

FIRE SHELTER DEPLOYMENT

MACKENZIE INCIDENT

KINGMAN RESOURCE AREA BLM

June 1, 1994

Fire Shelter Use and Performance

On June 1, 1994 three members of the Prescott Interagency Hot Shot Crew deployed fire shelters on the Mackenzie Incident on the Kingman Resource Area, Bureau of Land Management (BLM).

The three personnel include (#1 Charles Brian Misfelt, crew member) (#2 Duane Koon, foreman) and (#3 Curtis G. Heaton, squad boss). All three were wearing required PPE inclusive of, hard hats, without shrouds, Nomex III, shirts and pants, field worker gloves, 8" boots and were carrying fire shelters. All three were carrying recently issued fire shelters received from the Prescott fire cache. All three fire shelters were manufactured by Anchor Industries, under contract #GS-07F-19254 and date of manufacturer was 9-89.

FINDINGS

The Mackenzie fire located 40 miles SW of Kingman AZ was approximately 150 ac at 1300 on 6-1-94. The fire rapidly increased in size with rates of spread exceeding 50 chains/hr in the Desert Brush Fuel Model 4. Temperatures were near 100 degrees with RH in the single digits.

The deployment of shelters occurred at approximately 1400 hrs in a granite boulder field at the base of a very steep slope in a dense brush filled shallow drainage.

The boulder field was made up of 8 to 15 foot diameter round granite rocks that had numerous horizontal and vertical crevices from 1 to 10 feet wide. It was within the crevices that the shelters were deployed on the ground and on the boulders themselves. In general each site was under overhead boulders and in crevices open on each end. Discussion with the personnel involved in the shelter deployment indicated that they had read most available information pertaining to shelter deployments and had trained extensively in actual practice shelter deployments.

Shelter Deployment Site

After off loading helicopter 2TK at H2 the three members of the Prescott IHC proceeded in an East North East direction to attempt to reach the right flank of the fire. At this time the rate of spread and fire intensity had increased considerably, at approximately 350-400 yards away from H2 the personnel realized that they would not be able to reach the right flank and started looking for a suitable shelter deployment site. The shelter deployment site they chose was in a large granite boulder patch with little fuel in the immediate surrounding area. The deployment site was a very confined space with overhanging rock and very tight crawl spaces. The personnel had sufficient time to prepare for the burnover, all three people had gotten rid of flammable materials consisting of fuses and fuel bottles and had placed their line packs away from their fire shelters. The fire approached the deployment site from the south downhill. All three had removed their gloves to facilitate the deployment of their fire shelters, and during deployment #3 Curtis Heaton misplaced or lost his right glove, while entering his shelter Curtis became tangled in the glass tape and had to cut the tape with his knife to get into his shelter, this is a product of the confined quarters where they deployed. The three people entered their shelters with their feet facing the approaching flame front. #1 Brian Misfelt was closest to the radiant heat and #3 Curtis Heaton was directly above him while #2 Duane Koon deployed approximately 15' away to the east in a small crawl space. During the original burn over #2

Curtis Heaton sustained a second degree burn to his upper right shoulder area and he stated that he felt the pain immediately prior to all three suffering breathing distress from the lack of oxygen they estimated that they suffered from lack of oxygen for approximately 2 minutes. Directly after the period where they suffered from lack of oxygen they experienced a second burnover. They all felt that this event approached from the north east from the direction that their heads were pointed. #3 Curtis Heaton verbalized to #1 Brian Misfelt that he was taking a lot of heat and Brian moved back 2-3' to give Curtis more room. During the event all three commented on their experience as to how dark it was and then extremely bright where light was shining through pin holes in the shelter, after the intense light they all commented on the difficulty in breathing from lack of oxygen.

ANALYSIS

Investigation of the shelters and equipment at the entrapment deployment site suggests that #1 Brian Misfelt was subjected to radiant heat in the range of 500-700 deg F. His shelter exhibited delamination due to break down of adhesive and discoloration of the glass cloth. All damage was sustained to the foot end of his shelter, it is difficult to determine at this time if the tearing of the foil on his shelter was due to direct flame or to abrasion from the granite rock. Brian Misfelt's line pack sustained melt damage to the 11 OSY back coated nylon duck that would indicate temperatures in the 500-550 deg F range his pack was sitting approximately 2 feet to the right of his shelter.

His PVC shelter liner was found on the ground back and below his deployment site and sustained damage that would indicate temperatures in the 350-400 deg F range. Brian's shelter indicated that his shelter received radiant heat in the 500-700 deg range up to approximately his lower back the only heat that Brian felt while in his shelter was on his feet

which resulted in no injuries. It is our opinion that he had an excellent air space between himself and the shelter that he did not receive any burn injuries to the back of his legs.

Examination of #2 Duane Koon's shelter did not indicate any delamination or discoloration of the glass cloth, his PVC shelter liner did not show any melting or shrinkage but did indicate areas where burning embers had landed on the material. Estimate that he experienced temperatures in the 300 deg f range.

