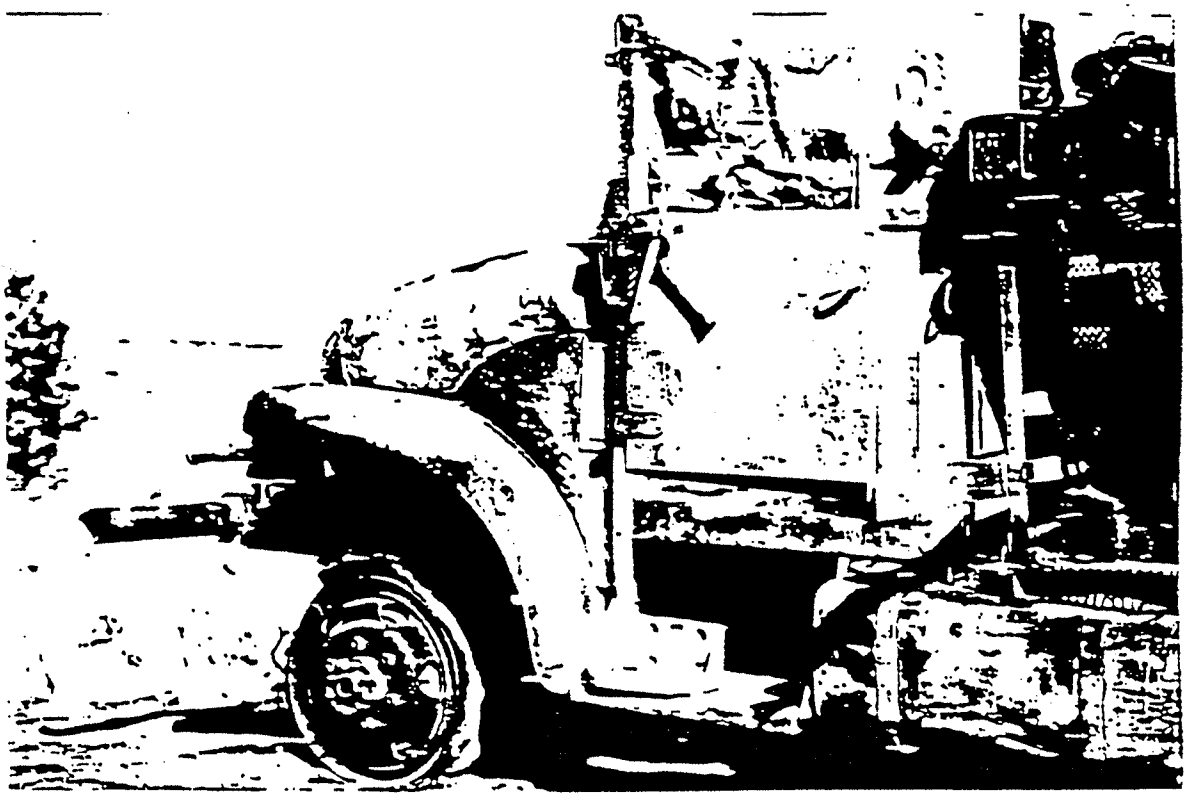

Fayette Fire Engine Burnover Investigation

October 7th, 1996

Prepared By:
Marc R. Mullenix
Safety Officer

Attachments

1. Fayette Fire - Vicinity Map
2. Incident Overview Map
3. Fayette Fire 10/07/96 - I.A.P.
4. Fayette Fire team Briefing - October 8th, 1996
5. Fayette Fire - Delegation of Authority
6. Engine 97 Personnel Gear Inventory List

Witness Statements

7. Kevin Coulter - Sublette County Fire Investigator
8. Kevin Joseph (Lookout) - Zone Fire Management Officer, Bridger Teton N.F.
9. Dave Vesterby (Operations Chief) - Bureau of Land Management, Pinedale, Wyoming
10. Rich Roberson (Safety Officer) - United States Forest Service, Bridger Teton N.F.
11. Scott Smith (Engine Operator #231) - Wyoming Game and Fish
12. John Chapman (Fire Behavior Analyst)
13. Lee Morson (Wyoming State Smokebusters)
14. Rick Covey (Engine 97 Operator) - Fremont County
15. Dave Geibel (Engine 97 Crewmember) - Fremont County
16. Pinedale Medical Clinic Report (Rick Covey)

On October 7th, 1996 fire crews were engaged in suppression operations on the Fayette Fire five miles northeast of Pinedale, Wyoming. A Type III Incident Management Team utilizing Unified Command from the Wyoming State Forestry, United States Forest Service and Sublette County were in place.

