

Appendix: Human Factors Analysis

The investigation team utilized the Human Factors Analysis and Classification System (HFACS) to assess the impact of human factors issues on the performance of the personnel and management throughout the Thirtymile Fire incident. The results of this analysis are presented below.

1. Sensory and Perceptual Factors

There were clear indicators throughout this incident of individuals with low situational awareness, possibly exacerbated by sensory or perceptual factors listed below.

- Misjudgment of distance or time (expectation of rate of fire movement): For most of the day on July 10, the fire had moved relatively slowly with a few dramatic runs up the sides of the canyon. This may have led the entrapped crew at the deployment site into assuming that they would see the fire coming at the same rate they had all day. This might help explain how they were taken by surprise when the turnover occurred, even though they had over 45 minutes to prepare for a possible deployment.
- Impaired visual cues: Mountainous terrain, curves in the road, a relatively tall and dense canopy, as well as the ever-present smoke, made visual tracking of the fire's progress difficult. Eventually, the smoke would prevent the air attack from identifying the eventual deployment site, further complicating the challenge.
- Geographic disorientation: Some of the crew did not know that the Chewuch River Road was a dead end road.
- Attention management: There were three major and distinct attention management issues.
 - Fire management personnel were "surprised" by the explosive fire behavior in a riparian area. This occurred despite known 1000 hour fuel levels, temperatures at historic highs and relative humidity at historic lows
 - District and Forest personnel were not continuously aware of the changing nature of the fire throughout the day on July 10th.
 - The crew was not kept aware of the trainer/trainee relationship at any given time during the day, resulting in confusion as to who was acting in what roles. This may partially explain the IC's difficulties at the eventual deployment site.
 - At the deployment site, the crew's attention was "turned inward." The time and attention of experienced crewmembers was channelized almost exclusively on two non-fire issues. The first was keeping less experienced crewmembers calm and the second was the low key conflict between the IC/Crew Boss and two squad bosses about coming down out of the rocks. This occupied the crew leadership and lowered the vigilance level as the

fire approached and prevented any serious preparation from being accomplished at the site.

2. Medical and Physiological Factors

The single overwhelming physiological factor that impacted upon this mishap was fatigue caused by sleep deprivation. Recent research (Lamond and Dawson, 1998) points out that the loss of even a single night's sleep (25.1 hours of wakefulness) impairs decision-making and vigilance to levels comparable to a blood alcohol content of .10, suggesting that "moderate levels of sustained wakefulness produce performance (impairment) equivalent to or greater than those observed at levels of alcohol intoxication deemed unacceptable when driving, working, or operating dangerous equipment."

This may help explain a series of uncharacteristic lapses in judgment and the multiple violations of the 10 Standard Fire Orders and the 18 situations that shout "Watch Out" The investigation team attempted to reconstruct the sleep histories of key personnel on this incident. The team forwarded these data to Dr. James Miller of the USAF Warfighter Fatigue Countermeasures team at Brooks Air Force Base, where he ran the sleep data through a quantitative analysis to predict cognitive capabilities throughout the period of the mishap sequence. The report is attached to this HF analysis and some key considerations follow:

- DFMO: At the key point where the DFMO escorts and inbriefs NWR #6 at Action 103 (when they took the fire from the Entiat IHC), he has had less than 30 minutes sleep in the previous 24 hours (with little more than that the previous night). He remains unaware of the observation by the initial attack crew the night before that this fire would not be held and would "hit the ridge and get large." He considers the fire "basically a mop-up show." Due to his high fatigue level, the District Ranger orders him to get some rest, and he is therefore out of the loop for several key hours as events unravel later in the day.
- Entiat IHC Superintendent: When the Entiat IHC arrive at the Twisp Ranger station on the night of 9 July, they are at the end of a 30-hour period of little or no sleep. After bedding down for less than 30 minutes (no sleep), they are directed to the Thirtymile Fire where they work throughout the night. After being relieved by NWR #6 and bedding down a second time, they are awakened again after less than one hour and asked to return. The key here is that the Entiat IHC Superintendent's (Marshall Brown's) large fire experience and considerable judgment are incapacitated at this critical point by nearly 50 hours with little or no sleep. He is offered and declines incident command citing the complexity of the fire, but his interview made it clear that he felt that neither he nor his crew were in any condition to reengage the fire at this point. This makes the coordination and execution of the rescue operations at 1800 that night all the more impressive.
- NWR #6 Crew: On average, the NWR #6 crew may have gotten one to three hours of sleep while driving to the incident the night prior to the mishap. Most of the crew received the phone call around midnight the previous night and the crew

did not begin the drive to the Okanogan until after 4 a.m. on July 10th. They admit to being excited about the assignment with some crewmembers reporting no sleep and others periodic rest during the drive. None of this could be considered quality sleep. Once again, the effects on performance involve the key areas of decisiveness and vigilance, possibly shedding some light on the actions of the crew.

3. Knowledge and Skill

Although documentation was inadequate to prove the training levels of all crewmembers was complete; knowledge and skill did not seem to play a significant role, with two notable exceptions.

- Wildland fire inexperience of Crew Boss/IC trainee: Several crewmembers expressed discomfort with the "fast tracking" of the crew boss trainee. In news releases after the event, he was quoted as saying he had "never lost a fire" and that "the hair on the back of his neck never stood up." In contrast other more experienced firefighters reported that they "knew we were in a Watch Out situation."
- Fire Shelter Deployment Irregularities: Mishap site analysis determined that several crewmembers did not follow procedure while deploying their fire shelter by (1) taking their packs inside the shelter, and (2) not deploying in the preferred position. This may have been a result of the relatively sudden onset of the blowup.

4. Mission Factors

There were several mission factors that contributed to the decisions leading up to the entrapment.