Examination of #3 Curtis Heaton's shelter does not indicate any delamination or discoloration of the glass cloth and his PVC shelter liner indicates a light shrinkage and numerous burn holes from burning embers. His shelter has numerous pin holes and approximately six small rips and tears on the head end of his shelter all on fold and crease lines. It is our opinion that these are abrasion tears and rips from entering his shelter in the confined space and the granite rock.

CONCLUSIONS

1. All personnel were fully equipped with the required Personal Protective Equipment
2. With the exception of the field workers glove which the personnel stated they felt inhibited their ability to deploy their shelter due to loss of dexterity, all the protective clothing and fire shelters functioned within their design limits.
Considering the confined space and the extreme abrasion of the granite rock at the deployment site the fire shelters held up extremely well.
3. Temperatures at the deployment were moderate in the 500-700 deg f range and survivable inside the fire shelter.

4. Throughout the entrapment personnel involved thought clearly, took positive action and gave good support to each other indicating excellent training and discipline.

RECOMMENDATIONS

1. Issue a reminder to all field units to inspect all fire shelters prior to issuing them and for individual firefighters to inspect their shelters every two weeks while in use.
2. Individuals should strongly consider using the hard plastic protective liner with their shelter to protect the shelter and increase its service life during field use.
3. Implement use of the double pull PVC bag.
4. Individuals should wear gloves that are correctly sized to improve dexterity.

**C-444 Mackenzie Wildfire
Fire Shelter Deployment Investigation Report
June 1, 1994
BLM Fire No. C-444
USFS Fire No. P38663**

On June 1, 1994 a fire shelter deployment occurred on the Mackenzie fire, Kingman Resource Area, Phoenix District, Bureau of Land Management. The Mackenzie fire (C-444) is located 40 miles southwest of Kingman, Arizona on the Hualapai Mountains. The fire site is approximately 2 miles south of the Copper World Mine, Copper Creek Drainage near Bee Springs.

The deployment involved three members of the Prescott HotShots crew during the extended attack phase of the fire. The members are (#1. Dewain Koon - Foreman, #2. Charles Brian Misfeldt - Firefighter, #3. Curtis G. Heaton - Squad Boss). All three survived the deployment with only minor health concerns.

Resources assigned to the incident, at the time of the deployment, were the Pleasant Valley Hotshots, Prescott Hotshots, BLM Type 6 Engine (E-234), four Single Engine Airtankers (25X, 678, 913, 10X), three Large Airtankers (06, 12, 05), three light helicopters (395 Bell 206, 2-TK Bell 206, 89-G Soloy) 2 with crews and 1 with CWN (Call When Needed) manager, Lead Plane (L-47), and a Air Attack Group Supervisor.

Investigation Objectives

At the request of the acting Phoenix District Manager an interagency investigation team was formed the afternoon of June 1, 1994. The team was given the direction to identify and define those environmental and human factors that led to the fire shelter deployment of the Mackenzie Fire C-444.

The primary objective of the investigation is to identify causes resulting in the deployment of the fire shelters. The second objective is to develop recommendations to reduce the risk of the event happening again. It is not the intent or chart of this investigation to fix responsibility.

Team Composition

The Interagency Team consisted of:

Mike Fisher (BLM Arizona State Office)
Fire Management Specialist

Ellis Gardner (USFS Prescott National Forest)
Safety & HazMat Manager

Loren Derosear (BLM Yuma District Office)
Fire Control Officer

Bill Hunington (BLM Arizona State Office)
State Safety Officer

Pat Valasco (USFS Tonto National Forest)
FMO Payson District

Rick Reitz (USFS Tonto National Forest)

Glenn Joki (BLM Phoenix District)
Fire Management Officer

Joe Wagonfher (USFS Regional Office Region -1)
Assistant Director of Fire and Aviation Management
Missoula, Montana

George Jackson (Forest Service Technology & Development Program)
Equipment Specialist
Missoula, Montana

The Shelter Investigation Team was ordered on 6/1/94 after the shelter deployment was reported to the Phoenix District Fire Management Officer. Instructions were passed on through dispatch to secure the site and not to remove items. A preliminary report was faxed to the National Interagency Coordination Center (NICC) that evening.

The team met at the Kingman Resource Area (KRA) office June 1, 1994, at approximately 2200 hours. The investigation team attended the initial Type II team briefing with the Kingman Resource Area Manager. The Type II Incident Commander (Jeff Whitney) and the investigation team discussed how the process would be handled. It was agreed upon the investigation team would work independently of the overhead team.

The investigation process included collection, review and analysis of applicable fire records weather reports, resource orders, communication logs, personal logs, redcard qualification records, personal interviews, photographs, videos, and individual statements of events. Expertise was consulted regarding weather, fire behavior, and equipment. The Team and those directly involved in the deployment, visited the deployment site, and recreated the events that lead up to the deployment.