High northwest winds and extreme fire behavior were causing control problems. The fire was making runs from the south in Division A and was attempting to hook around a spur ridge (see reference 1 on attached map) and head in the direction of Half Moon Mountain. Burnout operations were employed on the southeast end of Division A to secure firelines and attempt to keep the fire out of the timber on Half Moon Mountain.

At approximately 1300 hours, Kevin Joseph acting as a lookout one mile west of the fire in Division A, noticed the fire making runs from the north, northeast. The fire began to hook the spur ridge unshielded by any topography and was driven by high winds and slope.
Around the same time, Operations Chief Dave Vesterby standing near USFS Road 762 noticed that the fire had started to slip around a retardant and foam line below his position. Fremont Engine 97 was parked on USFS Road 762 and had a hose lay down to the area attempting to reinforce the retardant and foam line and stop the fire from advancing to the southeast. As the fire began to move through the line, Vesterby ordered the crew to retreat back to the USFS Road 762 to a safe position (see reference 2 on attached map).

Joseph contacted Safety Officer Rich Roberson and informed him of the potential for the fire to overrun the crews on the road above the advancing fire. Roberson asked Joseph if crews were burning back to the south. Checking with binoculars, Joseph could see personnel burning in this area. Joseph contacted Roberson and relayed that the burning operation would not work since the fire is running on it's own and the burnout operation would just increase the speed of the fire and potentially hook around them and run to Half Moon Mountain.

Monitoring radio traffic, Joseph overheard the Air Attack Supervisor, Dave Sisk transmit a warning to Roberson to leave his present position because of the active fire below him. After Vesterby checked on the retreat of Engine 97 and crew, he walked down below USFS Road 762 on a two track road and evaluated the probability of initiating a backfire utilizing the road as an anchor point.

Joseph contacted Vesterby and warned him that personnel and equipment could be viewed on the spur ridge and that the fire would eventually outflank them and run to Half Moon Mountain. Vesterby replied that everyone was okay in their present position. Steve Kilpatrick, Wyoming Game and Fish Engine 231 Supervisor met Vesterby on the road and suggested a backfire operation from the road to stop the advance of the fire and to keep it out of the timber. Vesterby and Kilpatrick both agreed on the tactic. Vesterby mentioned that an engine was needed on the road to support the operation. The plan was to tie-in to the black along the two-track road and ignite a small strip (2-3ft.) of vegetation to prevent large flame lengths from crossing the road. Before the burning operation started, Robertson arrived and also concluded that a backfire was necessary to hold the fire at the road. Scott Smith, the Engine Operator on Engine 231 met with

Kilpatrick and Vesterby to coordinate the burn plan.

Vesterby requested that Kilpatrick and Smith start blacklining along the two-track road and head downhill with Engine 231 supporting the operation. Quickly thereafter, the pump on Engine 231 began to lose pressure and cut-out. Vesterby ordered Fremont Engine 97 to come down the hill from their present location on the ridge and support the burning operation. With ignition operations underway (see reference 3 on attached map), Division A Supervisor Hostetler arrived and met with Vesterby and agreed that a backfire may save the day. As Engine 97 pulled into position on the road two-track road behind Engine 231, a second lighter touched off an area 15-20 feet below it's position. Flames quickly ran up the slope and impacted the engine on the drivers side. Almost immediately, the engine appeared to have a large concentration of fire coming from behind and underneath the cab and between the pump package. Because of the extreme heat and smoke, Engine Operator Rick Covey attempted to back Engine 97 uphill. It was impossible for him to see Engine 231 and personnel below him and believed his only option was to back uphill away from potential danger.

