Regional Forester

Enclosed is the investigation report for the Engine-73 incident. The engine burned as a result of embers igniting hose packs and personal gear packs being stored on top of the engine. Other safety related factors came to our attention in the investigation. Management actions that the Forest has initiated are recommended in the report.

The recommendations in the report are as follows:

1. The Forest should hold formal briefings for all local and incoming firefighting resources on the severity of this fire season.
2. The Forest and District FMO's need to refocus firefighter safety and reinforce the legitimacy of firefighter's rights to a safe assignment.
3. The Blue Ridge/Long Valley District Ranger needs to review and take appropriate action to resolve the discomfort some seasonal employees expressed in talking with a supervisor about safety concerns related to a fire assignment.
4. The Forest and District FMO's need to ensure that IC's and Dispatchers manage radio communications during incidents, assure communications protocols are understood and followed, and actively work to minimize unnecessary radio traffic.
5. District FMO's need to examine all vehicles regularly assigned to fires and take actions to minimize exposure of flammable material.

In addition to the management actions recommended in the report, the Forest will take these additional measures in order to mitigate a repeat occurrence of this type:

a. The Forest will enter a summary of this incident on the Safe Net program.

b. The Coconino and Lincoln National Forests will prepare a letter for the Regional Forester's signature concerning the safety elements common between the two engine incidents that occurred in the Region this year.

c. I will have discussions concerning the safety aspects of this incident with the supervisors involved in the incident.

Please contact Hunter Wistrand of this office if you need additional information.

JIM GOLDEN
Forest Supervisor

Enclosure

cc:
District Rangers
Forest Fire Staff

ENGINE 73 INCIDENT
COCONINO NATIONAL FOREST
REGION 3
May 24, 2000

Section I.

Introduction

During initial attack operations on the Clover Fire, located on the Long Valley portion of the Blue Ridge/Long Valley Ranger District of the Coconino National Forest, Engine 73 (E-73) became cut-off from their escape route and was forced to abandon their vehicle. The crew escaped to another engine (E-71). E-73 was destroyed by fire. Two E-73 crewmembers sustained minor injuries to the hand and face. An investigation team was assigned to the incident the afternoon of May 24, 2000. The Team was selected based on representing a diversity of experience, knowledge and qualifications. The E-73 Incident Investigation Team was made up of the following people:

Rodger Zanotto	Team Leader	Coconino National Forest Staff Officer (Forestry, Wildlife, Range and LMP)
Alan Anderson	Team Member	Zone HAZMAT Coordinator (Coconino, Kaibab and Prescott National Forests)
Tom Hooker	Team Member	Zone Fleet and Equipment Specialist (Kaibab and Coconino National Forests)
Tom Kuhn	Team Member	Assistant Zone Fleet and Equipment Specialist (Coconino and Kaibab National Forests)
Karen Malis-Clark	Team Member	Coconino National Forest Public Affairs Specialist

Team Qualifications

Rodger Zanotto	Fire Qualifications/ Experience	Operations Section Chief II (OSC2)
	Related Experience	Support Team, Yellowstone Incident Investigation, 1988 – 1989

		South Canyon Incident - mapped incident 1994
		Miscellaneous vehicle, horse/rider and OHV accident investigations
		Forest Service administrative investigations
Alan Anderson	Fire Qualifications/ Experience	Volunteer Firefighter, EMT (wildlands and structure)
	Related Experience	Arson investigation training
		Forest Service accident investigation trainer
		HAZMAT On-Scene Coordinator
Tom Hooker	Fire Qualifications/ Experience	Ground Support Unit Leader Equipment manager
	Related Experience	Forest Safety Committee (1976 to present)
		Member Region 9 Interagency Motor Equipment Advisory Council
Tom Kuhn	Fire Qualifications/ Experience	7 years on engines 12 years as fire dozer operator Crew rep., crew boss and strike team leader
	Related Qualifications	Fleet Manager Vehicle accident investigations
Karen Malis-Clark	Fire Qualifications	Fire Information Officer (IOF2)
	Related Qualifications	Fire Refresher 02/2000 Member Northern Arizona Incident Management Team 1990 – 1996

Investigation Process

The E-73 Incident Investigation Team visited the site for approximately 6 hours on May 25, 2000. Personnel involved were interviewed and site conditions were examined along with physical evidence in and around the incident. On May 28, 2000 the Team Leader conducted additional interviews with some of the personnel involved in the incident.