Fire Situation

The Mackenzie fire started the afternoon of May 31, 1994. It was controlled on June 05, 1994 at 1,940 acres. Most acreage loss occurred on June 1, 1994 during a 2 hour interval. The fire area contained public and private lands.

The following is a synopsis of events leading to the deployment of fire shelters by the three Prescott Hotshot crewmembers. The deployment occurred on Wednesday, June 1, 1994 at approximately 1420 hours. ✓

Times listed or mentioned are approximate. To the extent possible events within the same time block are arranged in order.

Helicopter Helispot designator refers to the initial attack and extended attack designator. These numbers don't correspond to the Type II Teams helispot designator.

Sequence of Events

5/31/94 Tuesday

All times are approximate times taken from various narratives.

1812 The Mackenzie fire was reported to Phoenix Dispatch on 5/31/94 at 1812 hours by Phil Gill (KRA Station Manager). The preliminary location was reported to Gill by the Yucca Fire Department as south of Wabayuma Peak (34 55 9 , 113 55 50) in the Wabayuma Wilderness Area.

The rural fire department had estimated the fire to be 4 acres in size burning in shrubs and light grass. The cause of the fire was determined to be lightning. It was located on the middle 1/3 of slope. The slope at the fire origin was estimated to be 41-55%. The origin of the fire was at an estimated elevation of 4,500+ feet. The observed Rates of Spread (ROS) of the fire at initial size up was low. Flame length were estimated at approximately 3 feet. Wind was blowing from the Northeast at 5-10 mph at eye level.

1845 Helicopter 2-TK and a resource advisor was ordered to conduct a reconnaissance of the fire and verify the location. Engine 234 was dispatched to deliver maps to the resource advisor at the airport and then proceed to the fire. Bruce Olson, BLM (E-234) +2 left the airport for the fire at 1845.

Reconnaissance by 2-TK placed the fire south of the wilderness area. A Single Engine Airtanker (SEAT) was dispatched and made one drop before daylight limitations took effect.

Engine E-234 could not find direct access to the base of the fire. Olson left E-234 to scout the fire from an opposing ridge. The remaining two engine firefighters from E-234 attempted access from Borianna Canyon Road. When this access attempt failed the two firefighters (E-234) were instructed to established a helispot at Borianna Mine for next day operations.

After the one SEAT retardant drop no direct fire suppression efforts took place that night. Additional resource orders were placed.

Olson placed orders for a: 1 Type I crew, 20 backpack pumps/filled, and 1 helicopter with crew.

06/01/94 Wednesday

- 0100 Weather taken by E-234 was Dry Bulb 64, Wet 45, Relative Humidity 23%, winds 0-4mph out of the NE. Wind down canyon.
- 0400 E-234 crew noted fire ROS still low in all directions. Flame length of 3-5'.
- 0500 E-234 reported winds were still out of the NE and down canyon. Fire spread slow to the south with potential to get in the bottom of the drainage. The fire was estimated at 20 acres.
- 0640 Olson conducted a reconnaissance of the Mackenzie fire in 2-TK.
- 0800 Air operations begin utilizing 2 SEAT's directed by a Air Attack Group Supervisor.
- 0900 The Pleasant Valley Hotshots arrived and began to work the fire. They were assigned to work the south edge (heel) of the fire to keep it out of the Copper Creek drainage. Fire is estimated to be 80 acres.
- 1130 Phil Gill, Station Manager (KRA), met with Tony Sciacca Prescott Hotshot Superintendent at the Kingman Resource Area Office. Gill asked Sciacca if he would assume duties of IC from Olson upon arrival at Fire. Sciacca agreed to this assignment. Gill explained the fire objectives to Sciacca. The fire objectives were to keep the fire out of the Wabayuma Wilderness Area and be safe.
- 1230 Prescott Hotshots arrive at the fire.

Sciacca and Koon met with Olson (Initial Attack Incident Commander). Sciacca and Koon were briefed by Olson of the current fire situation. It was agreed that Sciacca and Koon would conduct a reconnaissance of the fire before Sciacca assumes the Extended Attack Incident Commander position.

Sciacca and Koon conducted a reconnaissance of the Mackenzie Fire in (89-G). They flew the perimeter of the fire a few times (20-30 minutes), then developed a strategy before Sciacca assumed the Incident Commander position from Olson.

The plan of attack was for Pleasant Valley Hotshots to continue to work the SouthWest part of fire, proceeding East along the southern flank eventually hooking into the retardant line on the ridge at H-1. One heavy airtanker and 1 SEAT was assigned to support Pleasant Valley.

The Prescott Hotshots were to be shuttled to H-1. From H-1 they were to work on the northern portion of the fire working NorthEast along the ridge. The Prescott Hotshots would also have support from one heavy tanker and 2 SEAT's.