- Dispatch and Forest Management communications: The mishap investigation team was unable to completely document the flow of communication from the fire scene to District and Forest management. These critical pieces of information included:
 - The nighttime situation report from initial attack crew (Laughman) that the fire would grow and "we would not contain it."
 - The time lag between the first request for aviation support (0215) and the initial dispatch inquiry regarding the allowable use of the helicopter using the Chewuch River as a dip site.
 - General information regarding the deteriorating fire behavior and conditions.
 - How and why Engine 701 gets dispatched to the fire line in the afternoon.
- Lack of shared understanding of appropriate fire strategy and tactics: This led to a somewhat ill-defined strategy of "keeping the fire east of the road if you can." Eventually, (due in part to significant curves in the road, which should have been obvious to local officials or anyone consulting a map) this put the NWR #6 crew in front of the main body of a moving fire that was heading directly towards the

one and only escape route. In effect, this was an entrapment by design, but one that might have been avoided if there was a shared understanding of what was being attempted with the roadside strategy.

5. Personalities and Safety Attitudes

Safety is a stated core value in USDA Forest Service Fire and Aviation Management operations. This investigation found no intentional or flagrant disregard of safety standards. However, in a mishap where the vast majority of the standing Fire Orders were violated and all but a few "Situations that Shout Watch Out" were present, one must question the field level understanding or commitment to the stated core value. One crewmember, when asked about the apparent apathy towards the guidelines, responded, "everyone knows that these things (Fire Orders) are just guidelines and can't always be followed." This appears to be a good distance away from the stated management philosophy that "we don't bend them and we don't break them."

- Contrasting personality traits: Crewmember testimony indicates that the IC was not a forceful leader and that may have impeded his ability to command the situation at the deployment site, especially when contrasted with the personality traits of the crew boss trainee and some of the squad bosses on site, who were described as more charismatic and outgoing.
- Sociological factors (clustering at the deployment site): Interviews with key survivors of the deployment indicate that those who deployed in the rock scree area reconfigured to District affiliations (friends that they knew and trusted) even though they were technically assigned to different squads. This is common behavior in the early stages of group assimilation and likely accounts for the failure of some members who were fatally injured to respond to the direction of the Crew Boss to "come down out of the rocks."

6. Risk Management

This entire event was characterized by ineffective risk management, specifically an underestimation of the risks associated with working in front of a moving fire on a day with historic high energy release components, high temperatures, low humidity, and unstable atmospheric conditions. No one associated with this fire gave it the respect it was due.

7. Communications and Crew Coordination

Communication and crew coordination were hampered at multiple levels throughout this incident. Failure to conduct briefings at key points – particularly after the final break at the lunch spot and after arrival at the eventual deployment site – as well as a lack of assertiveness by individuals who did sense the dangerous conditions characterized the poor crew coordination in this situation.

The charts on the following pages highlight fatigue levels of selected individuals.

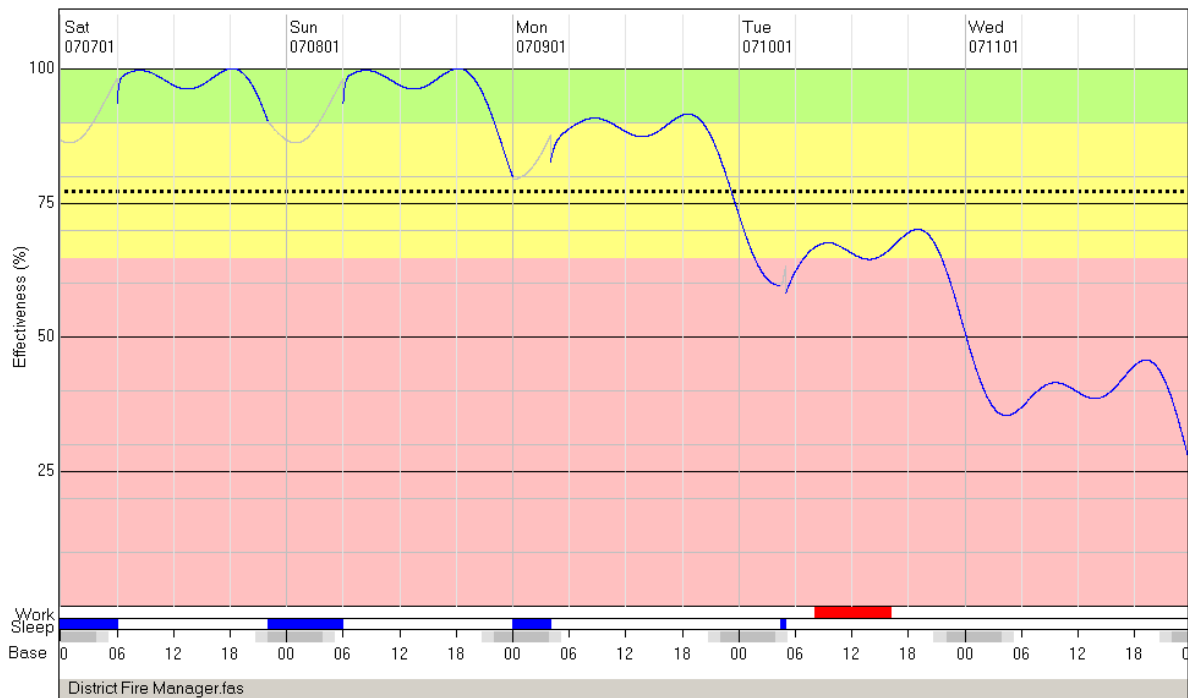
District Fire Manager Officer (FMO)

Schedule start: 00:00, 7 July 2001. Assume normal sleep through 06:00, 7 July.
Estimated sleep periods for nights beginning:

- July 7: unknown
- July 8: 00:00-0:400
- July 9: 04:30-05:00 "cat nap"

On 10 July 2001, predicted cognitive effectiveness was:

- 08:00-12:00: 67%
- 12:00-16:00: 65%



Entiat IHC Superintendent

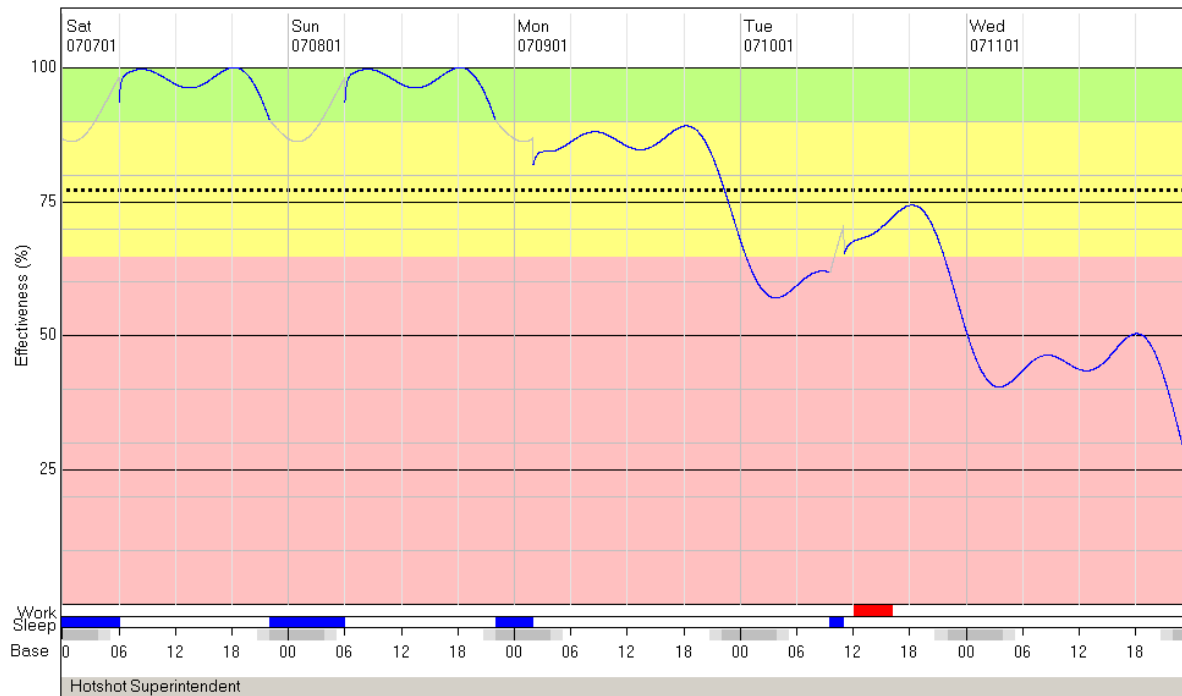
Schedule start: 00:00, 7 July 2001. Assume normal sleep through 06:00, 8 July.

Estimated sleep periods for nights beginning:

- July 8: 2200-0200
- July 9: no sleep
- July 10: 0930-1100 nap

On 10 July 2001, predicted cognitive effectiveness was:

- 12:00-16:00: 69%



NWR-6 Crew

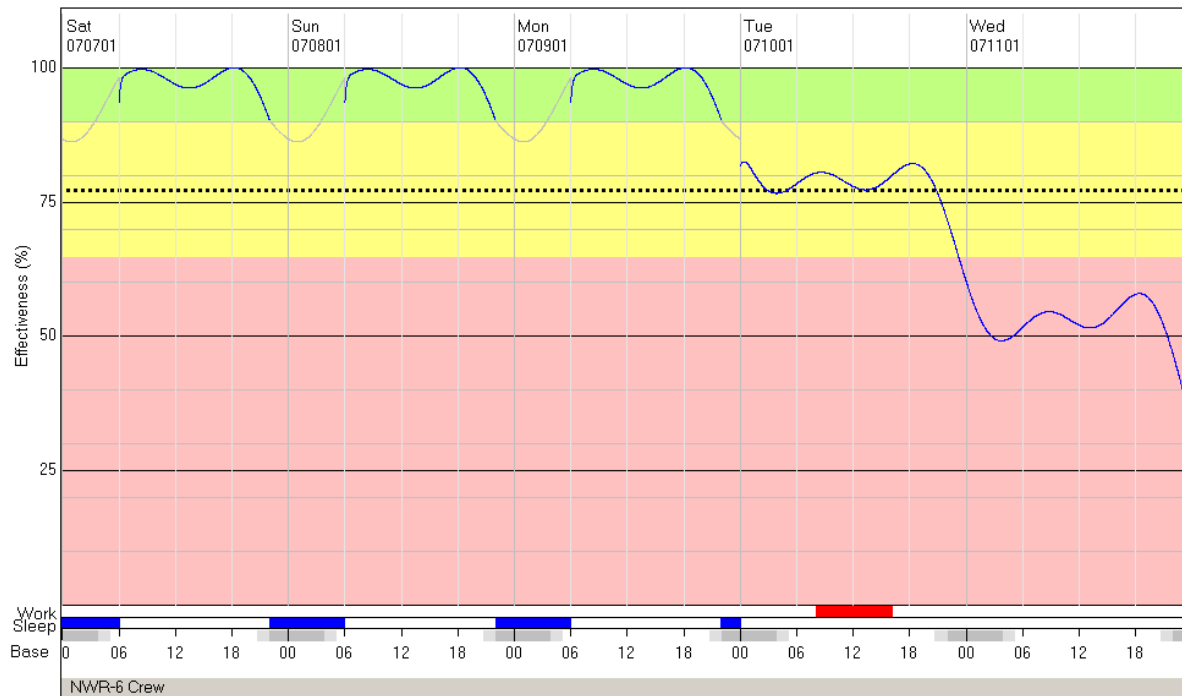
Schedule start: 00:00, 7 July 2001. Assume normal sleep through 06:00, 9 July.

Estimated sleep periods for nights beginning:

- July 9: 2200-0000

On 10 July 2001, predicted cognitive effectiveness was:

- 08:00-12:00: 80%
- 12:00-16:00: 78 %



Appendix: Equipment

The analysis of the personal protective equipment used in the area of the fire shelter deployment was accomplished by thoroughly examining the entire deployment area, describing, photographing and retaining the items found, and mapping the area using GPS. Temperatures were estimated by comparing the condition of items found to known effects of temperatures on various materials.