Additional information used in this investigation included:

- Northern Arizona Fire Weather Forecasts for May 23, 24 and 25.
- Fire qualifications, fitness scores and Fire Refresher training dates for all personnel involved.
- Flagstaff Zone Dispatch Incident Logs.
- Written statements from personnel involved.
- GPS/GIS maps of the Clover Fire after the E-73 incident and roughly estimated maps prior to the incident.
- Photos of the scene the day after the E-73 incident.

Summary of Events

At 1112 on May 24, 2000, Hutch Mountain Lookout reported a fire at 178 degrees near the community of Clints Well. E-73 was dispatched with Assistant Engine Foreman [redacted] and Crewmen [redacted] and [redacted] E-73 arrived on scene at 1137, making an initial response assessment and reporting to [redacted] Initial Attack Incident Commander (IC) and [redacted] Initial Attack Operations Section Chief. [redacted] is the District Fire Management Officer (FMO) on the Blue Ridge/Long Valley Ranger District and Copp is the Assistant FMO on the same District. [redacted] had activated the District Type III Incident Command Team and Copp was assigned as the Incident Commander (IC) on that Team. [redacted] was serving as Operations Section Chief (OSC) until the rest of the Team arrived. [redacted] directed E-73 to the east side of the fire to join other resources in implementing the burnout operation along the eastern flank of the fire. The fire was being driven in a northeasterly direction by prevailing winds and terrain. A combination of dozer lines and hand lines had been constructed around most of the fire, with the exceptions being a short stretch of line at the heel of the fire (southwest corner) and a short piece of line across a drainage running toward the northeast along the western edge of the fire.

Feature designations (roads, drainages, etc.), on the attached map, are specific to this report and do not reflect actual road numbers or drainage names on Forest maps. Most roads within the fire perimeter are not system roads and the drainages are not labeled. The naming/numbering conventions used in this report are to provide clarity in terms of better describing the incident and the surrounding area.

Prior to beginning the burnout, E-71 with Assistant Engine Foreman [redacted] and Crewman [redacted] and [redacted] (E-71 Foreman); and the

Crew from E-73 met with the IC at the junction of the main road (RD-1) leading into the fire and the two-track (RD-2) serving as the fireline along the eastern flank of the fire. The meeting was to review burnout tactics and discuss safety issues including designating the area they were standing in as a safety zone. [redacted] had responded on his day off and was assigned by [redacted] to function as the Division Supervisor for Division A and manage the burnout operation being conducted by [redacted] E-71 and E-73.

The burnout was underway and functioning as predicted, backing from east to west along (RD-2) and (RD-3) and moving through a drainage extending along the western one-half of the heel of the fire. [redacted] Crew Representative for Hopi #3 arrived on the fire at approximately 1200. In interviewing [redacted] he noted increased fire behavior while waiting for an assignment with his crew at the junction of (RD-1) and (RD-2). [redacted] a crewman on E-73, was assigned to work with [redacted] and E-73 on the burnout along (RD-2). [redacted] was moving [redacted]s vehicle as they progressed along with the burnout. E-73 was primarily working spot fires from the burnout on the east side of (RD-2).

At approximately 1245 the two engine crews and [redacted] observed a radical change in fire behavior, and wind direction was becoming more erratic as it shifted to a more westerly flow. E-71 was working on spot fires along (RD-3) when, in what they described as a matter of seconds, they observed a significant increase in fire activity and numerous spot fires occurring over the fireline. [redacted] decided to move E-71 along with Crewman [redacted] back to the junction of (RD-2) and (RD-3). E-73, [redacted] and [redacted] had also moved to the junction of (RD-2) and (RD-3). All seven people now at the junction noticed fire moving toward their position from the drainage that runs to the northeast on the west side of the fire. [redacted] told everyone to get in their vehicles and proceed to the safety zone at the junction of (RD-1) and (RD-3). E-71 Crewman [redacted] got into E-73 along with [redacted] and [redacted]. E-71 Crewman [redacted] and E-73 Crewman [redacted] got into the pickup along with [redacted]. [redacted] moved out first driving E-71 north on (RD-2) and moved to a clearing south of the designated safety zone. Fire was moving across the road in front of E-71 which prevented [redacted] from reaching the designated safety zone.

