

CRANK FIRE BURNOVER

AUGUST 30, 1987

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

AND

UNITED STATES FOREST SERVICE



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OF ACCIDENT REPORT _____

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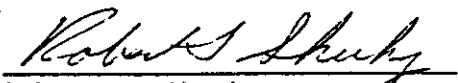
CDF INVESTIGATION TEAM MEMBERS

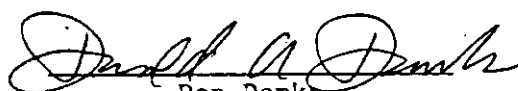
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Wayne Chandler
Modoc NF Representative


Robert J. Sheehy
Lassen-Modoc Ranger Unit-CDF


Don Domke
Investigation Team Leader

PREFACE

Due to a drought for several months, the forest fuels in much of California were tinder dry by August of 1987. A lightning fire occurred on Sunday afternoon, estimated 1505 hours, August 30, 1987, approximately 20 miles north of the town of Bieber. It was one of many lightning fires that occurred over several days in northern California and was later called the Crank Fire.

Two (2) Modoc National Forest (USFS) engines, one (1) CDF Lassen-Modoc Ranger Unit engine and one (1) Conservation Camp Crew from Intermountain Camp, a total of 25 personnel, were assigned as ground initial attack resources to fight the fire, which had grown to 4-6 acres, burning slowly in a heavily timbered area.

At approximately 1700 hours, a thunderstorm cell moved over the fire causing erratic high winds, estimated up to 45-60 mph. The fire crowned out, surrounded them and moved over and around the crews. Under the direction of the four (4) supervisors (2 USFS, 2 CDF), all 25 members deployed their fire shelters and had to remain under cover for approximately 40-45 minutes.

The injuries which occurred were limited to a few first and second degree burns from radiation to exposed skin, eye irritation and minor smoke inhalation. The three (3) engines were totally destroyed.

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A. DATA-INFORMATION-STATISTICS

Fire

Name - Crank

Start - August 30, 1987, 1505 hours

Incident Number - LMC-1180

Lassen-Modoc Ranger Unit, Bieber Ranger District

California Department of Forestry and Fire Protection

Sec. 16, T 41N, Rng. 4E

CREWS-VEHICLES-PERSONNEL

Engine 4 - Modoc NF (FS)

Adin - Model 42 Pilot Model

Keith Bryan - Supervisory Fire Engine Operator

Susan Holmes - Assistant FEO

Barbara Zylstra - Firefighter

Engine 6 - Modoc NF (FS)

Canby - Model 31

David McMaster, FEO

Kevin O'Keefe, Firefighter

Paul Weldon, Firefighter

Stacy White, Firefighter

Richann Vaughn, Firefighter

Engine 2276 - Unit 5x38, CDF

Grasshopper - Model #1

Bob Togstad, Fire Captain A

Matthew T. Estacio, Firefighter I

Elias P. Villegas, Firefighter I

Intermountain Crew #4
Intermountain Conservation Camp, Nubieber
Inmate Type I Crew (Leader plus 13)

Ted Sullivan, Fire Captain B	
Inmate Vargas	D-33622
Inmate Lopez, J. L.	D-37078
Inmate Brothers	D-43523
Inmate Anderson	D-43333
Inmate Felton	D-32739
Inmate Turner	D-43356
Inmate Taylor	D-45178
Inmate Kelsey	D-35168
Inmate Delaney	D-28724
Inmate Flores, R.	D-37426
Inmate Aguilar	D-44090
Inmate Flores, E.	D-49452
Inmate Quintanilla	D-49989

Incident Commander
J. Quigley, Battalion Chief
Bieber IC 2213 (Later Crank IC)

Agency Representative - USFS
Dan Bouse, Asst. FMO, Big Valley
Acted as Triage-Medivac Coordinator

Medical Treatment Centers - Assignments
Mayers Memorial Hospital (Fall River Mills)

Stacy White	USFS
Keith Bryan	USFS
Barbara Zylstra	USFS
Susan Holmes	USFS
Bob Togstad	CDF*
Elias Villegas	CDF*
Delaney	Inmate
Taylor	Inmate
Flores, R.	Inmate
Lopez, J. L.	Inmate
Felton	Inmate
Vargas	Inmate
Anderson	Inmate

*Later transported to Chico Burn Center

Alturas Hospital

Dave McMaster	USFS
Kevin O'Keefe	USFS
Richann Vaughn	USFS
Paul Weldon	USFS

Fire Shelters

Shelter, Fire M-1981
Contract GS-08F-37855
NSN 4240-01-121-8698
December 1985 - Anchor Industry
August 1985 - Anchor Industry

Shelter, Fire
Contract GS-085-36256
NSN 4240-123-1616
December 1982 - Cecile Industry
February 1983 - Cecile Industry

WEATHER CONDITIONS

INDEXES

Adin Actuals 1400 hours

Ignition 34

Spread 7

BI 51

FORECAST

General discussion 0930, August 30, 1987. More hot/dry conditions expected today. High pressure over Nevada giving off shore flow across northern California. Coastal zones clear so ample daytime heating will allow afternoon cumulus to grow over mountains with isolated thunderstorms. Mountains north and especially east will see good cumulus development today, but thunderstorms will be mostly dry. Some afternoon clouds will move from eastern mountains over north valley because of southeast flow aloft but valley temps still very hot.

Specific Forecast for Zones 597 and 599

Sunny and warm with increasing afternoon cumulus. LALS 2-3. Little change temperature-humidity from yesterday. Mostly north to east winds 4-10 mph with stronger gusts near thunderstorms.

Weather Observations-Comments (National Weather Fire Services)

The thunderstorms that occurred on August 30 and 31, 1987 were unusual to the area and were high based "dry" type thunderstorms. The base of the storms were from 10,000 to 18,000 foot elevation. When a thunderstorm is based at a high level, the downrush of cold air travels a farther distance and is accelerated by the evaporation of the rain. This causes extremely gusty and erratic surface winds when the downrush hits the ground. This is what is known as a microburst and can cause surface wind gusts in excess of 50 mph.

Forest Fuel Type

Understory: 90% of the ground area was covered by forest residue of 1/4 inch diameter and larger, with an average duff and litter depth of 2 inches. Accumulations of logging slash and large clumps of pine-fir (1" DBH) thickets surrounded both the skid trail and the safety zone (clearing). The entire area was scattered with down old growth cedar from earlier logging operations.

Secondary Overstory: 1" to 4" DBH, 15 to 30 feet tall, sapling trees of mixed jeffery-ponderosa pine, incense cedar and white fir produced a 75% closed canopy in the initial attack and safety zone areas.

Primary Overstory: Was mixed conifers of second growth trees 4" to 24" DBH averaging from 60 to 80 feet in height.

This forest stand was last selectively logged twelve (12) years ago in 1973 (diameter cut was 20" DBH and greater) utilizing crawler tractor and rubber tire skidders for yarding.