Sciacca, Koon, and Olson concurred on the plan of attack. After agreement the suppression plan was relayed to Air Attack (Tobin). The suppression plan was repeated, agreed to and acknowledged by Tobin.

1300 Sciacca took over as the Incident Commander, Koon became acting superintendent of the Prescott Hotshots, and Heaton became the acting crewboss. Olson remained with Sciacca to assist in operations and logistics.

Prescott Hotshots Squad Bosses were briefed on suppression strategy and tactics.

The active part of the fire was in the South - SouthEast corner. Pleasant Valley Hotshots were assigned and working this section of the fire. The fire was making short runs in Copper Creek and up Copper Creek SouthEast slope.

Sciacca, Koon and the pilot (89-G) had agreed upon the location of H-1 (initial helispot) during the reconnaissance flight. H-1 was in the black and next to a retardant line on the northern edge of the fire. The helispot was looked at from the air but no landings were made during the reconnaissance flight.

Size of fire was approximately 100-150 acres.

2-TK arrived at helibase.

The Prescott Hotshots began to coordinate the shuttle with helitack at the helibase.

1320 Tobin (Air Attack Group Supervisor) contacted the IC (Sciacca) and requested Lead 47 take over as Air Attack because of low fuel and need for break. The request was approved and Air Attack duties were transferred to Lead 47.

Tobin reported the fire was not very active at this time.

1330 89-G transported Koon and 1 Helitack (Pat Willeito) to H-1 with their firefighting gear and 2 backpack pumps.

As 89-G headed to H-1, they flew over the Pleasant Valley Hotshots. Pleasant Valley Hotshots were working the Copper Creek drainage towards the east per assignment.

During the initial transport of Koon and Willeito to H-1 the Helibase was moved 1/4 mile to the west. The new location was a mining area clearing. This move was done to accommodate the 2 additional helicopters. A total of three light helicopters were now on the fire. (395, 2-TK, 89-G).

89-G attempted to land at H-1. The pilot determined ash and uneven terrain made it unacceptable as a landing area.

89-G (Koon, Willeito) searched for a new landing site. They tried a bench located a little lower and to the south. The pilot again determined it to be unacceptable. The search continued. A site was (H-2) selected approximately 1/2 mile east of H-1. [H-2 is located on a flat knoll within a basin. It is approximately 70' x 80'. Vegetation surrounding H-2 was low chaparral 1-3' tall.]

89-G landed at H-2. Koon and Willeito departed with their fire gear and unloaded the 2 backpack pumps. At this time Koon and Willeito observed fire activity near H-1. The fire was moving to the north of H-1.

Koon and Willeito noticed a change in winds from S to SW.

2-TK left the helibase with Heaton and Misfeldt.

Koon called his crew and notified them of a possible change of plans.

Koon notified Yowell not to send anyone else up at this time.

2-TK arrived at H-2 with 2 crewmembers (Heaton, Misfeldt), 3 bundles of tools, 1 chainsaw, and 4 backpack pumps.

Koon instructed Willeito to leave with 2-TK and return to the helibase. Koon informed Willeito that his plans were to look over the fire situation. If fire activity picked up they would head south to flank the fire.

2-TK left with Willeito and returned to the helibase. Koon, Misfeldt, and Heaton noted while standing at H-2 that the winds were shifting from the S SW to West. The fire north of H-1 began a slow run to the east. The crewmembers noted the drainage to the south of H-2 was smoked filled. They could not see to the bottom of the drainage.

Fire activity was observed by Pleasant Valley Hotshot crew to be building in the drainage they were working. Pleasant Valley reported to Air Attack they were having problems holding the fire on the south flank. The fire on the south flank began to spread east (up the drainage).

Koon, Misfeldt, and Heaton observed increasing winds.

Koon, Misfeldt, and Heaton started to burn out H-2 on the west and south side to strengthen the safety zone at H-2. Burnout was erratic and incomplete due to shifting winds.

1350 Koon, Misfeldt and Heaton left H-2 and moved east taking with them 1 chainsaw, and 3 bundles of tools (shovels, pulaski). [The thought was to head east then south to the flank of the fire activity]. [At this time the 3 individuals felt no urgency and that it was not a problem to get to the base of the fire.]

The 3 firefighters began to move East from H-2, following their preplanned escape route which was down the drainage to the southeast corner of the fire or the heel.

They continued to move to the east with the intent to flank the fire and work towards the southeast heel of the fire. Misfeldt was instructed to drop one of the bundles of tools.

It was observed by the firefighters that the fire was moving directly to the east towards H-2.

[Lead 47 was in the process of leading air drops in support of Pleasant Valley Hotshots. This fire activity was not known to the three Prescott Hotshot firefighters. Pleasant Valley did try and contact them by radio. A ridge between the two crews locations did not allow for direct transmission without a repeater]

1402 Koon made radio calls to Air Attack (Lead 47) requesting retardant drops on their flank/position and possible helicopter removal from their location.