The area of the deployment is divided into two sites for the purposes of this report. The upper deployment area was located on a jumbled rock scree slope, 96 feet above the road. The slope between the road and the deployment site is 25%. The slope changes to 45-55% immediately uphill from where the deployment occurred. Rocks in the area ranged from 6 inches to many feet in diameter. Six firefighters, including the four fatality victims deployed shelters at this location. Two firefighters left their shelters after 2-5 minutes, one moving to a van on the road and the other moving to the river. Both survived, though one was severely burned.

The lower deployment area includes the dirt road along which 10 of the 16 entrapped people deployed fire shelters. Eight firefighters employed by the USDA Forest Service and two civilians, also trapped by the fire, survived the burnover in fire shelters deployed in this area. The civilians shared a single fire shelter with a firefighter deployed next to the road. The Chewuch River runs alongside this portion of the road, separated over most of the length of the deployment area by a small backwater and a sandbar. The van in which the firefighters arrived was parked at the edge of the road, on the side of the road closest to the river. The pickup truck driven by the two civilians was, at the time of the deployment, parked on the road at the upcanyon edge of the deployment area.

The Upper Deployment Area

Fire Shelters

The fire shelters were examined as they were found at the deployment site. It was not possible to identify with certainty the shelter used by each person who deployed in this area due to the circumstances involved in handling the fatalities. Only the shelter used by Thom Taylor was identified with certainty.

Five of the six fire shelters in the upper deployment area were seriously damaged, showing severe delamination. Conditions of the material indicate that four of the six shelters were exposed to temperatures in excess of 1200 ° F. Two of these shelters show damage indicating temperatures of at least 1600 ° F. These temperatures far exceed the protective ability of the fire shelter. Only a small piece of the fifth shelter was present for examination. The condition of this shelter indicated temperatures in the range of 500-800+ ° F.

The sixth shelter found in the upper deployment site was mostly intact. Conditions indicated temperatures generally less than 500 ° F. Dark brown scorch of the fiberglass under a hole located at the head end of the shelter indicated temperatures of at least 600 ° F at that location.

Given the relative lack of damage to this shelter and the presence of melted nylon or plastic at the foot end, it is believed that Thom Taylor used this shelter, since Taylor's pack was located immediately at the foot end of his shelter and was severely burned. Taylor escaped after several minutes to the backwater immediately below the road. He survived with minor burns.

Line Gear Packs

Six line gear packs were found at locations identified as LG#1-LG#6 on Equipment Map # 2. All line gear packs in this deployment area were destroyed. Line Gear Pack #6 was located in the deployment site used by Tom Craven.

Tools

Two shovels with burned out handles were found in the upper deployment area. (SH1 and SH2 on Equipment Map #2).

Discussion of Upper Deployment Area

- All six of the firefighters who deployed in the upper deployment site deployed on large jumbled rocks 6" to 3' in diameter. Thom Taylor and Jason Emhoff deployed in the rocks immediately uphill from the deceased. Both left their shelters after a few minutes and moved toward the river and road respectively. Both survived. There is evidence, based on interviews with these two individuals that the four fatality victims had already succumbed when Taylor and Emhoff left the area. This would imply that though the 6 firefighters were deployed very close to one another, the microsites where the two survivors deployed experienced less severe conditions than did those of the four fatality victims. Whatever protection Taylor and Emhoff had during the first few minutes after deployment, it allowed them to survive the initial lethal conditions so they could then escape to more moderate conditions on the road and in the river.
- The coroner reported that all four fatality victims died of asphyxia due to inhalation of superheated products of combustion. Thermal injuries were considered postmortem in nature.
- Due to the severe damage caused by the fire, it was impossible to determine the presence and prior condition of the personal protective equipment (PPE) worn by Jessica Johnson, Tom Craven and Karen FitzPatrick. Devin Weaver's PPE appears to have been appropriate and approved equipment. It is clear that the personal protective equipment used by three of the four fatality victims and the fire shelters used by all four victims were subjected to extreme temperatures and significant direct flame exposure, conditions that far exceed the design limitations of these products. The condition of Devin Weaver's clothing indicate that though the temperatures to which he was exposed were lethal, they were far lower than those to which the other three victims were exposed. It is possible that a large rock, immediately downhill from the site where Devin Weaver deployed offered some protection from the extreme levels of convective heat coming from below. However, holes between the rocks at his deployment site passed directly through to the unprotected area immediately downhill. Superheated gases may have passed directly into his shelter from below.

- Four of the six people who deployed in this area dropped their packs well below the deployment site. Tom Craven took his pack into his shelter and was likely exposed to extremely high temperatures when fusees inside the pack ignited. Fusees burn initially at 3500 ° F and then continue to burn at 1700 ° F. Thom Taylor left his pack outside, but adjacent to his own shelter. The heat from his fusees igniting and from his pack burning may have resulted in an increased heat load impacting Thom Taylor's shelter.
- Thom Taylor's use of gloves and a face/neck shroud protected him during the deployment and during his move from the deployment site to the river. Without gloves and a face/neck shroud, Jason Emhoff was exposed directly to severe heat conditions and suffered serious burn injuries. Use of these articles of personal protective equipment would have reduced the severity of his burns.
- Examination of an intact line gear pack after the event yielded 2 extra pairs of leather gloves. Firefighters should ensure that all personnel have necessary PPE. If not, efforts should be made to find equipment by asking other firefighters for extras.
- Rocky areas can be adequate deployment sites and have offered survivable deployment sites in past entrapments, but firefighters should be made aware of potential problems that can occur when deploying in rock:
 - It was apparent from discussions with Thom Taylor and Jason Emhoff, and from observations made at the site that it can be very difficult to obtain a seal with the edge of the fire shelter in large jumbled rocks such as those present at the deployment site. Firefighters must be warned that deployment on even surfaces can provide a better seal for the fire shelter.
 - Significant levels of downed fuel were present among the rocks at the upper deployment site and led to high convective heat loads when this fuel burned. Standing timber immediately below and immediately upcanyon from the deployment site created high levels of convective and radiant heat on the deployment site when they burned. Firefighters must be reminded to avoid all types of fuel, even when deploying in a rockslide.

The Lower Deployment Area

The ten people who deployed on or next to the road survived the burnover in fire shelters. They moved to the river and sandbar after the hottest part of the fire had moved through the area.