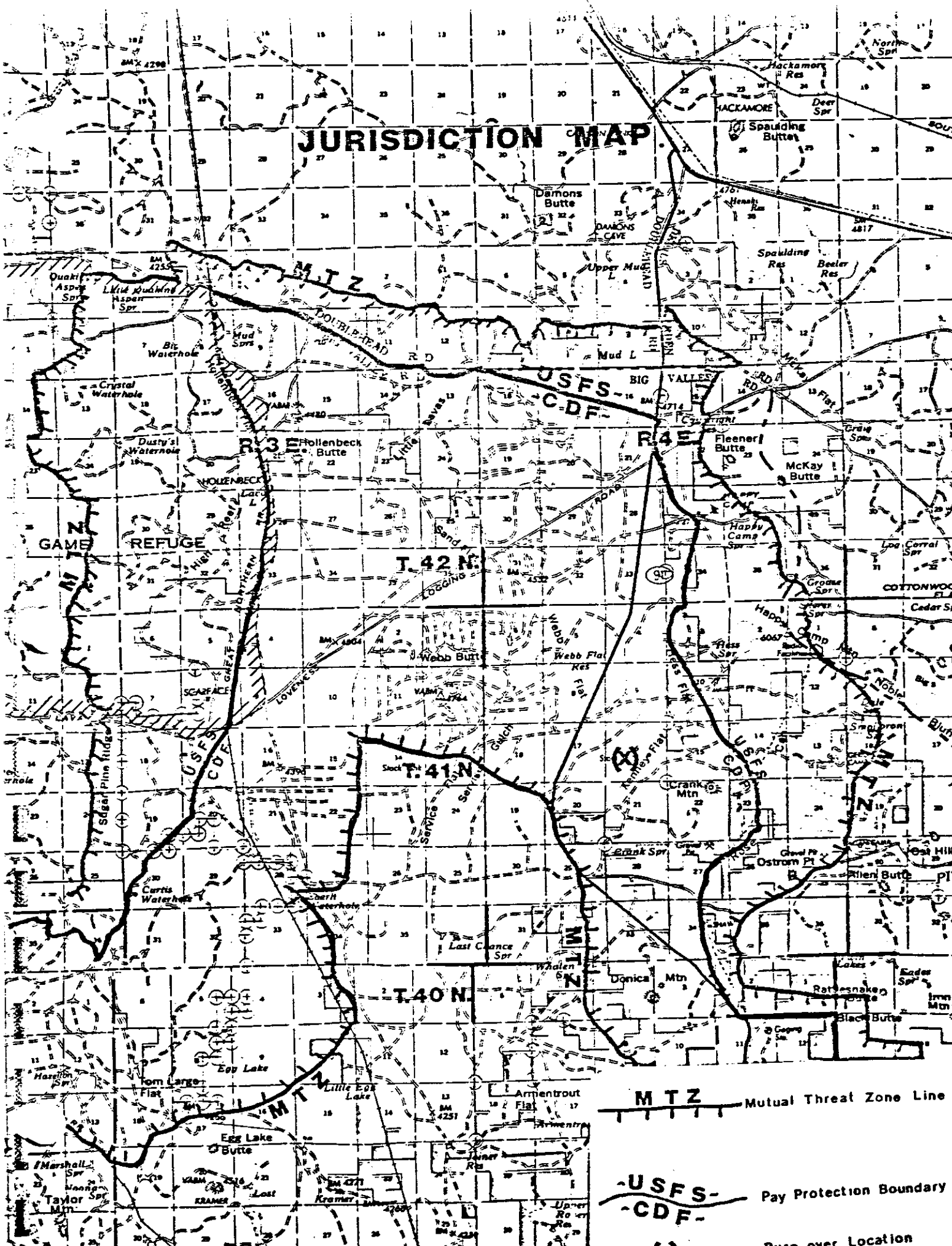
Available Fuel: 25 to 30 tons per acre
Fuel Moisture: Live Fuel Moisture was 60%
10 hr Dead Fuel Moisture was 3%
100 hr Dead Fuel Moisture was 5%
1000 hr Dead Fuel Moisture was 7%

All fuel moisture figures considered extremely low.

Topography: The area of the blow-up was relatively flat with a slight southwest aspect.

Jurisdiction: The fire occurred in a State Responsibility Area (SRA) that is part of the Lassen-Modoc Ranger Unit, Bieber Ranger District. This area is also within a Mutual Threat Zone (MTZ) with the Modoc National Forest.

JURISDICTION MAP



MTZ Mutual Threat Zone Line

USFS-CDF Pay Protection Boundary

M Burn over Location

B. SEQUENCE OF EVENTS

Fire Information

Fire Name: Lightning 3-2

Later named "Crank". Incident Number LMC-1100

Fire Started: August 30, 1987 at 1505 hours

Fire Reporting Agency: Happy Camp Lookout (USFS)

Equipment Committed:

1. CDF Engine 2276. Captain plus 2 @ 1510 hrs
2. Air Tanker's 92 and 140 @ 1510 hrs
3. Air Attack 240 and ORE-1 @ 1510 hrs
4. Intermountain Crew #4. Captain plus 13 @ 1534 hrs
5. CDF Battalion 2213. J. Quigley @ 1602 hrs
6. Modoc Engine 4, SFEO plus 2 @ 1607 hrs
7. Modoc Engine 6, FEO plus 4 @ 1607 hrs

1. Initial Attack

Air Tanker 140, a C-119J Type 2, was the first unit to arrive on fire 3-2 at 1613 hours: the pilot reported the fire to be "a spot in timber, burning hot". He described it as "approximately 10 acres in size and spotting". The aircraft made a retardant drop on the east flank of the fire, successfully knocking down the flames where it had been burning the hottest, including some crowning. The drop also drifted through much of the upper 1/2 of the entire fire (retardant was found on the skid trail adjacent to the safety zone on the west flank and in the crowns of several trees in the original burn area).

The first ground unit at the scene was Intermountain Crew 4; Fire Captain B Ted Sullivan parked his crew bus (CCV) on the south end of Kenney Flat in a safe clearing. He toolied up his 13 man handcrew and walked to the fire, up an old logging skid trail; Captain Sullivan used flagging to mark his route to aid the responding engines. From the clearing to the fire's heel was approximately 1500 feet on a very windy, overgrown trail. (See Map B)

When Crew 4 reached the fire, Captain Sullivan saw a small spot (slop over) on the west side of the skid trail; he had his crew put the spot out then instructed the crew to begin constructing hand line along the left (west) flank towards the head using the skid trail as an anchor point. Captain Sullivan then left his crew to scout the fire. He walked in a clockwise direction from the anchor point around the head and back to the heel at the skid trail. Captain Sullivan estimated the fire to be ten (10) acres in size with only 60% of the vegetation and ground fuels actually burning (many spot fires). The fire had crowned-out on the upper east flank but Air Tanker 140 was very effective in knocking it down with a well placed retardant drop. (See Map C)

After Captain Sullivan's recon walk, the winds remained light and variable from the southwest and the fire stayed on the ground with very little spread. He felt that he and his handcrew had a safe escape route to the northeast up a small draw out to Kenney Flat: the skid trail they came in on was also in Captain Sullivan's mind as an escape route.

When Captain Sullivan returned to his crew he found them spaced too far apart to be effective so he reformed them closer together, then continued hand line construction up the left flank.

At 1650 hours all three (3) engines arrived at the fire simultaneously with Engine 2276 first, followed by Engine 4, then Engine 6. The first-in engine crew spent several minutes clearing the flagged skid trail of logging debris and other down material.

CDF Fire Captain Bob Togstad, from Engine 2276, conducted a face-to-face meeting with Engine 4 SFE0 Bryan and Engine 6 FEO McMasters. It was decided that Engine 6 would be spotted at the heel of the fire and the five (5) person crew would run a hose lay (wet line) along the east flank (right flank) with the intention of tying in with Intermountain Crew 4 at the head. (See Map C)

Engine 4 positioned itself on the skid trail on the lower east flank and the three (3) person crew began extinguishing fire on the large down cedar logs inside the burn area.

Captain Togstad parked Engine 2276 on the skid trail just above the hand line anchor point. He had his two (2) firefighters start a supporting hose lay, using the right reel hard line, up the three (3) foot wide hand line that Intermountain Crew 4 put in.

Captain Togstad met with Captain Sullivan and exchanged fire information. Captain Sullivan explained his assessment of the fire, based on his earlier recon walk; both crew leaders had monitored the radio traffic from Air Tanker 140 on his fire size up. Captain Togstad then walked up the hand line to the drainage at the fire's head then back to his engine.

Intermountain Crew 4 and the two (2) CDF firefighters, using the hard line, reached the drainage almost to where the air tanker retardant line ended on the upper right flank. The two (2) firefighters then went back to Engine 2276 and informed Captain Togstad that they needed more hose. They reeled in the hard line and began an 1-1/2 inch cotton jacket hose lay. Engine 6 had progressed approximately 150 feet up the right flank during that time period.