2-TK overheard call for assistance from Koon. 2-TK contacted Lead 47 on victor frequency to inform him of Koon's request for assistance. Lead 47 told 2-TK to standby with message for Lead was in a middle of a retardant run. The helibase manager heard call to Lead 47 for air retardant drop from Koon. 2-TK contacted Koon and asked if help was needed. Koon said yes and 2-TK powered up and left helibase to try and reach Koon, Misfeldt, and Heaton.

2-TK departed and headed for the area of H-2. 2-TK was unable to visually contact the firefighters because of smoke. 2-TK did have radio contact with them. 2-TK preceded to a ridge top above H-2 and maintained radio contact with the firefighters and the Air Attack Group Supervisor.

Misfeldt was instructed to drop the second bundle of tools. Koon, Misfeldt, and Heaton proceed a short distance and Heaton dropped the chaninsaw.

Air Attack requested 2-TK to assist in directing Lead 47 and T-12 to where Koon, Misfeldt, and Heaton were located. 2-TK was hovering on a ridge top about 1000 feet above where Koon, Misfeldt, and Heaton were thought to be.

Lead 47 and T-12, made a run and dropped 1/2 a load.(1200 gals retardant).

They made a second run and dropped the other 1/2 of load. Approximately 80 feet closer to 2-TK. The retardant dropped about 200 feet and winds and convection caused the drop to drift towards 2-TK and 2-TK was covered by the dropped retardant.

None of the retardant was not felt or seen by the firefighters.

[Fire behavior calculations estimated the fire at 400 acres]

1422 Koon made the decision to use a boulder site as their safety zone and instructed Misfeldt, and Heaton to prepare to use their shelters. Koon notified notified Air Attack that they couldn't reach 2-TK and they were going into their shelters.

The deployment site was in a large granite boulder patch approximately 350-400 yards east of H-2. Heavy Chaparral fuels existed within the immediate surrounding areas. The deployment site was a confined space with overhanging rock and very tight crawl spaces.

Communication was maintained between Koon, Misfeldt, and Heaton during deployment event. 2-TK and Air Attack also maintained communications with the three trapped individuals.

Air attack switched back to Tom Tobin and Lead 47 resumed lead duties.

1436 The first wave of fire passed over the deployment location with a duration of approximately 4-5 minutes. The fire came up from the southwest.

1444 A second wave of heat and flame hit from the east side and lasted about 5 minutes. The interval between the waves was approximately 2 minutes.

[Fire Behavior calculations estimates the fire at 1000 acres]

1447 Department of Public Safety Helicopter (DPS) and ground ambulance were ordered through dispatch by the IC to report to helibase.

1453 Air Attack conducted a welfare check with the Koon, Misfeldt. Everybody was reported as still ok.

1458 Koon made the decision when the crew could leave their shelters. Once outside shelters, Koon contacted Air Attack to report there condition. Koon reported they were o.k.

Total time spent in the shelters is estimated to be 35 to 45 minutes.

Air attack advised the IC that Koon, Misfeldt, and Heaton were staying in place till the area clears of heavy smoke and that they were ok. Koon, Misfeldt, and Heaton rested for a bit. They checked each others welfare and gear, took water and then notified Air Attack they were heading back to H-2 for a pickup.

1506 The Incident Commander called dispatch to order a stress debriefing team and an investigation team.

1515 Air Attack did crew welfare check and the crew was ok.

1525 DPS helicopter and Ground Ambulance arrived at helibase.

1532 Air Attack did crew welfare check and the crew was ok. Crew requested Air Attack have a helicopter pick them up at H-2.

2-TK which remained in the area, flew to H-2 and retrieved crew and returned to helibase.

Crew was given Oxygen and intravenous fluids. They were transported to Kingman Hospital for a medical evaluation.

Hospital released the crew after 2 hour of evaluation.

1545 Line Mangement made the decision was made to order a Type II Incident Management Team

1600 Gill relieved Sciacca as IC.

Entrapment Elements
(See Entrapment Investigation Element Matrix)

I. Fire Behavior

A. Fuels

The fuels are estimated to be 80% Chaparral(NFFL Model 4) and 20% Desert shrub(NFFL model 2). Live fuel moisture sampled for chaparral was 84%. Time lag fuels were calculated to be; 1 Hr. = 2-3%, 10 Hr. = 4%, 100 Hr. = 5%.

B. Weather

The temperature was 88 degrees, Relative Humidity was 12%, Mid flame wind speed 15 miles per hour and sky was clear with no cloud cover.

C. Topography

Average slope is 60 - 75% with the deployment site located on a small midslope bench. Elevation ranges from 4000 to 6200 with the deployment site at 5,400 ft. All aspects are present and the predominate aspect being south, southwest.

Topographic features of the area were a significant contributing factor that influenced the fire behavior.

D. Predicted vs. Observed

No Fire Behavior Analysts was on the incident during the deployment. All fire behavior mentioned was observed by on site fire resources.