Fire Shelters

The fire shelters that were found on the road and in the river had all been deployed on or next to the road. Except in two cases, it was not possible to identify the shelter used by each individual since the shelters were moved more than once after the deployment took place. The individuals that used two shelters were identified by comparing the damage to the shelters with the experiences reported by those involved.

Five of the eight shelters deployed in the lower deployment site had little or no heat damage, indicating temperatures of <500° F. These shelters were all deployed on the road surface and had little or no direct flame contact. Three shelters did suffer minor to moderate heat damage.

Shelter #8 on Map #2 was used by Rebecca Welch (Deployment Site 9), Bruce Hagemeyer (Deployment Site 15) and Paula Hagemeyer (Deployment Site 16). It was deployed just off the road in brushy fuels. This shelter had delamination and torn foil damage on one side and on the foot end of the shelter. Temperatures in the area of the damage are estimated to have been 600-700° F. The heat damage to this shelter was caused by direct flame contact, which resulted from deployment next to brushy fuels. Tears present in the floor seams were likely caused by being pulled tightly over three people.

Shelter #11 on Map #3 was used by Matthew Rutman (Deployment Site 13). This shelter was deployed between two line gear packs that had been dropped by other firefighters. The shelter was exposed to direct flame when line gear packs adjacent to shelter ignited. Nylon residue was found on both sides of the shelter. Delamination and torn foil damage to the shelter resulted from direct flame contact with the burning packs. Temperatures in the area of the damage are estimated to have been 600-700° F.

The final shelter deployed in the lower area showed some brown scorch on the sod cloth of the shelter. It appeared as if the shelter had been deployed directly on top of some fuel, which ignited and caused the minor scorch damage. It is not known who deployed this shelter or at which specific deployment site (in the lower deployment area) it was deployed.

Discussion of Lower Deployment Area

- All but two people discarded their packs prior to entering their shelters. Of the six packs that were discarded, 3 burned and 3 were mostly intact after the fire passed. Neither of the packs that were worn inside the shelters ignited, but both had fusees inside them that could have proven fatal had ignition occurred. It is recommended that firefighters be reminded of the importance of discarding packs with fusees prior to deploying a fire shelter.
- While six firefighters did discard their packs, some of these packs were left so close to the deployment sites they caused damage to at least one fire shelter and led to second degree burns on one individual when they ignited. Firefighters should be reminded of the importance of leaving packs well away from the deployment area.
- The road area was an effective deployment site. Temperatures in this area were less than 500° F. The presence of some intact polyvinyl bags on the road surface indicate that in some areas temperatures were less than 280°F, at least at ground level. Those firefighters who deployed in the road had a much less severe exposure to heat and flames than did those who deployed near brush and fuels at the edge of the road. Firefighters should be reminded of the importance of deploying shelters away from fuels of all kinds.
- Four of the eight people who deployed on the road had not pulled the tabs on their fire shelter bags half-way down prior to the deployment as was directed in a safety alert

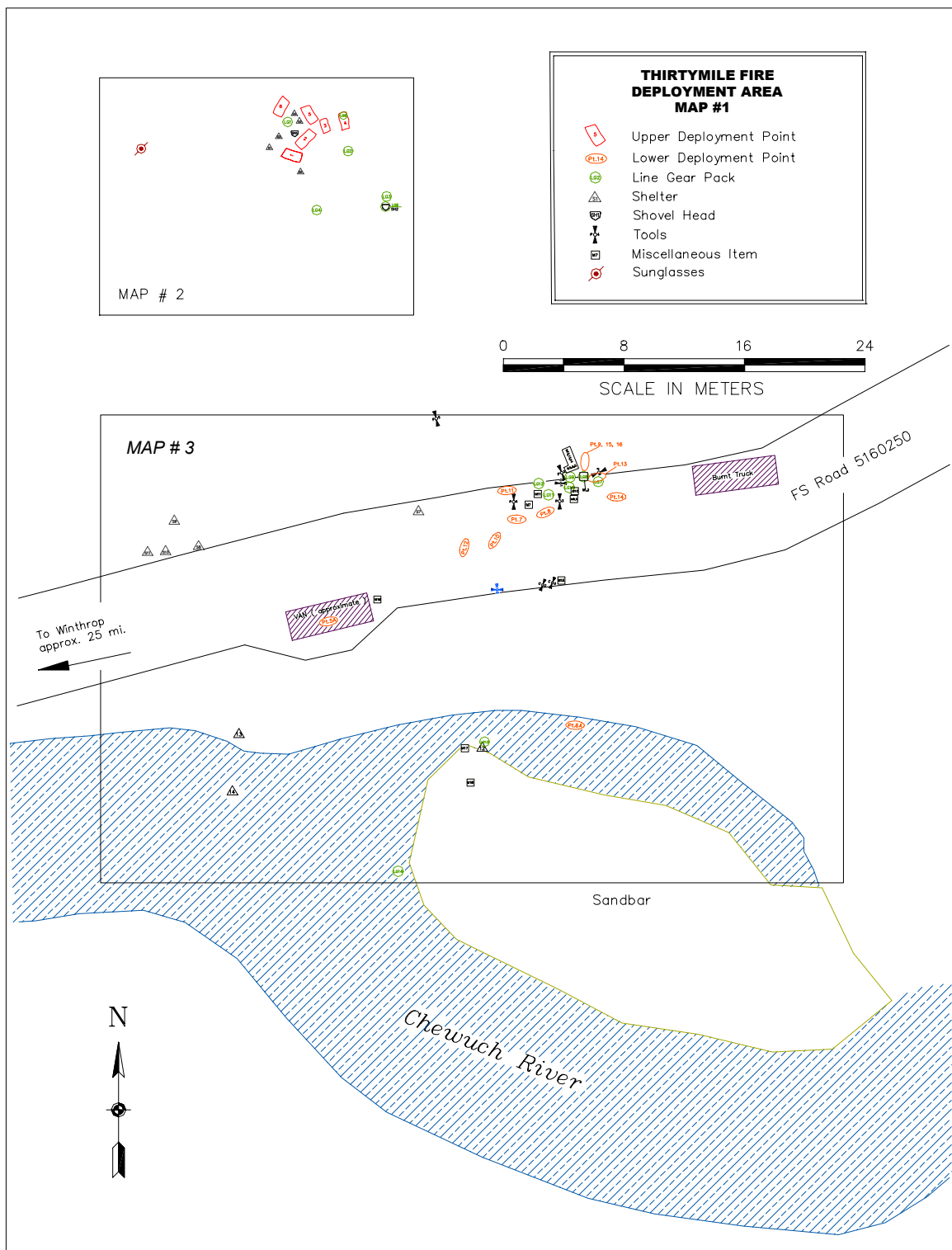
issued in spring, 2001. One person (whose tabs **were** pulled prior to deployment) did tear a tab while opening the fire shelter bag. However, they had no further trouble opening the shelter with their gloved hands. It is clear that some people are not receiving or following the information in the safety alert that calls for all tabs to be pulled down half way until shelters can be rebagged with the improved bag system. Managers must ensure that firefighters receive important safety information.