2. Fire Blow-Up 1700 Hours

"Bieber IC" Battalion Chief 2213 Jerry Quigley had been driving on the Kenney Flat Road on the northwest edge of the meadow looking for an easier route into the fire. (See Map A)

At 1700 Chief Quigley radioed Bieber Station that he was experiencing extremely strong winds (50 mph+) at his location which could cause a blow-up condition on Fire 3-2. Chief Quigley also attempted to call Engine 2276 (Togstad) to alert him of the sudden weather change.

At that same time Captain Togstad sensed the weather change at his location that began causing erratic fire behavior. He called "Bieber IC" on the engine radio; Chief Quigley informed Captain Togstad that he had tried to reach him by radio earlier but couldn't due to other radio traffic. He told Captain Togstad to expect strong gusty winds in his area very soon due to an approaching thunderstorm cell.

Within a couple of minutes Engine 6 FEO McMasters walked up to Engine 2276 and told Captain Togstad that the heel of the fire had blown out to the west across the skid trail. He said that their escape route was cut-off. Captain Togstad looked down the trail and could see fire on both sides of the skid trail, running both on the ground and in the tree crowns.

Captain Togstad decided to abandon the initial attack action and directed FEO McMasters to bring the two (2) Forest Service engines up to his location. Captain Togstad then ordered Intermountain Crew 4 off the fireline back to his position using Engine 2276's PA system.

On his way back to Captain Togstad's position, Captain Sullivan observed that the crew's escape route to the northwest had been cut-off by a fire run in that area.

The four (4) crew leaders quickly decided that a small clearing immediately to the west could be used as a safety zone. (See Map C)

The three (3) engine crews and the handcrew collectively started to enlarge the 24 x 48 foot clearing by removing slash and felling trees. Three (3) fallers using chain saws dropped 45 to 50 trees around the clearing perimeter, mostly small diameter fir and pine; the remainder of the crews dragged off as many of the felled trees as possible.

Engine 4 was driven in to the clearing first, then Engine 6 was backed into position. Engine 4 was backed along the side of Engine 6 and finally Engine 2276 drove head first into the safety zone just as the fire began to crown-out around them. (See Map D)

3. First Safety Shelter Deployment

The time frame is from 1700 hours when Captain Togstad talked to Chief Quigley on the radio to 1723 hours when the fire became so intense that the crews had to stop working on clearing their safety zone and deploy shelters or seek safety in the engine cabs. The final size of the enlarged safety zone was approximately 75 x 75 feet but there was still a considerable amount of ground fuels inside that area.

At 1723 hours the main fire crowned-out all around the safety zone. The winds first blew from east to west causing numerous spot fires in an arch around the west side of the safety zone in a previously unburned area up to 1/4 mile out in front of the main fire.

At 1735 hours there was a 180 degree wind shift back to the east towards Kenney Flat. This wind caused the numerous spot fires west of the safety zone to combine and burn back towards the crews.

A large wall of solid flame moved towards the safety zone from the southwest hitting the driver's side of Engine 6 then changing from the west and northwest hitting the front and passenger side of Engine 2276. A third flame run came from the south and hit the back end of Engine 4.

At that point in time, Inmate Delaney began to receive flame along the right side of his fire shelter from ignited slash and ground litter. (See Map D)

Inmate Delaney was the last inmate to deploy his shelter because as the crew's faller, he was limbing the fallen trees along side Engine 4 up to the last possible moment. He did not have a clear place to deploy so he laid down directly next to the slash. His shelter snagged on the limbs as the fuel began to burn under his right leg. He yelled for help because he felt he needed to relocate in a hurry. The crew in Engine 4 heard him yell; they opened the right side door and told Inmate Delaney to get in with them. Inmate Delaney left his shelter, hard hat and gloves behind and got into the truck cab.

During the first 18 minutes of burn-over, while the crews used the engines as shelter, Captain Togstad on Engine 2276 and SFE0 Bryan on Engine 4 kept their vehicles running and hosed down the equipment, crews and surrounding vegetation. Engine 6 had been shut off early in the blow-up because of electrical shorting inside the dashboard; this engine also received the most direct flame when the wind shifted the fire back towards them.

The crew on Engine 6 observed all of the plastic on Engine 2276 (lights, grill, turn signals, etc) rapidly melt down. The windshield on Engine 6 cracked in several places; the driver side saddle gas tank vented and caught fire sending flame inside the 6-pack cab on the floor behind the drivers seat. Intense radiant heat melted the inside plastic door liners on the left side into a pool of liquid on the floorboard; other plastic items on the dash, including the steering wheel, began to give off toxic vapors inside their crew compartment.

4. Redeployment of Fire Shelters at 1741 Hours

The passenger side tires, batteries and spare tire on Engine 2276 caught on fire at the same time Engine 6 began to burn. Captain Togstad stated that the cab glass was cracking and the crew was experiencing intense heat on them. Captain Togstad ordered his two (2) firefighters, who were huddled on the cab floor, to get their fire shelters out and remove them from their plastic covers. The spare tire mounted directly behind the cab exploded. Captain Togstad attempted to reach both Engine 4 and Engine 6 by radio to tell them to evacuate; there was no reply. He then ordered his crew out of the cab from the drivers side (the right side of Engine 2276 was fully involved in fire at that time). This occurred at 1741 hours, 18 minutes after the first shelter deployment in the safety zone. Captain Togstad instructed his two (2) crew members to deploy their shelters on the skid trail. (See Map E)

At the same moment Captain Togstad evacuated his engine, the inside of the 6-pack cab on Engine 6 became black with thick smoke. FEO McMasters ordered his crew out of the vehicle using the passenger side doors. They deployed their shelters while standing between Engine 4 and Engine 6. Four (4) of the fire crew members experienced difficulty deploying their shelters due to the thick smoke; they could not see the pull rings on the plastic covers. Some of them removed their gloves and others used their teeth to rip open the plastic covers. Once they shook out the safety shelters the crew from Engine 6 remained standing between the two (2) Forest Service vehicles for a short time with their shelters over them because of burning material and concerns regarding venting fuel on the ground around them.

FEO McMasters five (5) person crew followed Captain Togstad and his two (2) firefighters out east to the second deployment site; some of the inmates got up and also began to redeploy their shelters along the skid trail at that same time.

Meanwhile the four (4) people in Engine 4 observed the other crews redeploying. Engine 4 was not on fire at that point in time, however. SFE0 Bryan decided it was time to evacuate to the skid trail. He ordered his two (2) subordinates and Inmate Delaney out of the cab on the passenger side. Inmate Delaney was given the engines spare shelter and was told to stay with the engine crew. They went around the back corner of Engine 4 and out to the trail through the initial attack spot fire area, then past several deployed shelters to the north end of the skid trail. (See Map E)

Inmate Delaney stayed with Engine Crew 4 until they reached the safety of the meadow.

Captain Togstad returned to Engine 2276 and told the remaining inmates and crew leader Captain Sullivan to redeploy their fire shelters out on the skid trail. Captain Sullivan stayed with Captain Togstad from that point on.

All 25 personnel were redeployed on the skid trail in a single file line away from the burning engines in an estimated three (3) to four (4) minute time period.

After approximately ten (10) minutes in their shelters, Captain Togstad looked up from his shelter and saw what appeared to be a single fire shelter still along side the right rear of Engine 4. He and Captain Sullivan attempted to go back to that area, however the fire intensity from the burning engines was too great and they were forced to remain where they were deployed.

During the redeployment time period on the skid trail, Chief Quigley attempted to reach "Engine 2276" by radio with no answer. Captain Steve Hallberg, from Intermountain Crew 1, was located south of the fire and could hear several explosions coming from where the crews were trapped. Captain Hallberg radioed Chief Quigley, using his handi-talkie and told him that all of the crews were probably deployed in their shelters because he could hear the sound of tires exploding.