At approximately this time, Engine 231 attempts to extinguish the flames on Engine 97. Heat, smoke and pump problems force Engine 231 to utilize their downhill escape route to safety (see reference 4 on attached map). Covey stated that the engine must have started and died 4 or 5 times during his attempted escape. Finally, the engine started and Covey began to back and turn up the hill. By this time Covey was in a potential life threatening situation. The engine was engulfed in flames and the drivers window shattered and the mirror fell off the drivers side. Dave Geible, the engine crew member opened the passenger door, grabbed Covey and pulled him to safety out the passenger door. As Covey was exiting the cab, he attempted to set the parking brake. At this time, the engine is facing downhill and completely engulfed in flames. As Covey and Geible scramble to safety, the engine begins to roll slowly downhill. The engine rolls approximately 100 yards and comes to rest after coming in contact with large rocks (see reference 5 on attached map). As the engine is burning, explosions occur due to tires, airpacks and as other pressure vessels are heated.

Covey sustains smoke inhalation and heat exposure and is taken to the Pinedale Clinic for treatment (see attached).

Incident Overview

Type of Incident: Engine Burnover
Date of Incident: October 7th, 1996
Time of Incident: Approximately 1330 hours
Incident Name: Fayette Fire

A. Fire Behavior and Environmental Factors

1. Primary fuel types in the vicinity of the burnover: sage and grass (Fuel Model 2).

2. Live fuel moistures: very low, approximately 70-80%.

3. Dead fuel moistures: 5-10%.

4. Percentage of dead material per plant (Fuel Model 2): 25-30 %.

5. The continuous fuels and slope, 30-35% created enormous control problems for suppression operations.

6. Dry and windy conditions preceded the fire and record high temperatures were predicted for the near future.

7. The fuel types with associated low moisture content in the vicinity of the burnover combined with high winds, 30-40 miles per hour, and slope caused extremely high rates of spread. Flame lengths of 10-20 ft. were reported at the time of the burnover.

Fire weather forecast issued at 0315 hours, October 7th:
Temperature: 70 degrees
Relative Humidity: of 20%.
Winds: Southwest winds 3-7mph.
Haines Index: 3 or very low

Actual weather at the time of the burnover:
Temperature: 70 degrees
Relative Humidity: 10-20%
Winds: Northwest 30-40 mph

B. Incident Management

An Incident Action Plan was initiated under Unified Command and all critical elements were identified and filled with qualified personnel for a Type III incident.

The overall incident objectives from the I.A.P. included:
1. Provide for firefighter and public safety
2. Protect structures to the east and south of the fire
3. Keep fire on the south half of Half Moon Mountain
4. Keep fire west of the 763 road to Little Half Moon Mountain
5. Keep fire east of Fremont Lake Road
6. Keep fire north of the Highland Ditch

Control operations for Division A included:
Secure roads and continue burnout operation to close gap between roads and existing fire edge. Special Instructions associated with the burnout operation were to coordinate burnout in rough terrain at the southeast end of Division A with Black Mountain Hotshots and Operations.

C. Safety

1. The IAP for the operational period covers safety in detail. It is documented that crews could expect high rates of spread due to flashy fuels. The Health and Safety Message by Roberson states to post Lookouts and ensure everyone knows their Escape Routes and Safety Zones.

2. LCS is mentioned and implemented before and during the burnover.

A. Kevin Joseph was one mile west and in a good location to view the fire activity and crews. Joseph communicated with Operations and Safety and warned them of the potential and to "get into the black".

B. Vesterby ordered the crew of Engine 97 to abandon their position and head to their safety zone as the fire hooked and passed through the retardant line.

C. Engine 231 identified their escape route downhill from the flare-up and followed it to safety.

D. The Communication Plan is detailed and includes three tactical channels, one command and one air to ground frequency.

E. Vesterby assigned two Smokebusters as lookouts above the backfire operation.

3. One Fire Order was violated: Ensure Instructions are Given and Understood.

A: Given the extreme fire behavior and lack of resources, it was crucial to protect the firefighter's on the road and the timber to the east. The decision to backfire was the only tactical operation available at the time. Covey is sure he was not informed of the backfire operation.