From interviews and written statements, the following fire behavior scenario occurred with approximate time frames and fire behavior characteristics. At approximately 1300 to 1330 hours the fire was observed to be approximately 100 to 150 acres, rate of spread was slow, with isolated movement of the fire upslope and downslope. The fire did not display any threatening fire behavior characteristics. From 1330 to 1400 severe and threatening fire behavior occurred. Estimated rates of spread were 80 to 130 chains/hour were observed by the individuals involved in the deployment. Recreation of this event by the Fire Behavior Analyst, (FBA) verify the rates of spread to be up to 102 chains/hour.

II. Environmental Factors

A. Smoke

Smoke laying in the drainage of Copper Creek did not allow for clear visibility of the fire activity by the crew. Smoke column did not indicate any sign that a rapid increase in fire behavior was about to occur.

B. Temperature

Temperature was 88 degrees which is normal for the time of year.

C. Visibility

Other than the smoke laying in the drainage visibility was excellent and did not contribute to the event.

D. Slope

Steep slopes influenced the rapid fire spread upslope.

E. Winds

Normal up slope and up canyon winds were influenced by the topography which created fire behavior within the Copper Creek drainage.

III. Incident Management

A. Incident Objectives

The primary Objective given to the Incident Commander was to keep the fire out of the Wabayuma wilderness area.

B. Strategy

Minimize the acreage burned and stop northern spread within Copper Creek drainage.

C. Tactics

Direct attack the fire with hand crews, airtankers and helicopter support.

D. Safety Briefings/Major Concerns Addressed

Safety briefings and major concerns were addressed.

E. Instructions Given

Instruction given were followed.

IV. Control Mechanisms

A. Span of Control

Span of control was a significant contributing factor in air operations just prior and at the time of the shelter deployment. Because at the time of the major fire run air attack was not in the air and Lead 47 had assumed air attack responsibilities. Lead 47 was in the middle of a heavy air tanker retardant run on the south part of the fire and was not able to provide air attack responsibilities at the time of the blow up.

B. Communications

Communications was a significant contributing factor prior to the deployment event. The two Hotshot crews did not communicate with each other once they were on the fireline.

C. Ongoing Evaluations

Ongoing evaluations influenced significantly to the deployment event due to the lack of current fire information.

D. 10 Standard Fire Orders

Evaluation of 10-Fire Orders

Rated by designation of: Followed
Compromised

- 1. Fight fire aggressively but provide for safety first.**

Followed....Their is no indication during the investigation that basic crew safety was not top priority.

Based on the information the three individuals had they identified reasonable safety routes and zones. Koon overflow (Pleasant Valley Hotshots)and the southwest section of the fire enrout to H-2. No unusual fire activity was noted.

There is a concern because the fire to the southwest of H-2 could not be observed by the three individuals while at H-2, they had no full time lookouts that could see the fire, or communication with someone who could. With more updated information just prior to the fire blowup a different safety strategy would have been formulated.

- 2. Initiate all action based on current and expected fire behavior.**

Followed....All tactical fire planning was done with current and expected fire behavior information available.

- 3. Recognize current weather conditions and obtain forecasts.**

Followed....Forecasts were obtained prior to crew placement. The abnormal weather conditions that brought about the blowout were not recognized or predicted.

4. Ensure instructions are given and understood.

Followed....Appropriate instructions were given and followed.

The IC gave clear instructions and the crewboss understood them. Concern is that the helispot location was changed to H-2. The crewboss informed the Helibase manager. The IC was unaware of the change. The helispot change may have prompted the IC to develop alternative tactics and strategy.

5. Obtain current information on fire status.

Compromised....The crew was unaware of the fire activity below them.

6. Remain in communication with crew members, your supervisors, and adjoining forces.

Compromised....The crewboss was in contact with his crew, but did not have current updated information on fire status and had not communicated the tactical change from H-1 to H-2 with the I C. The firefighters at the H-2 did not have direct communication with adjoining forces.

7. Determine safety zones and escape routes.

Followed/Compromised....The group could not reach agreement on this fire order. Safety zones and escape routes were identified based on the fire information they had at the time. The escaped route down the drainage east of H-2 was in questions because of the fire activity at the southwest section of the fire.

8. Establish lookouts in potentially hazardous situations.

Compromised....Lookouts were established, but were not adequate. Air Attack was not a dedicated full time lookout over the fire at the time of the incident.

9. Retain control at all times.

Followed...The crew leader had control of his crew members, both at the helibase and at the helispot. He remained in control during the entire deployment incident.

10. Stay alert, keep calm, think clearly, act decisively.

Followed....It is quite evident that this was followed, as the situation developed.

E. 18 Watch out Situations

18-Watch out Situations

Basis for rating Watch out Situations: Contributed
Not a factor

1. Fire not scouted and sized up.

Not a factor....A reconnaissance flight took place just prior to shuttling to the fireline.

2. In country not seen in daylight.

Not a factor....Reconnaissance was made in the daylight.