At 1751 hours, Captain Togstad took Captain Sullivan's handi-talkie radio and made his first transmission to Bieber IC Quigley telling him that he thought all 25 personnel were in their shelters and in good condition. Between Captain Togstad's last transmission to Chief Quigley at 1733 hours and 1751 hours when Captain Togstad called Chief Quigley on Captain Sullivan's handi-talkie from inside his fire shelter, aircraft crews on ORE-1 and Air Attack 240 observed the winds shift back and forth on the fire several times. The initial blow-up was due to strong winds gusts from east to west. At 1737 hours, the winds changed abruptly 180 degrees from west to east and at 1743 hours, the wind shifted again north to south; then at 1746 hours, the wind shifted around from the southwest to northeast. According to the aircraft crews the winds remained fairly constant, blowing northeasterly from that time on until the trapped personnel walked clear of the fire at 1810 hours.

5. Crew Evacuation to Kenney Flat

At 1759 hours, Copter 202 with CDF Helitack Captain Bob Bare, flew over the trapped crews but was unable to see the personnel because of thick smoke. Captain Togstad radioed Copter 202 to tell them that they just flew over his position; Copter 202 did not copy that message.

At 1801 hours, Captain Togstad advised Chief Quigley that he believed there were two (2) or three (3) crewmen with at least second degree burns and to begin plans on arranging for medivac. At that same time, Copter 202 began using its sling bucket to drop water along the skid trail to cool down the crews deployment area. The first few drops missed the crews due to the thick smoke cover.

At 1804 hours, all 25 personnel began walking out from their second deployment area, south on the same skid trail they came in on. Captain Togstad and Captain Sullivan once again tried to go back to the engines to locate a missing crewman but were again turned back due to extreme heat from the three (3) fully involved engines. The two (2) could still see a fire shelter behind Engine 4 and were unaware that Inmate Delaney had abandoned his shelter earlier and had taken refuge with the Engine 4 crew.

Captain Togstad held back the inmate crew in order to do a head count while still inside the burn; Inmate Delaney stayed with the Engine 4 crew and walked around the other inmates. This caused Captain Sullivan and Captain Togstad to miscount and think one (1) inmate had remained at the engine site.

Also, at 1804 hours, Assistant FMO Dan Bouse, a US Forest Service Agency Representative, with Chief Quigley, began planning for triage in the meadow where the two (2) crew buses were parked. He had Intermountain Crew 1 and a Hughes 500 Helicopter "ORE-2" standing by. AFMO Bouse ordered two (2) ambulances through the Modoc US Forest Service Dispatch Center: one (1) from Alturas Rural Fire District and one (1) from Adin. Susanville (SIFC Dispatch) ordered Redding Mercy Hospital "Air-1" fixed wing plane to respond to Fall River Airport to standby in case any personnel needed flown to a burn center rapidly.

Intermountain Crew 1 walked up to the fire line on the flagged skid trail to assist the trapped crews as they came out. At 1806 hours Captain Togstad radioed Copter 202 that the last water drop was just east of their location. Copter 202 returned at 1809 hours and made a direct hit on the crews inside the burn as they were walking down the skid trail towards the safety of the meadow.

The ORE-1 flight crew remarked that they could see some of the trapped personnel walking out of the smoke. Then Copter 202, Captain Bare, radioed Chief Quigley that he could see the crews walking out clear of the fire carrying their shelters over them.

Captain Togstad radioed Copter 202 that they were having a problem with the crew count; they were at least short one (1) person. Copter 202 maneuvered close to the three (3) burning engines and reported back to the IC that the vehicles were fully involved in fire and they couldn't see very well into that area.

At 1811 hours all 25 trapped personnel reached safety outside the fire perimeter. At 1814 hours, after the crews were separated into individual units, all personnel were finally accounted for. Inmate Delaney had remained with the three (3) personnel from Engine 4 throughout the ordeal. Once Inmate Delaney got into their engine the crew encouraged him to remain with them as part of their unit not knowing that the combination of Captain Togstad and Captain Sullivan seeing Inmate Delaney's abandoned shelter and the inmate miscount during the evacuation process was causing some tense moments. Captain Sullivan thought that he had lost one of his crewmen in the fire.

6. Triage Process

From 1814 to 1850 hours, Assistant FMO Bouse supervised the triage process assessing the medical and emotional needs of all 25 personnel. The physical injuries were all minor including first degree burns to most of their faces, second degree burns on some persons' elbows and ears, smoke and heat inhalation and minor eye irritation for many of the victims.

Thirteen (13) personnel were transported to Mayers Memorial Hospital in Fall River Mills and four (4) were transported to Mercy Modoc Medical Center in Alturas. Later that night Captain Togstad and Firefighter Villegas were flown by Air-1 to Chico Burn Center for further evaluation: they were kept overnight for observation, then released from the hospital the following morning.

C. CONTRIBUTING FACTORS OF THE BURNOVER

1. Ten Standard Fire Fighting Orders

The review committee compared the initial attack activities and crew leader decisions with the Ten Standard Fire Fighting Orders. The committee was in agreement that none of the orders were flagrantly violated. Past fire history of that area and considerable crew leader experience did not prepare the personnel for the sudden fire behavior change when a violent thunderstorm cell approached.

Order #7. "Maintain Prompt Communications". was not followed for several reasons. The crews could not react quickly to the sudden weather and fire behavior changes because of the lack of radio communications between the initial attack units on the fire.

Consequently, CDF personnel did not know about the conditions of the Forest Service crews area of attack along the right flank: the heel of the fire suddenly became very active and the south side trail escape route was already lost when FEO McMasters (Engine 6) came up to Captain Togstad to tell him about the trouble. Also initial attack Forest Service crews were not able to monitor Bieber IC's warning to CDF people that a thunderstorm cell was approaching along with very high, gusty winds.

2. Thirteen Situations That Shout "Watch-Out"

#3 - winds suddenly increase and change directions;

#9 - during initial attack wind shifts cause the fire front
to keep changing directions several times;

#10 - the crews experienced multiple spot fires from the
beginning of their initial attack action.

All four (4) crew leaders individually recognized the above three situations that shout "Watch-Out" on Fire 3-2 which helped them decide to quickly try to prepare a safety island/zone as a place of refuge from the fire blow-up.

3. Communications

There was a common ground radio net established at 1610 hours between the initial attack crews responding to Fire 3-2: "CDF-2", 151.265. In reality no radio communications ever existed between responding units.

- a. The vehicle radio in Engine 4 was out of service. The pack set they were using did not have the assigned CDF frequency.
- b. Engine 6 did have CDF-2 in their vehicle radio, however, heavy usage of that channel by other units not on Fire 3-2 made it impossible for Engine 6 to get out on CDF-2.
- c. The handi-talkies assigned to Engine 4 and Engine 6 did not have the assigned fire frequency, CDF-2.
- d. Engine 2276 had a 5-channel DuMont handi-talkie that did not have any Forest Service radio nets in it.
- e. Intermountain Crew 4 had a hand held King radio with all the frequency capabilities in it.

Consequently the four (4) initial attack crews could not communicate between each other by radio. All of the communications were verbal (face-to-face) which slowed down the intelligence gathering causing a slowing down in fire strategy planning.

4. Training

Training was a significant contributing factor as to why the crews are alive today with none of the 25 survivors sustaining any serious burn injuries.

a. Previous Training

All four (4) initial attack crews received recent training in firefighting safety procedures.

b. Experience

All four (4) crew leaders were experienced in crew supervision and leadership in firefighting tactics.

c. Intermediate Fire Behavior

All four (4) crew leaders had received training known as "Intermediate Fire Behavior".

- d. The Engine 6 crew went through fire shelter deployment training five (5) days prior to the Crank Fire.

- e. Intermountain Crew 4 inmates had all graduated from the Susanville Training Center and one (1) week before this incident. Crew Supervisor Dan Collins spent four (4) hours training that crew in fire shelter deployment.
- f. All four (4) crews displayed complete confidence in their crew leader's judgement and leadership ability. All 25 personnel were well disciplined resulting in no panic at any time during the course of the burnover incident.

NOTE: The issue was discussed by the review committee as to whether safety training should teach shelter deployment while personnel are inside the engine cabs during a burnover situation.