B. Vesterby's briefing to the burn crew was very specific. Burn a strip next to the road 2-3 ft. wide and follow the road downhill. One lighter walked 15-20 ft. down the slope and into the green and burned a strip. Either the instructions were misunderstood or the individual deviated on their own from the original plan.

4. Two "Watch Out" Situations were compromised:

#5. Uninformed on strategy, tactics and hazards.

A. Covey was not informed of the tactical decision to backfire from the road.

#6 Instructions and assignments not clear.

B. The specific plan to burn a 2-3 ft. wide strip along the road was dismissed by one of the burners. It is possible that the burning standards were not clearly communicated and/or the assignment was not possible to accomplish due to some environmental, physical or lack of training situation.

D. Equipment

Two issues concerning Equipment were prevalent during the investigation process.

1. Robertson in his deposition states that one of the Smokebuster crewmembers witnessed a fluid leak on Engine 97 originating from under the cab. From his description this is what caused the engine to catch fire.

2. In interviews with Engine 97 crewmembers and mechanic, there were no leaks of any kind before or during the incident. It must also be pointed out that the engine was experiencing no mechanical problems prior to the burnover.

3. Engine 231 was experiencing pump problems prior to and during the backfire operations. Engine 97 was requested by Vesterby to fill-in for 231 to assist in the backfire operation. Engine 231 stayed on the road and were incorporated into the holding operation. Engine 231 attempted to suppress the fire on Engine 97, but the pump

could not function properly.

4. Engine 97 had a considerable amount of flammable liquids stored in various locations. One five gallon fuel can was mounted to the running board on the drivers side. Another was located in a storage basket behind the cab next to the fire pump. Both these cans were metal with plastic caps. A case of motor oil was above the water tank on the drivers side. Chainsaw mix was also stored on top. An engine inventory list has not been supplied.

E. Backfire Operations

The decision to backfire is based on many factors; experience, fire behavior, environmental conditions, timing, anchor point, etc. At no times should a backfire operation jeopardize the safety of personnel. In some instances, backfiring may be the safest and/or only tactical choice. The one factor which is vital for a successful backfire operation is coordination. Based on interviews and depositions, the following is a capsulated view of the decision process.

1. The decision to backfire should rest with the Operations Chief. Dave Vesterby consulted with other experienced firefighter's and overhead and all collectively agreed to fire from the road. One of the stated objectives in the IAP was to keep the fire on the south half of Half Moon Mountain.

2. A briefing was initiated before the operation. Vesterby's direction to Kilpatrick and Smith and later to Robertson was to fire a small 2-3 ft. strip along the road. Smith in turn briefed two Smokebusters and incorporated them on Engine 231 for holding operations. Their job was to wet the road down to minimize the likelihood of the fire crossing the two-track road.

3. Engine 97 was requested by Vesterby to assist in the holding operation on the two track road because of the pump problems with Engine 231. Covey, the engine operator on 97, states he had no prior notice of the plan to backfire from the road. Dave Geibel, the firefighter on the engine met with Vesterby and was apprised of the plan.

4. As Engine 97 pulls into position behind Engine 231, Vesterby witnesses a member of the burn crew lighting 15-20 ft. below the Engine 97. The fire, driven by slope and wind, races up to the two-track road and almost immediately ignites the engine.

5. Covey tries to back the engine up the road. His logical escape route is down hill, but Engine 231 and other holding personnel are enshrouded in smoke. The engine is engulfed in flames and smoke. Covey after repeated attempts, gets the engine started and backs up the road.

6. Covey travels approximately 75 ft. and turns the engine facing west. Geibel opens the passenger door and drags Covey out before the parking brake is completely set. As the engine is facing downhill, it begins to slowly roll. The engine travels approximately 100 yards, and rests on some large rocks where it is completely consumed by fire.