3. Safety zones and escape routes not identified.

Not a factor (with a concern)....Initial zones and escape routes were in place. Upon moving to H-2, new conditions were considered and safety zones and escape routes were identified based on fire behavior and weather they could observe.

Not knowing what the fire was doing below and to the south of H-2 may have led to a false sense of safety.

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

Contributed....Although Hotshot crew was familiar with Kingman Area, no one involved with the fire, anticipated the rapid change in wind conditions and fire behavior that occurred.

5. Uninformed on strategy, tactics, and hazards.

Contributed....Crew was informed of strategy and tactics. Hazards related to current fuel conditions were not available.

6. Instructions and assignments not clear.

Not a factor (with a concern)....Crew was aware of all assignments and objectives.

During the extended attack phase of a fire the IC may need to be kept better informed on changes in Helispot location which may affect tactics.

7. No communication link with crew members or supervisor.

Not a factor....The crew had radio communications with crew and the IC.

An area of concern is the inability to communicate with adjoining fire resources due to terrain.

8. Constructing line without safe anchor point.

Not a factor....Crew was not building line at that time.

9. Building fireline downhill with fire below.

Not a factor....Not building a fire line, and the tactic was not to do that.

10. Attempting frontal assault on fire.

Not a factor....

11. Unburned fuel between you and fire.

Contributed....When they moved to H-2, there was a considerable amount of unburned fuel between H-2 and the fire.

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

Contributed....Due to smoke, main fire could not be observed from H-2. Air attack had gone in for fuel and duties were turned over to Lead 47 who was actively engaged in lead plane activities. We did not have Air Attack for constant surveillance of the fire area.

V. Involved Personnel Profiles

A. Training and Qualifications

Did not contribute. All personnel involved in the deployment incident were qualified for the position they were performing.

B. Operational Period Length/Fatigue

Did not contribute. The crew was well rested.

C. Attitudes

Did not contribute.

D. Leadership

Did not contribute.

E. Experience Level

Did not contribute.

VI. Equipment

A. Availability

Did not contribute. Personnel involved had required personal protective equipment.

B. Performance/Non-performance

Did not contribute. Protective gear performed as expected.

C. Clothing and Equipment

Did not contribute. Protective gear performed as expected.

D. Used for Intended Purposes

Did not contribute. Protective gear was used for its intended purpose. The deployment site did not allow for the normal tent set up of all fire shelters.

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

Not a factor...

14. Weather becoming hotter and drier.

Not a factor...

15. Wind increases and/or changes direction.

Contributed....Winds changed from the South to West and wind speeds increased from 5 to 30 MPH.

16. Getting frequent spot fires across line.

Not a factor....No indication that spotting was a factor in the fire spread.

17. Terrain and fuels make escape to safety zones difficult.

Contributed....Terrain, fuels and large boulders made it difficult to use the escape route.

18. Taking nap near fireline.

Not a factor....

| Entrapment Investigation Element Matrix | | | |
|---|--------------------|------------|--------------------------|
| | Did Not Contribute | Influenced | Significant Contribution |
| Fire Behavior | | | |
| Fuels | | | x |
| Weather | | x | |
| Topography | | | x |
| Pred vs. Observed | | | x |
| Environmental | | | |
| Smoke | | x | |
| Temperature | | x | |
| Visibility | x | | |
| Slope | | x | |
| Winds | | | x |
| Incident Management | | | |
| Objectives | | x | |
| Strategy | | x | |
| Tactics | | | x |
| Safety Briefings | x | | |
| Instructions Given | x | | |
| Control Mechanisms | | | |
| Span of Control | | | x |
| Communications | | | x |
| On Going Evaluations | | x | |
| 18 Situations | | | x |
| Standard Fire Orders | | | x |

| Entrapment Investigation Element Matrix | | | |
|---|-----------------------|------------|-----------------------------|
| Involved Personnel | | | |
| | Did Not Contribute | Influenced | Significant Contribution |
| Training | x | | |
| Fatigue | x | | |
| Attitude | x | | |
| Leadership | x | | |
| Experience Level | x | | |
| Equipment | | | |
| Availability | x | | |
| Performance | x | | |
| Clothing/Equip. | x | | |
| Used for purpose | x | | |

Narrative statement summarizing the findings.

Significant factors that contributed to the shelter deployment were the lack of current information on the fires status, no communication with adjoining resources, inadequate lookouts, unformed on fuel hazards, moving into an area of unburned fuels, inability to observe main fire activity, major change in wind speed and direction, and terrain making it difficult to use escape routes. All of these contributed or influenced the situation resulting in the deployment of fire shelters.

The three firefighters excellent physical fitness condition, mental attitude and high level of training were major factors in the firefighters coming out of the entrapment with only minor medical concerns.