5. Mechanical-Vehicle Committee Observations

- a. Plastic material inside engine cabs, such as steering wheels, dashboards, door panels, etc., create toxic fumes due to intense radiant heat.
- b. CDF Engine 2276 - plastic front grill instantly melted down during the burnover.
- c. Spare tires caught fire and exploded with great force.
- d. There was fire inside the crew cab of Engine 6.
- e. The plastic door panels melted down on Engine 6.
- f. Saddle fuel tanks vented through the fuel cap vent plugs causing fire around the crew compartment of Engine 6 and Engine 4.
- g. Fire extinguishers exploded becoming dangerous missiles due to their thin wall construction and no vent plugs.

6. Safety Shelter Observations

- a. Some of the personnel on Engine 6 and from the Intermountain handcrew had difficulty or were unable to pull the tabs on the shelter plastic cases (several CDF issue right hand gloves were found in the shelter deployment area).
- b. Some of the Engine 6 crew had difficulty seeing the pull tabs due to heavy smoke and resorted to ripping the plastic covers open with their teeth.
- c. There was insufficient time for the personnel to clear all of the burnable ground litter under them prior to shelter deployment, consequently ground fire got under several deployed shelters.

- d. All shelters had pin holes and wear marks along the creases and folds but the Cecil Industries shelters showed the largest number of holes and rips of the shelters used (perhaps due to the age). Captain Togstad's shelter (Cecil Industries) received a two (2) foot long tear up the backside along the top crease.

Regardless of the condition of the shelters, all of them were effective in preventing serious burns or loss of life. All of the personnel felt secure when deployed in their fire shelters except for the burning ground litter that was inside some of the shelters.

The crew leader and 13 inmates on Intermountain Crew 4 spent a total of 41 minutes inside their protective fire shelters during the Crank burnover.

The 11 personnel on the three (3) engines took refuge inside their vehicle cabs for the first 18 minutes of the burnover and spent 20 minutes deployed in their fire shelters.

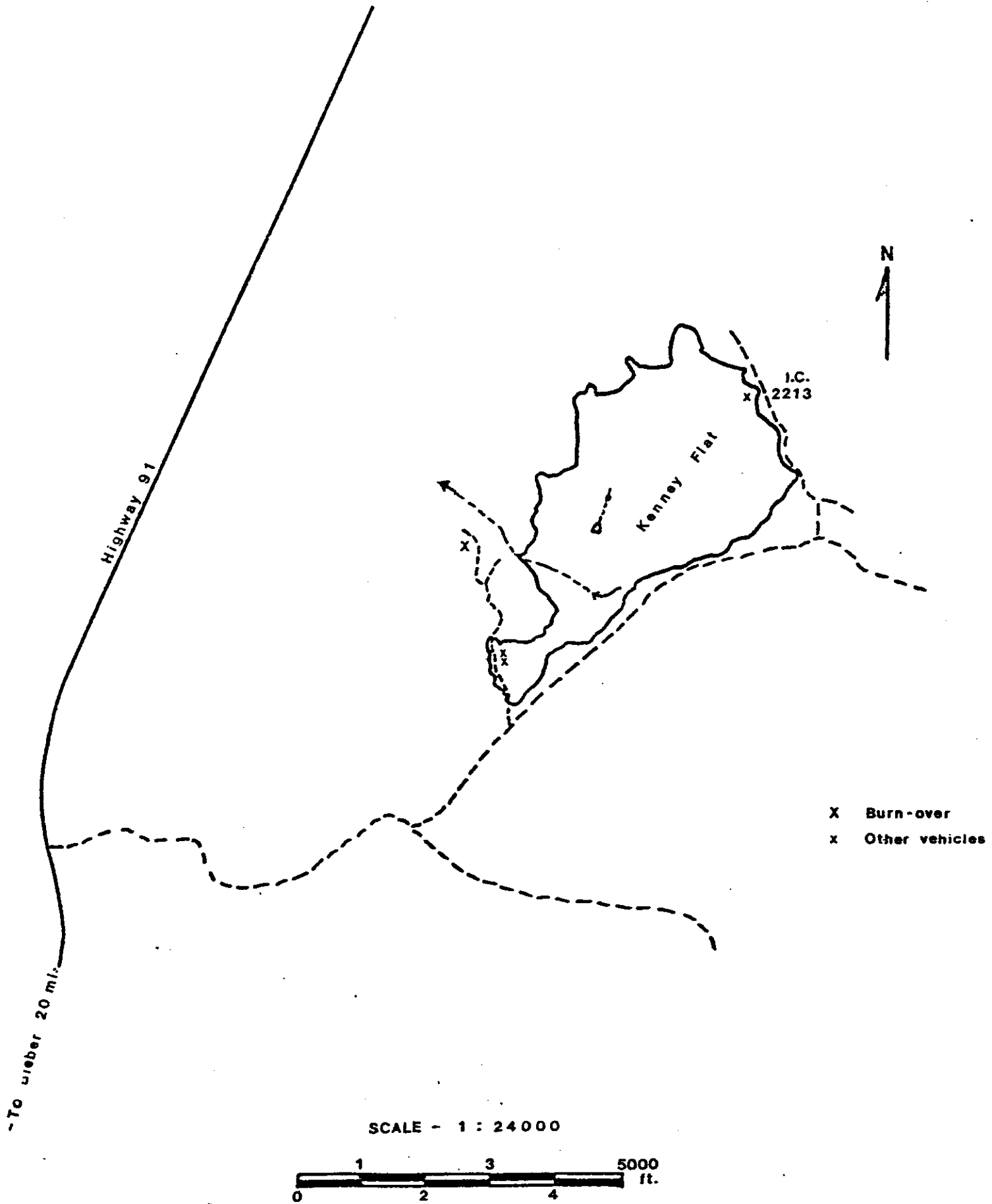
7. Personnel Protective Equipment

- a. All CDF personnel, including the 13 inmate firefighters were fully equipped with protective nomex clothing and safety gear.
- b. All US Forest Service personnel were fully equipped according to their agency standards; the difference being Modoc National Forest fire going employees are issued work type gloves and are not issued nomex helmet shrouds. The absence of the shrouds may be related to some of the facial and ear burns they experienced.
- c. Inmate Delaney deployed his shelter next to a slash pile; the slash later caught fire. When he abandoned his shelter to get inside Engine 4 he also left his gloves, helmet and nomex shroud behind. The absence of his helmet and shroud may have contributed to the second degree burns to his ears.
- d. Inmate Delaney's nomex pants and blue denim trousers had burn holes on the lower right leg most likely due to direct contact with burning vegetation. He was also wearing chain-saw chaps which were oil soaked, however, the chaps did not catch on fire.
- e. All of the right hand gloves found at the first shelter deployment area in between the engines were CDF issue. They were taken off by Intermountain Crew 4 personnel to more easily open their fire shelters. The gloves were not put back on because of the difficulty with the tight elastic wristlets on the wildland fire gloves.

In contrast, some of the Forest Service personnel using open wrist work gloves removed their gloves during shelter deployment but were also able to easily put their gloves back on.