E. Summary

On October 6th, 1996, a prescribed fire conducted by the Wyoming Game and Fish escaped containment lines. During Initial attack operations on October 7th an engine from Fremont County was burned over. On October 8th, 1996, Team A from the Rocky Mountain Region took over command of the escaped prescribed fire, Fayette Fire, which was under Unified Command by the Wyoming State Forest Service, United States Forest Service, Bridger-Teton National Forest and Sublette County.

As the Safety Officer for Team A, I was asked by Carl Jungck, the State of Wyoming Rural Fire Training Officer, to provide an investigative report on the burnover incident. My focus is to recreate the chronological events which led up to the burnover. I would like to thank the firefighter's which provided written deposition, interviews and follow-up phone conversations in the weeks during and after the fire.

The decision to backfire from the two-track road to prevent the fire from running to Half Moon Mountain was based on good sound firefighting principles. It was the only tactical option to meet this objective. The extreme fire environment left few options to the command staff on what suppression tactic to utilize.

The lack of firefighting experience and/or training was not a factor in the burnover. The Command Staff and firefighting personnel on the incident have vast knowledge and experience in prescribed fire and suppression operations.

Safety violations were few. Crews and personnel on the fire were briefed on the safety hazards and implemented proper mitigation practices before, during and after the burnover.

Communications were adequate. During the initial Team briefing on October 8th, it was mentioned that the forest radio system was antiquated and at times experienced some problems. I encountered no information during the investigation that the radio system failed to operate adequately. The only breakdown in communications was face to face interaction.

1. Covey was the only member of the backfire operation which was unaware of the plan to backfire from the road. He believed his job was to stop the fire from crossing the two-track road by utilizing the engine to wet it down.

2. The briefing Vesterby had with the burn crew was specific. "Light a narrow strip of vegetation 2-3 ft. in width next to the road and head downhill." This direction was not followed.

F. Recommendations

1. Any engine or piece of suppression equipment experiencing problems should be addressed immediately. The decision to keep Engine 231 on the two-track road and support the backfire operation was ill advised. The engine should have been sent to a safe location away from suppression operations and only return upon complete repair. Engine 231 attempted to suppress the fire on Engine 97, but was unsuccessful due to pump problems. This did not contribute to the engine burnover, but provided a potential safety problem for the crew.

2. The storage of flammable liquids contributed to the fire that consumed Engine 97. The drivers side of the engine was hit with 20-30 ft. flames and intense heat. It is the conclusion of Kevin Coulter, Sublette County Fire Investigator and myself that flammable liquids stored on the engine when ignited caused the engine to burn independent of the wildfire. The fire that was burning underneath and between the cab and pump package was characteristic of a flammable liquid fire. The lids of the cans were plastic and the integrity of the vessels were compromised by the wildfire which impinged upon the engine. The future external storage of flammable liquids on engines or vehicles should be evaluated and mitigated.

3. It appears that all the proper steps were taken to achieve a successful backfire. In fact, many backfires implemented during suppression operations go through much less scrutiny.

A. Vesterby consulted with other Command staff and firefighter's.
B. Support resources were identified and in-place including; lookouts, holding crew and engines, burning crew and Safety Officer.
C. A short briefing was conducted.
D. Safety Zones and Escape Routes were identified.

The vital loop which was not closed was to: Ensure Instructions are Given and Understood. Timing was critical before the backfire was to be implemented. Getting everyone in-place and informed in a timely manner was paramount. Flexibility is always essential during suppression operations. Given the extreme fire environment conditions, the only manner in which the road could have been successfully burned was sticking with the original plan. Either the instructions were not clear or they were misunderstood by one of the burn crew members. Furthermore, the only person which was not informed of the backfire operation was Covey the engine operator of the burned engine.

The lack of effective communications is recognized as one of the leading causes of firefigher injuries and fatalities. In this case, the lack of complete communications with all backfire operations personnel was the key. Never assume that crew members will pass on vital information, especially when crews are involved in stressful conditions. The overall recommendation would be to organize an effective post fire critique with all involved parties. The critique is intended to provide constructive criticism and direction for the future, not to blame and point fingers.

FAYETTE FIRE

V.I.C.I.N.I.T.Y._MAP 10-10-96

ICP

FIRE AREA