The fire was moving toward (RD-2) through an area with pockets of concentrated heavy fuels and a canopy of blackjack ponderosa pine and Gambel oak. E-73, with [redacted] driving, moved north on (RD-2) until it came up behind E-71. E-71 had found a defensible space to wait out the fire, as it crossed the road in front of him, before proceeding to the safety zone. As E-73 pulled up behind E-71, [redacted] saw flames to his left and behind him. He was unaware of why E-71 was stopped. [redacted] honked his horn and tried raising E-71 on the radio. E-71 did not hear E-73's horn or notice E-73 behind him. The area was completely smoked in at the time. Radio traffic was heavy and E-71 did not hear E-73 trying to reach him on the radio. [redacted] got out of E-73 and ran up to tell [redacted] to move E-71 so that [redacted] could move E-73 out of the path of the fire. [redacted] was unaware that fire was crossing in front of E-71. As [redacted] got out of E-73 burning embers were coming in and around the [redacted] but [redacted] stated he did not feel extreme heat from the fire and believed he had time to get

up to E-71 and ask [redacted] to pull forward. [redacted] moved to the passenger side of E-71 and told [redacted] "we need to go - fire is coming upon us". [redacted] told [redacted] that he was concerned about his crew. He was unaware that [redacted] was with [redacted]. [redacted] and [redacted] ran up to E-71, pushing [redacted] inside as they got in. They told [redacted] and [redacted] that E-73 was on fire and "we need to go now". The fire had moved on east of (RD-2) and E-71 with [redacted] an[redacted] proceeded to the designated safety zone.

After reaching the safety zone, E-73 made contact with[redacted] to confirm everyone was okay. [redacted] sustained a minor burn to his face and [redacted] received minor burns to his hand. E-71 sustained minor damage to plastic light covers on the left and rear of the unit and vehicle FS #3100 received damage to the vehicle paint, the right door Forest Service decal and light covers on the right side of the vehicle. A four-wheeler in the back of vehicle #3100 also sustained damage to fenders from the heat of the fire. E-73 was destroyed by fire. All witnesses to the incident reported observing a very active ground fire as the fire approached (RD-2) where E-73 was parked. [redacted] and [redacted] reported seeing flames coming from the area on top of the slip-on tank where the crew stores their gear and hose packs.

During the E-73 incident, resources on the west side of the fire included Hopi #3, E-52 and E-74. The IC was coordinating tactics on the west and north side of the fire and Operations was working with Dozer 7 on the southwest and south side of the fire.

Section II.

Affected Personal and Equipment

Site Condition

The E-73 Incident Investigation Team examined the site on May 25, 2000. Blue Ridge/Long Valley District Ranger [redacted] the seven people who were involved or witnessed the incident and other members of the Fire Team who had arrived after the incident, joined the Investigation Team during the review.

The road surface is soil and about 10 to 12 feet wide. Concentrations of ground fuels were scattered across the area and extended to the edge of (RD-2) on both sides. The overstory was primarily a mixed stand of Gambel oak and ponderosa pine also extending to both sides of the road.

The slope east and west of the incident ranges from 5 to 7 percent. The incident took place approximately ¼ mile east of two dissecting drainages. One drainage runs to the northeast, along the western edge of the fire, while the other runs east along the heel of the fire.

Vehicle Information

Engine-73 was a 1994 Ford F350 (FS-7932-275-04) (11,000 GVW) with a depreciated value of $5,624. The pump unit was a 1994 model 200-gallon slip-on (FS-7933-907-04) with a depreciated value of $3,249. The cost of engine replacement (vehicle and slip-on) is $45,327.

When the Investigation Team arrived, the vehicle was parked in the spot on (RD-2) where it was destroyed by fire. Vehicle destruction was virtually complete with all plastic and other combustibles completely consumed. Melted aluminum was noticed on the ground around the vehicle and for a distance of approximately 40 feet behind the vehicle. All glass was melted and the inside of the cab was completely consumed. Personal packs on top of the pump unit were completely destroyed as well as hose packs and other fire fighting tools and equipment. All tools and equipment, including chainsaws in the side mounted tool boxes were completely destroyed.

Crew Information

The following people were riding in E-73 just prior to the incident:

NAME	EXPERIENCE	FIRE REFRESHER COURSE DATE	STEP TEST SCORE
[redacted]	4th Season	4/29/00	46/III
[redacted]	1st Season	5/25/00	46/III
[redacted]	2nd Season	4/29/00	59/I

Section III.