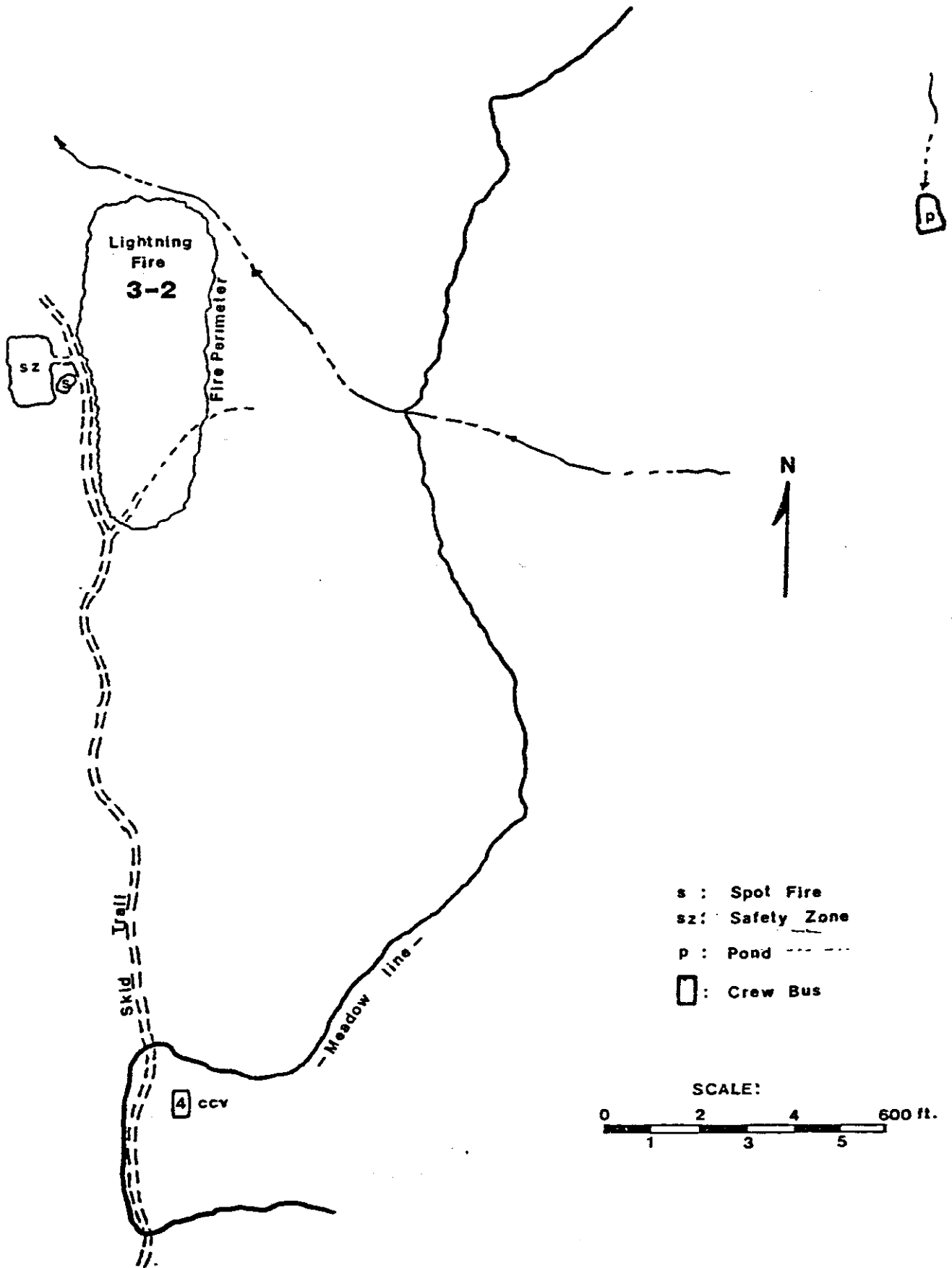
CRANK FIRE BURN-OVER

Map A



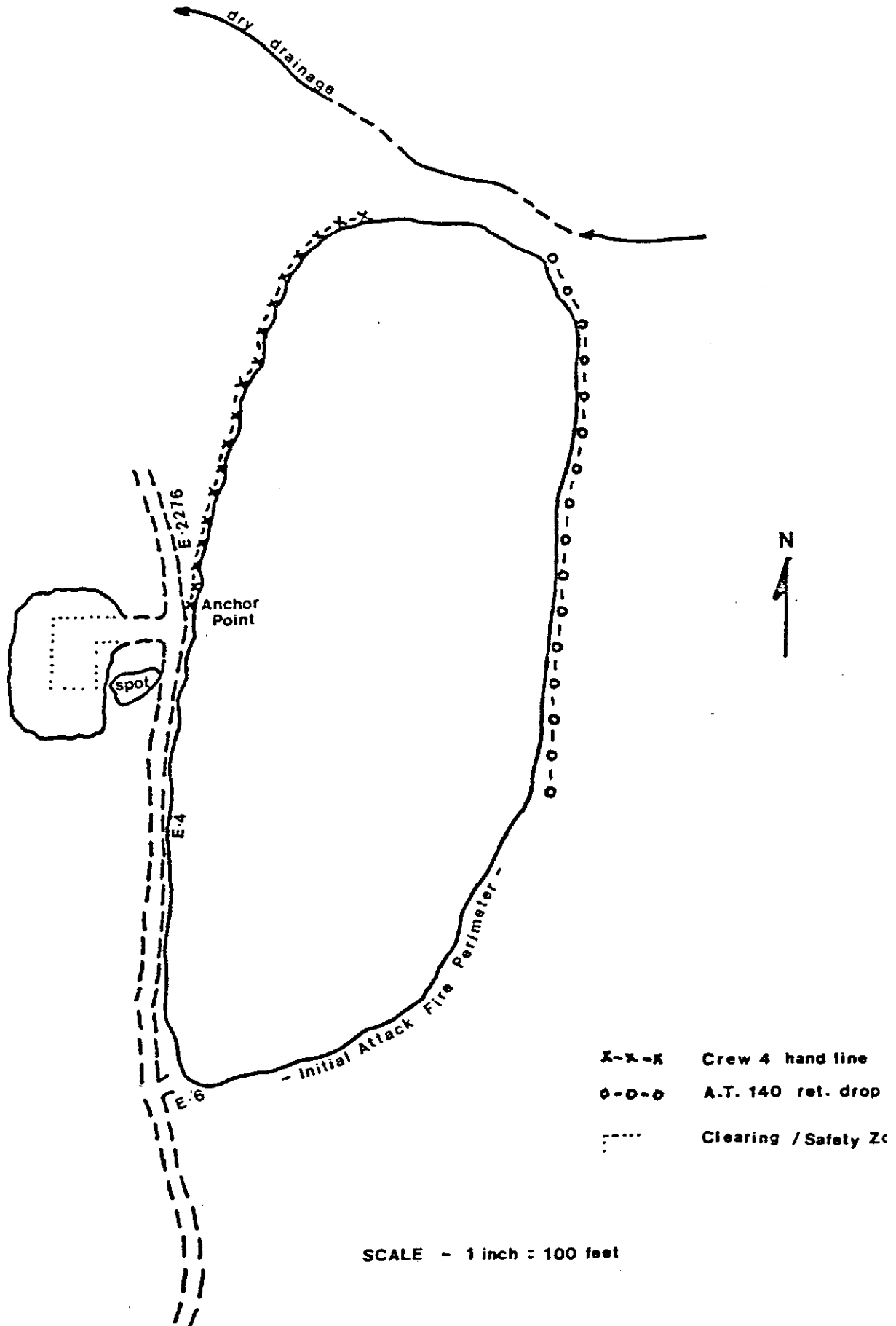
CRANK FIRE BUN-OVER

Map B



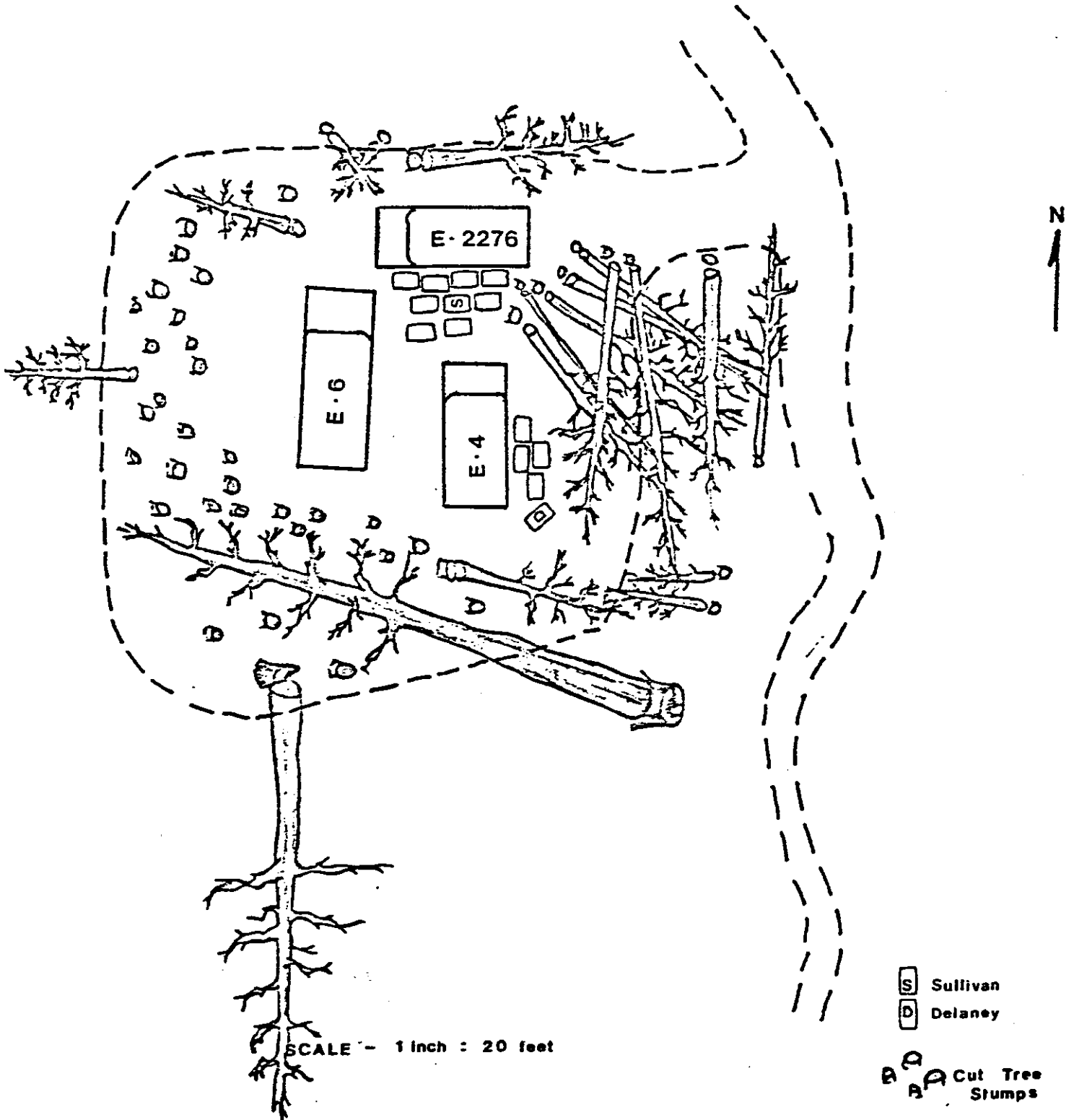
CRANK FIRE BURN - OVER

Map



CRANK FIRE BURN-OVER

Map



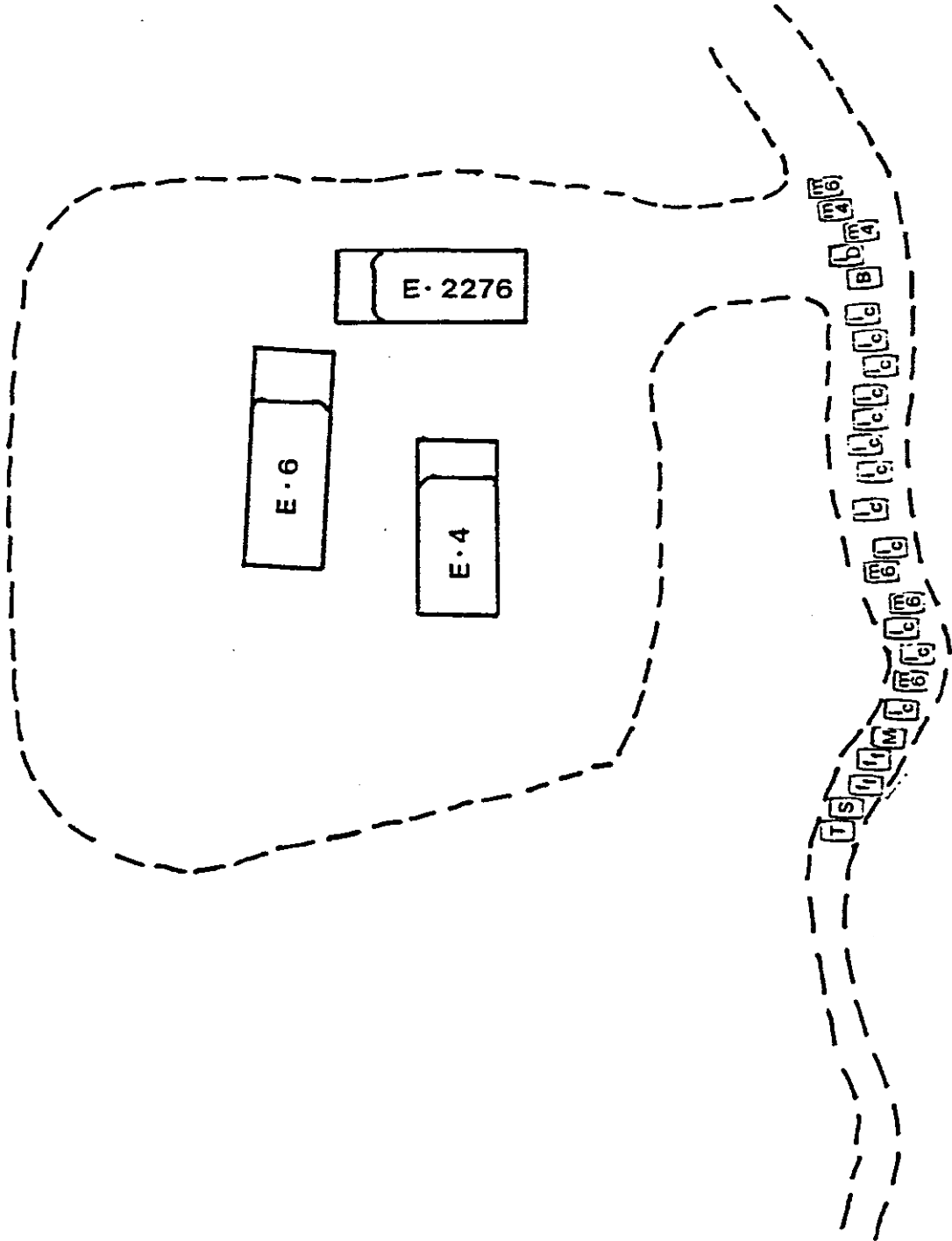
SCALE - 1 inch : 20 feet

S Sullivan
D Delaney

A Cut Tree
Stumps

CRANK FIRE BURN-OVER

Map E



- T** Capt. Togstad
- S** Capt. Sullivan
- F** CDF Firstlighte
- M** FEO McMaster
- m6** Modoc E-6 Crew
- B** SFEO Bryan
- m4** Modoc E-4 Crew
- ic** Inmate Crewma
- id** Inmate Delaney

SCALE - 1 inch : 20 feet

CRANK FIRE BURNOVER

PHOTO LOG

PHOTO NUMBER

- 1 Taken by ORE-1 at 1745 hours on August 30, 1987
Red circle represents approximate location of
trapped crews: Black arrow is where Crew 4's CCV
(bus) is parked. From the circle to the fire edge,
towards the arrow is approximately 1,000 feet.
- 2 Taken at 1400 hours on September 4, 1987 by
Robert Sheehy. Red circle shows three (3)
burned engines. Black arrow is the same spot
as Photo #1 (arrow).
- 3-4 Taken by ORE-1 at 1745 hours.
Red circle's represent approximate crew locations.
Photo #3 shows pond that Copter 202 used during
rescue operation.
- 5-21 Taken by Robert Sheehy, CDF
- 5-8 Taken on September 4, 1987 at 1400 hours.
Three (3) engines from the burnover in place
where they burned on August 30, 1987.
(See Map D)
- 9-12 Photo #9 taken on September 4, 1987. Photo #10 - 12
taken on August 31, 1987. Burnover scene over view.
- 13 Taken on August 31, 1987 at 1500 hours.
Drivers side of FS Engine 6. This area sustained
the most direct heat and flame during the first
18 minutes of the burnover; 5 personnel were
inside the 6-pack crew cab.
- 14 Taken on August 31, 1987 at 1500 hours.
Drivers side of FS Engine 4. This engine was the
most protected of the three (3) engines during the
burnover and did not catch fire until the crew left
the area. Inmate Delaney joined the 3 person-crew
in the cab of Engine 4.
- 15 Taken on August 31, 1987 at 1500 hours.
CDF Engine 2276 from the drivers side. The fore-
ground is where several handcrew members deployed
their shelters.