Conclusions

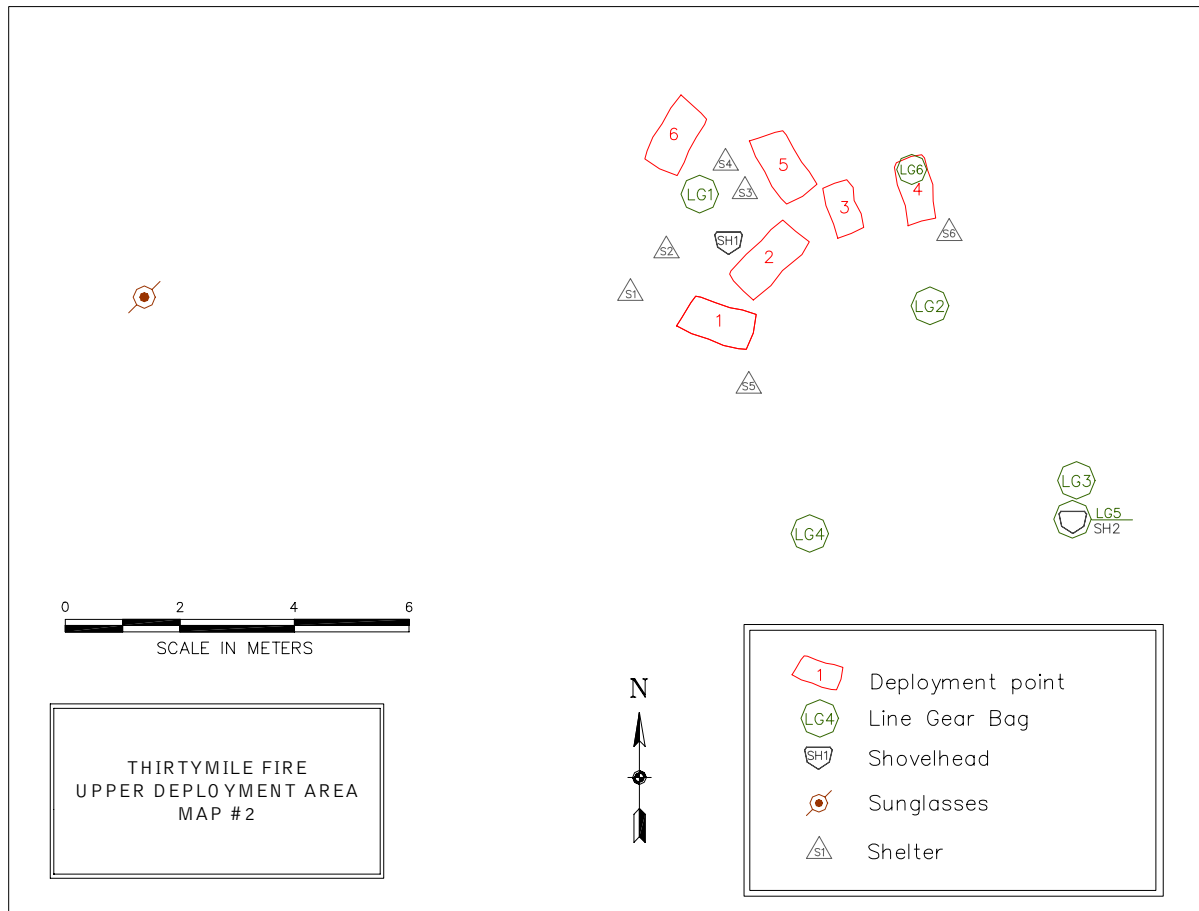
- Face and neck shrouds offered protection to some of the firefighters involved in the deployment and reduced the severity of burns for one firefighter. Requiring shrouds as mandatory personal protective equipment for wildland firefighters could help prevent burns during escape or entrapment. Training in the use of shrouds is imperative so that personnel understand that they are to be used *only* in escape and deployment situations.
- Fire shelters used by people deployed on and near the road prevented serious burns and deaths. Fire shelters also allowed two individuals to survive the initial lethal conditions in the upper deployment area so they could then escape to more moderate conditions on the road and in the river. Though fire shelters performed as designed – as a reflector of radiant heat – they failed to adequately protect the four fatality victims from severe flame and convective heat contact. Development of a fire shelter that can better withstand flame contact must continue per the established protocol and timeline, (i.e. field use by 2003).
- It is critically important to avoid rocky areas near timber or other flammable fuels or where there is downed fuel among the rocks.
- Personnel should be cautioned that deploying shelters in rocks can sometimes make it difficult to obtain a seal to prevent heat, embers and smoke from entering the shelter. Personnel should be advised that an even surface such as a road will provide for a better seal than will an uneven surface.
- The importance of wearing gloves during deployment should be reinforced during fire shelter training.
- Fire shelter training should recommend deployment in flat areas rather than sloped areas if possible. Though it is not possible to describe every deployment situation, flat areas will tend to provide better protection from radiant and convective heat, all other conditions being equal. Training should be provided for known circumstances where this rule is not valid. All recommendations for avoiding draws, chimneys, saddles, fuels, and snags still apply.
- Personnel should be trained to use all available time if they are entrapped and cannot escape.
 - Shelters should be out and ready for deployment. Do not wait until the last minute.
 - Ensure that everyone has appropriate PPE for deployment, which includes: fire shelter, gloves, hardhat, boots, nomex, face and neck shroud. If any individual is

missing PPE, find replacement equipment; i.e. ask all other personnel for extra equipment.