Reconstructed Chronology

1112 Fire reported by Hutch Mountain Lookout.

1113 Fire crossed by Apache Maid Lookout.

1114 Fire crossed by Moqui Lookout.

1115 E-73, Dozer 7, WT 71, E-74 and 7-3 dispatched to Clover Fire.

1137 E-73 arrives at Clover Fire.

1141 Clover IC (at this point Bateman) estimates fire to be 3.5 to 4 acres and orders air tankers.

1146 Dave Savage is dispatched to Clover Fire

1147 Air Attack estimates fire at 4 to 5 acres.

1154 Copp arrives at fire.

1202 E-71 dispatched to fire.

1211 Savage arrives at fire.

1218 E-71 arrives at Clover Fire.

1255 (approximate) E-73 destroyed by fire.

Section IV.

Contributing Factors and Associated Events

The business of firefighting, like many other businesses, is often a collage of many shades of gray. We do our best to make and implement decisions based on predicted outcomes but more often than not unforeseen variables influence the end result if mid-course corrections are not made. The events surrounding the E-73 incident are no different. The focus of this investigation is on the E-73 incident but that incident did not happen by chance. Many other factors and events led up to the destruction by fire of E-73 the afternoon of May 24, 2000.

We believe there are identifiable events and contributing factors that led to the E-73 incident. In the next five subsections we outline those events and contributing factors that our investigation pointed to, as playing major roles in this incident.

Organization

During the time period of the E-73 Incident, the Clover Fire organization was in transition from initial attack to a Type 3 incident.

There are clear indications the organization needed to accomplish the burnout was insufficient. The Clover IC had given instructions on implementing the burnout to [redacted] and the two engine crews and then departed for the west side of the fire to manage tactical operations in that area. Clover Operations was working with Dozer 7 anchoring the heel of the fire. [redacted] and the crews from E-71 and E-73, indicated during interviews, that all resources on the east side of the fire

were implementing the burnout. This left no one functioning as the Division Supervisor on Division A.

Each person interviewed, stated they were trying to monitor for changes in weather conditions and fire behavior, while at the same time, implementing the burnout. No one was designated as the lookout for fire suppression activities and associated safety issues on Division A.

Safety Zones

It was clear, during the interviews, the E-71 and E-73 crews and [redacted] were aware of the designated safety zone at the junction of (RD-1) and (RD-2). This seemed to be the only safety zone considered in sizing up the situation on initial attack. The area along (RD-2) at the heel of the fire was not mentioned as a possible alternate safety zone. During the interviews, it was apparent the engine crews were not aware of conditions south of the fire and the possibility of using that area as a safety zone. The designated safety zone was in the path (to the north/northeast) of the fire. There were no other designated safety zones mentioned during the interviews.

Fire Behavior

Forest health conditions; long periods of drought, primarily caused by mild winters; and above average windy conditions have set the stage for noticeably aggressive fire behavior. These conditions have been highly publicized and debated in terms of how best to remedy the situation. The 2000 fire season has brought a new awareness and appreciation for the effects these conditions have on wildland fire suppression. Firefighters are experiencing fire behavior and fuels consumption outside the norms taught in training and beyond the scope of their own personal experiences. The Clover Fire exhibited all of the attributes found in fires across the Southwest so far this season.

In interviewing E-73 and E-71 Crewmen, the feeling of uneasiness and fear prior to conducting the burnout was a common theme. Several statements were made that indicated they were uneasy about the fire behavior on the east side of the fire but they were relying on their superiors to make the right decisions and keep them out of harms way. Several felt uncomfortable raising their concerns for a variety of expressed reasons, including peer pressure; not wanting to disappoint their supervisors; and the struggle of questioning their own experience and knowledge in comparison to others with more experience.

[redacted] the Crew Representative for Hopi #3, arrived on the fire at 1200. He stopped at the intersection of (RD-1) and (RD-2) and made the decision not to take his crew down the east side of the fire due to fire activity in the drainage running across the heel of the fire. He moved his crew to the west flank of the fire.

Prior to the start of the Clover Fire, most of the District personnel were attending a new employee orientation meeting and were unaware of predicted weather conditions for that day.

Equipment Design

E-73, like most model 20 engines, has an open storage area located on top of the slip-on pumper unit. This area is generally used for hose and personal gear bag storage. The Crewmen in vehicle FS# 3100 reported seeing flames coming from the area on top of the pumper unit well before the fire actually reached the engine. The engine could have been on fire, from embers getting in and around the personal gear bags and rolls of hose, prior to reaching the point behind E-71 where E-73 was destroyed. Melted and puddled aluminum for about 40 feet behind E-73 supports this argument.