Fire Suppression Organization and Management

During the initial attack phase of the Mackenzie fire a simple command organization was formed utilizing the engine crewboss as incident commander. As the Mackenzie fire went into the extended attack stage an extended attack command and organization structure was put in place. The extended attack organization was built around the crew superintendent of the Prescott Hotshot Crew. When the fire made its major run, a Type II Team was ordered and took over management of the incident on 6/2/94 at 06:00.

Prescott Hotshot Crew Superintendent was ask and accepted the job of extended attack Incident Commander. This practice takes the first line supervisor away from the crew. While this is a common practice, it should be reviewed.

Recommendation:

1. BLM Arizona should discontinue utilizing crew superintendents as overhead (command functions) during the suppression phase of the fire. In leu of using the Crew Superintendent the districts should single resource order the needed command and support function positions needed to manage the fire.

Arizona should take this issue forward the National Office for national review and consideration.

2. Districts should continue developing Type III overhead teams within their districts/zones. Consideration should be given to having an on-call rotation list of Type III overhead and support personnel.
3. District FMO's should identify the districts extended attack organizational requirements. A comparison to the required organization to actual district capability should be addressed to management. Where their are shortfalls the districts should develop a strategy to improve the situation. The next update to the district Fire Management Activity Plan (FMAP) should address the districts Normal Unit Strength requirements.
4. Helispots should be checked for their functionality by conducting check landings and not just from an air reconnaissance.

Communication

Communications between fire resources is critical during the suppression phase of the incident. The Mackenzie fire did not have established frequencies during the extended attack incident. Due in part to terrain, the three firefighters did not have communications with the adjoining fire resources working below them (Pleasant Valley Hotshots).

Recommendations:

1. Incident Commanders should ensure adequate communication between fire resources is established.
2. Districts should evaluate the need for scene of action repeaters and initial attack/extended attack radio kits.

Fatality and Serious Injury Procedures

The extended attack Incident Commander ordered an critical incident stress debriefing team for the personnel involved in the fire shelter deployment. There was some misunderstandings with dispatch regarding the request. Dispatch interpreted the request as being the Human Resource Specialist position on the Type II overhead team.

The BLM national contract for such services was not able to meet the time frames established by the needs of the incident. The contractor did respond with a counselor. The counselor could only provide 2 one hour sessions over a two day period.

Recommendations:

1. Fire staff to work with the dispatch community at the local, zone, and area level on ordering debriefing teams.
2. District/State Office should identify any local sources which are available to provide critical incident stress debriefing.
3. Request national office to follow up with national contractor (Maschhoff, Barr, & Associates) to make them more aware of the needs of a fire incident when a responsive to fire needs.

Training/Physical Fitness

It is the option of the investigation team that the high physical fitness level, fire training and weekly proficiency drills were a major factor on why the individuals survived the entrapment.

Hard physical work and adverse environmental condition combine to make the energy costs of fire fighting very high and fatigue is an every present hazard. Fit, sound, and healthy firefighter who are less vulnerable to fatigue are needed to maintain safe, cost effective operations.

Recommendation:

1. Line Mangers need to continue to encourage fire training, proficiency drills, and physical fitness conditioning of their firefighters.
2. It is recommended on the job fitness training time be provided before and during the fire season for those individuals who hold a red card position requiring an arduous fitness standard (step test score +45).

Those who have fire suppression duties within their job description should be give a minimum of 5 hours per week for fitness training per NWCG guidance.

Initial Attack/Extended Attack Crews

The fireline handbook is not routinely being read and adhered to by people occupying decision making positions. The Handbook is the most available means of accessing basic firefighting information.

Failure to adapt to changing conditions on the fireline is a major concern. Conditions do change. People should not think that instructions from an incident action plan, are in concert with current conditions. Crews sometimes are given instructions to work in areas where common sense and basic firefighting principles indicated no one should be.

Recommend:

1. Emphasize to all personnel that the extent of the emergency does not relieve anyone of a safety conscious attitude and resultant performance, but calls for an even deeper commitment to "Safety First".
2. Crew and individual limitations need to be recognized and accepted. Less aggressive suppression tactics need to be applied when utilizing inexperienced or less fit crews.
3. Districts need to continue conducting refresher fire safety training before and during the fire season for all suppression personnel

Look Outs

When H-2 was selected to be used instead of H-1, this placed the 3 firefighters in a position of having unburned fuels between them and the main fire. They also could not see the fire activity below them. They had no communications with those on the ground who could. For a short time air attack was being covered by a lead plane. This resulted in a part time aerial lookout.

Recommendations:

1. Initial Attack/Extended Attack Incident Commanders ensure adequate lookouts are in place. This is especially critical when conducting direct attack.
2. To the extent possible Air attack breaks needs to be scheduled during the non critical burning period.
3. When major air operations is required for the suppression effort consideration should be given to having 2 Air Attack Group Supervisors for the incident. This would allow scheduling where there would be a Air Attack Group Supervisor over the fire full time and the duties would not have to be passed on to the Lead Plane pilot.