- Identify deployment sites in advance; making sure everyone is aware of the location. Prepare the deployment site by clearing away fuels, burning out, etc. Entrapments do not often allow ample time to prepare for shelter deployment. If entrapped, use every available moment to make preparations for shelter deployment.
- Reinforce the need to place packs away from the deployment area. Packs may burn and expose shelters to both radiant and convective heat. Packs may also contain flammable and combustible materials that can be extremely dangerous both inside and outside of a fire shelter.
- Fire shelter training needs to be of the highest quality to stress the importance of this critical piece of safety equipment. Use of shelter training materials in the form of videos, brochures and pamphlets should be mandatory. Issue pamphlets to each firefighter during refresher training.
- Fire shelter training must be provided for all personnel and management should document how and when it was accomplished as well as the methods used.
- All fireline-qualified personnel should perform the 5 training scenarios as outlined in the training materials. These must be completed at least once before a fire assignment.
- Crews should carry 2-3 extra sets of PPE and shelters to be prepared in case equipment is lost or people arrive without needed equipment. Equipment should be stored in suppression vehicles (engines and crew carriers.)
- Discuss actions in the event of the arrival of unequipped personnel and/or civilians.
- Management must ensure that all personnel receive Safety Alerts and, if required, complete any action necessary to comply with the Safety Alert.
- A power point program should be developed that can be utilized for fire shelter training. The program would be web-based and would be located on the Safety and Health Working Team web site. It should present:
 - The most current information on fire shelters
 - Any current fire shelter issues
 - National statistics on shelter deployments and fatalities



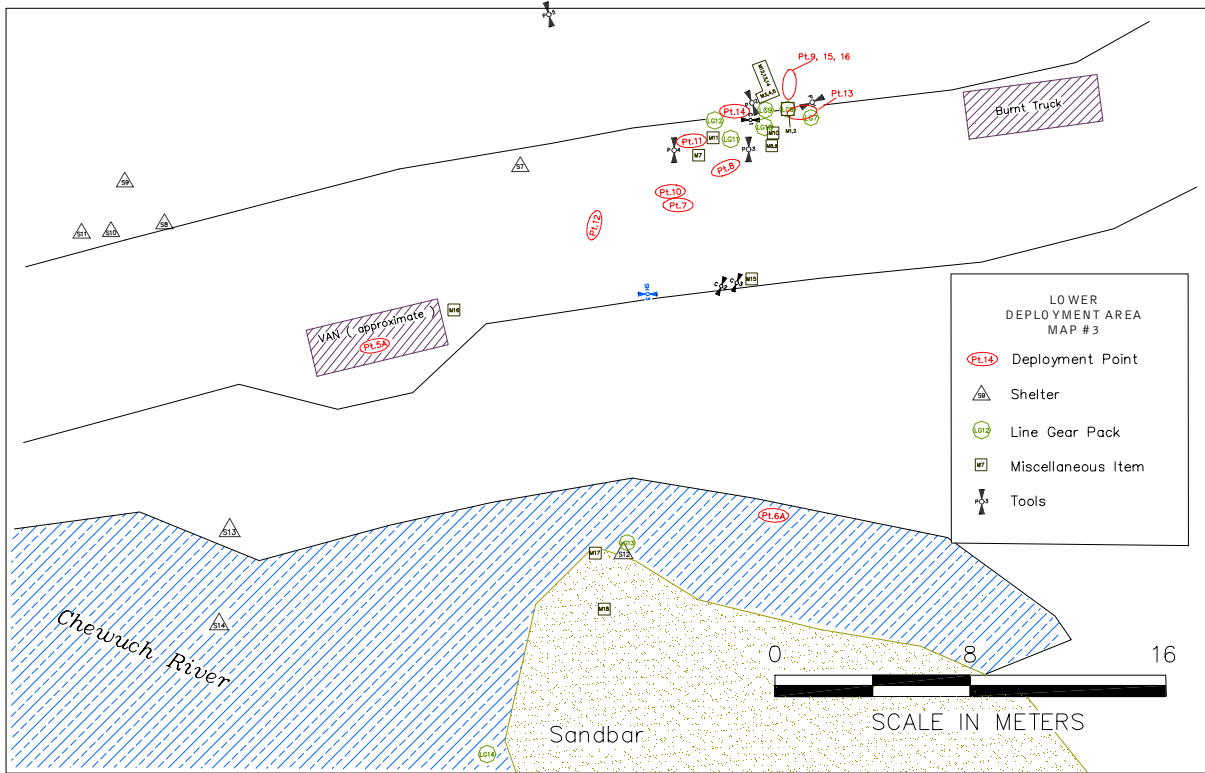
Equipment Appendix Map 1. The Deployment Area



Equipment Appendix Map 2. Upper Deployment Area

Deployment sites: (* Fatality)

1. Karen FitzPatrick*
2. Devin Weaver*
3. Jessica Johnson*
4. Tom Craven*
5. Jason Emhoff (initial deployment site, later moved to 5a on Map #3)
6. Thom Taylor (initial deployment site, later moved to 6a on Map #3)



Equipment Appendix Map 3. Lower Deployment Area

Deployment Sites:

- 5a. Jason Emhoff location after moving from Upper Deployment site
- 6a. Thom Taylor Location after moving from Upper Deployment site
- 7. Beau Clark
- 8. Scott Scherzinger
- 9. Rebecca Welch
- 10. Nick Dreis
- 11. Armando Avila
- 12. Elaine Hurd
- 13. Matthew Rutman
- 14. Ellreese Daniels
- 15. Paula Hagemeyer
- 16. Bruce Hagemeyer

Appendix: Qualifications

An analysis of the qualifications of the key personnel on the Thirtymile Fire was conducted based on a review of training records, class rosters, and annual reports. The following are the qualifications based on this analysis.