Communications

This incident started with the usual heavy radio traffic that is a part of initial attack. As the fire escalated, radio traffic increased. At the time of the E-73 incident, those interviewed indicated it was impossible to communicate due to the extreme volume of radio traffic. When the fire moved out of the draw running to the northeast, on the west side of the fire, it was impossible for anyone to warn the engine crews on the east side that it was coming in their direction. Radio traffic was so heavy the engine crews on the east side of the fire were unaware of the situation until they actually saw the fire advancing toward their division.

Section V.

Findings, Recommendations and Commendations

Findings

- On the morning of May 24, 2000, the Blue Ridge/Long Valley Ranger District was conducting their annual new employees orientation meeting. This meeting involved most of the District personnel and in particular, most of the District Fire Organization. No one interviewed recalled hearing the Morning Weather Forecast, which was broadcast at about 0900. The forecast called for temperatures in the low to upper 80s; relative humidity between 3 and 10 percent; and southwest winds 10 to 25 MPH. The forecast also predicted a weak trough approaching the Southwest with isolated thunderstorms over the higher elevations. This situation generally means a wind direction more from the west than

southwest and more erratic wind behavior in and around isolated thunderstorms. These conditions are typical for this time of year in the Southwest but long periods of drought, forest health conditions and an extremely windy spring, elevate the critical need to be aware of predicted weather conditions in making fire suppression decisions.

- The suppression tactics that were implemented during initial attack on the Clover Fire are standard and acceptable fire suppression tactics used in the Southwest ponderosa pine fuel type (and many other fuel types). These tactics include anchoring the heel of the fire; securing the flanks of the fire with fire lines or other natural or manmade barriers; and igniting the unburned fuels between the main fire and the fire line.

- Several Crewmen from the two engines felt an uneasiness about the burnout but were uncomfortable about raising their concerns. Peer pressure; not wanting to disappoint their supervisors; and questioning their own experience in comparison to their supervisor's were all contributing factors.

- Radio traffic was so heavy that [redacted] and the two engine crews were unable to communicate to the west side of the fire to get a reading on fire behavior and direction. They could only speculate based on what was observed from their location. Fire activity was increasing all around them, but they were unaware of the circumstances until they actually saw the fire moving their direction.

- The area used for storing hose and gear on the model 20 was exposed and vulnerable to entrapment of burning embers.

Recommendations

- The Forest should hold formal briefings for all local and incoming firefighting resources on the severity of this fire season. Briefings should focus on the extreme fire behavior observed many times across the Southwest this fire season and include known conditions such as long-term drought, forest health and this year's weather history. In addition, the briefings should include details on "close call" incidents such as the E-73 Incident and the Lincoln National Forest engine burn over. The Forest must also assure that resources assigned are fully qualified and that suppression strategies and tactics are commensurate with the severity of the fire season. The E-73 Investigation Team recommends the Forest FMO and District FMOs, develop a strategy to implement the recommended fire severity briefings and to put a process in place that assures resources assigned are fully qualified.

- The Forest and District FMOs need to refocus firefighter safety and reinforce the correctness of firefighter's rights to a safe assignment. This should include scheduled safety sessions in addition to annual refresher training and it should reach out to all individuals eligible for fireline assignments.

- The Blue Ridge/Long Valley District Ranger needs to review and take appropriate action to resolve the discomfort some seasonal employees expressed in talking with a supervisor about safety concerns related to a fire assignment.

- Communications protocols are in place to assist in managing radio communications on incidents. The Forest and District FMOs need to ensure that ICs and dispatchers manage radio communications during incidents; assure communications protocols are understood and followed; and actively work to minimize unnecessary radio traffic.

- District FMOs need to examine all vehicles regularly assigned to fires and take actions to minimize flammable material exposure. Gear needs to be stowed in areas not susceptible to ember entrapment. On the model 20s, this may mean designing protective covers or boxes to store personal gear and hosepacks.

Commendations

- The Team wishes to thank District Ranger [redacted] FMO [redacted] AFMO [redacted] and the rest of the Blue Ridge and Long Valley Ranger Districts for their cooperation and assistance in gathering information for this report.

- Thanks to the Flagstaff Zone Dispatch Office for taking time out of some extremely busy days to provide us information and documentation.