1. Between 1993 and May 2000 the Okanogan and Wenatchee National Forests followed NWCG PMS 310-1 as a guide for determining what formal training was needed. PMS 310-1 is less stringent than is the revised Forest Service Handbook 5109.17 (May 2000 edition) for fire training.
 - In order to become certified under this system, employees must complete "required" courses before consideration for certifying new ICS qualifications.
 - "Suggested" courses were not required for certification of qualifications.
 - Under this system there were no formal classes required for an advanced fire fighter (e.g., Squad Boss). Cravens, Taylor, and Kampen did not have S-211 (Water Use and Pumps) but were certified since S-211 was not required when they achieved their Squad Boss qualification.
2. After May 2000, the Wenatchee began implementing the revised FSH 5109.17.
 - Individual qualification reviews applying new requirements in revised FSH 5109.17, versus previous qualifications granted under PMS 310-1, have not been done.
 - The now required courses in revised FSH 5109.17 have not been formally waived to maintain individual qualifications gained under PMS 310-1.
3. The Wenatchee National Forest issued a taskbook for an ICS position after all formal required courses were completed.
 - In Pete Kampen's case, he was issued a taskbook before revised FSH 5109.17 was initiated. Kampen retained his taskbook and had trainee assignments while completing the formal training now required under revised FSH 5109.17.
4. Daniels took S-230 Crew Boss and completed his taskbook while on detail to the Redmond IHC in 1988.
5. Because the Lake Leavenworth Ranger District does not keep training records on temporary employees, they have been relying on class rosters and employee personal records to document training.

Northwest Regulars #6 Qualifications

Name	Assignment	Completed Required Training for Incident Position?	Completed Refresher or Basic 32 Hour Course?	Completed Work Capacity Training?
Ellreese Daniels	Crew Boss	Yes	Jun-01	Yes
Pete Kampen (1)	Crew Boss (T)	Yes	Jun-01	Yes
Nick Dreis	Firefighter	Yes	Jun-01	Yes
Elaine Hurd	Firefighter	Yes	Jun-01	Yes
Armando Avila	Firefighter/Squad Boss (T)	Yes	Jun-01	Yes
Brian Schexnayder	Squad Boss	Yes	Jun-01	Yes
Thom Taylor	Squad Boss	Yes	Jun-01	Yes
Mathew Rutman	Firefighter	Yes	Jun-01	Yes
Donica Watson	Firefighter	Yes	Jun-01	Yes
Emily Hinson	Firefighter	Yes	Jun-01	Yes
Dewane Anderson	Firefighter	Yes	Jun-01	Yes
Tom Craven	Squad Boss	Yes	Apr-01	Yes
Jason Emhoff	Firefighter/EMT	Yes	Apr-01	Yes
Jodie Tate	Firefighter/EMT	Yes	Apr-01	Yes
Karen FitzPatrick	Firefighter	Yes	Jun-01	Yes
Beau Clark	Firefighter	Yes	Jun-01	Yes
Scott Scherzinger	Firefighter	Yes	Apr-01	Yes
Devin Weaver	Firefighter	Yes	Jun-01	Yes
Marshall Wallace	Firefighter	Yes	Apr-01	Yes
Jessica Johnson	Firefighter	Yes	May-01	Yes
Rebecca Welch	Firefighter	Yes	Jun-01	Yes
Notes:				
(1) Kampen was qualified as a Squad boss under PMS 310-1 in 1996. The Wenatchee Red Card Committee qualified Kampen as a Crew Boss trainee in May 2000, however the qualifications system changed in May 2000. Kampen kept his trainee status and was scheduled to complete the new required courses. Of the 9 required courses, 8 were completed. S-234 (Ignition Operations) overlapped with another training detail and was not completed prior to the incident.				

Entiat IHC Qualifications

Name	Assignment	Completed Required Training for Incident Position?	Completed Refresher or Basic 32?	Completed WCT?
Marshall Brown	Superintendent/Night IC	Yes	Mar-01	Yes
Jason Lambert	Squad Boss	Yes	May-01	Yes
Chris Sotherlund	Firefighter	Yes	May-01	Yes
Ellis Thompson	Firefighter	Yes	May-01	Yes
Kyle Cannon	Asst. Superintendent	Yes	Mar-01	Yes
Jamie Sarabia	Firefighter	Yes	May-01	Yes
Josh Verellen	Firefighter	Yes	May-01	Yes
Jeff Steele	Firefighter	Yes	May-01	Yes
Matt Kennedy	Squad Boss	Yes	May-01	Yes
Kristian Mattson	Firefighter	Yes	May-01	Yes
Derrek Birks	Firefighter	Yes	May-01	Yes
Isaac Palmer	Firefighter	Yes	May-01	Yes
Mike Pipgras	Squad Boss	Yes	May-01	Yes
Zach Gormely	Firefighter	Yes	May-01	Yes
Alisha Glaesermann	Firefighter	Yes	May-01	Yes
Kory Mattson	Firefighter	Yes	May-01	Yes
Ben Spies	Firefighter	Yes	May-01	Yes
Taylor Wimberley	Firefighter	Yes	May-01	Yes
Amy Cram	Firefighter	Yes	May-01	Yes
Kerry Kelly	Firefighter	Yes	May-01	Yes

Methow Valley District Personnel Qualifications

Name	Assignment	Completed Required Training for Incident Position?	Completed Refresher or Basic 32?	Completed WCT?
Pete Soderquist	District FMO	Yes	Apr-01	Yes
Barry George	Asst. District FMO	Yes	Apr-01	Yes
Jack Ellinger	Suppressn. Spec./Duty Officer	Yes	Apr-01	Yes
Harry Dunn	Engine Supervisor	Yes	Apr-01	Yes
Dave Laughman	Engine Supervisor	Yes	May-01	Yes
Tim Schmekel	IA Crew Boss/IA ICT4	Yes	Apr-01	Yes