- 16 Taken on August 31, 1987 at 1500 hours.
Passenger side of Engine 2276; Note damage to the front fender due to a tire explosion. The spare tire exploded behind the cab while the crew was inside.
- 17 Taken on August 31, 1987 at 1600 hours.
Second fire shelter deployment area on North end (See Map E). Inmate crew gear is abandoned in foreground. The rear of Engine 2276 is seen behind trees on the left.
- 19 Taken on August 31, 1987 at 1600 hours.
Second fire shelter deployment area on South end of where the 25 personnel lined up (See Map E). Left foreground is where the spot fire had been put out during initial attack (See Map C).
- 19 Taken on September 4, 1987 at 1400 hours.
Aerial view of both the safety zone (3 engines) and the second shelter deployment area (left side of photo). The dirt area from the top to the bottom of this photo represents the total area where the 25 personnel deployed their shelters (See Map E).
- 20-21 Taken on August 31, 1987 at 1500 hours.
Abandoned personnel gear and fire shelter of Inmate Delaney, where he took refuge in Engine 4. The shelter became snagged on slash shown in photo #21 (upper right).

2. ↓



4.



↓

1.



3.



6.



8.



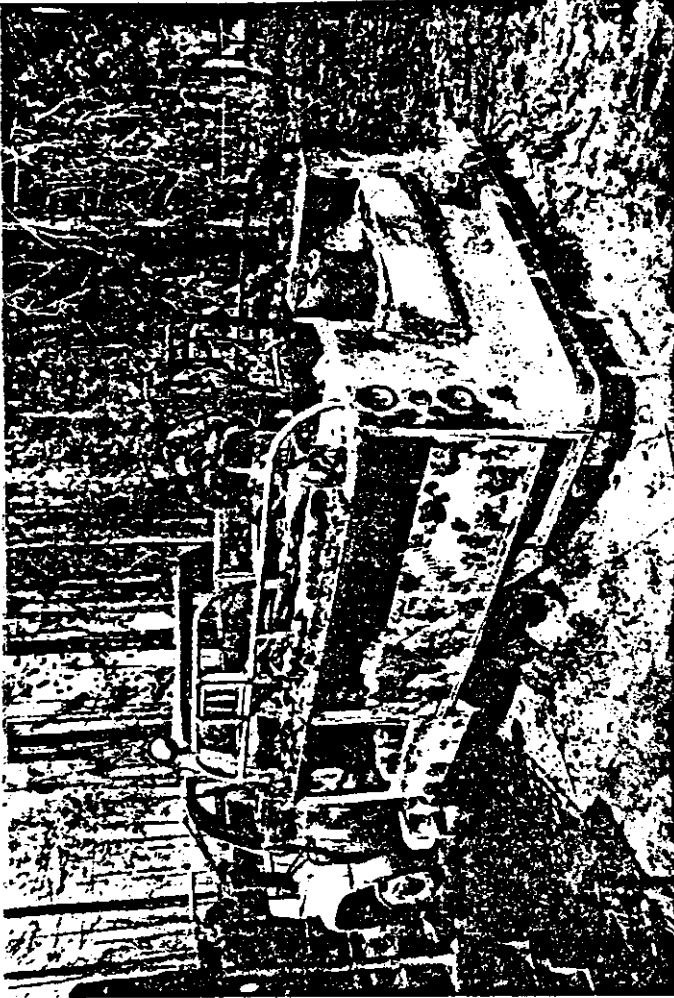
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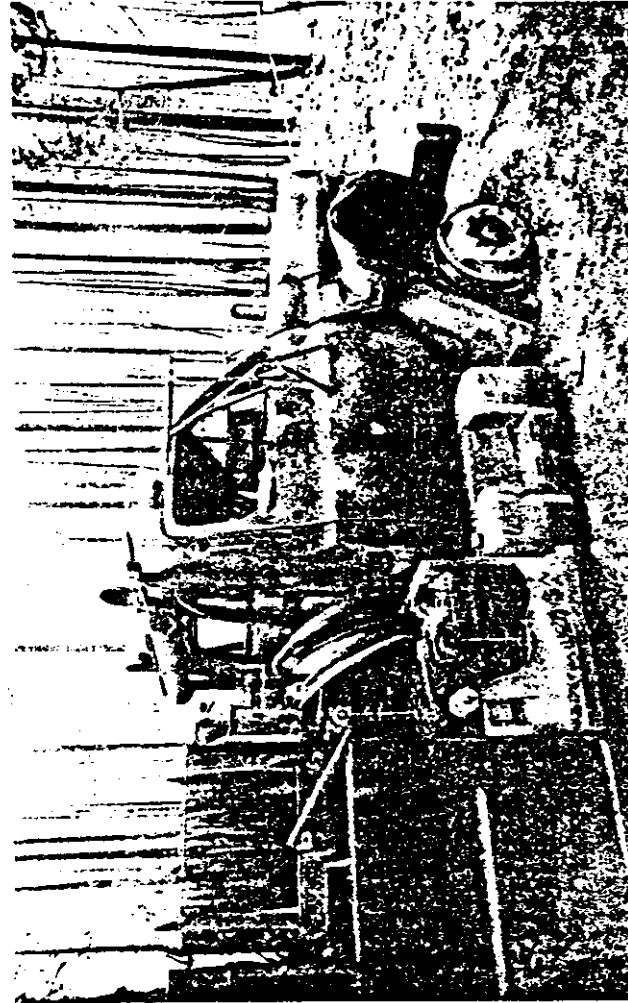
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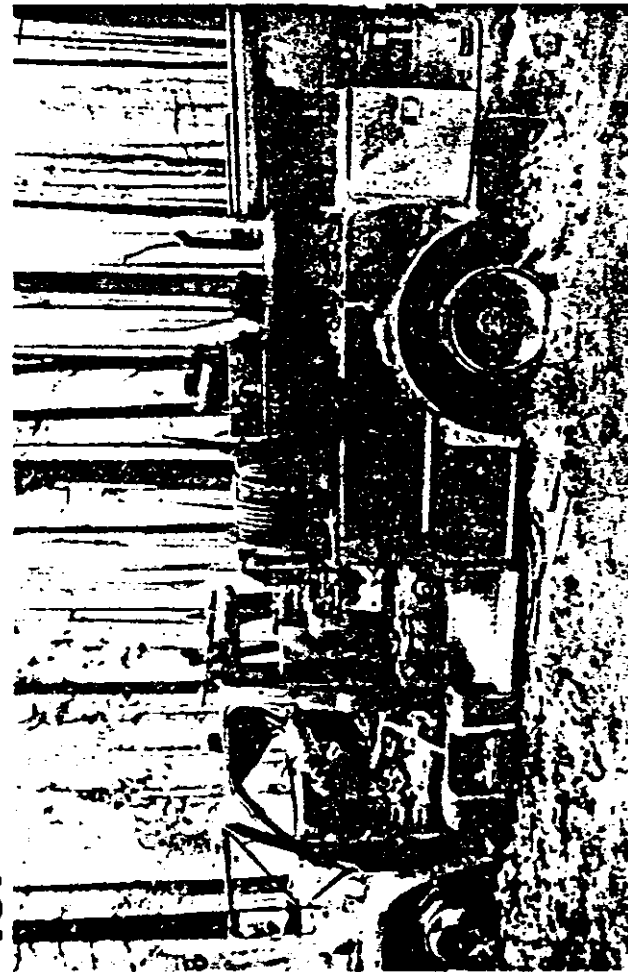
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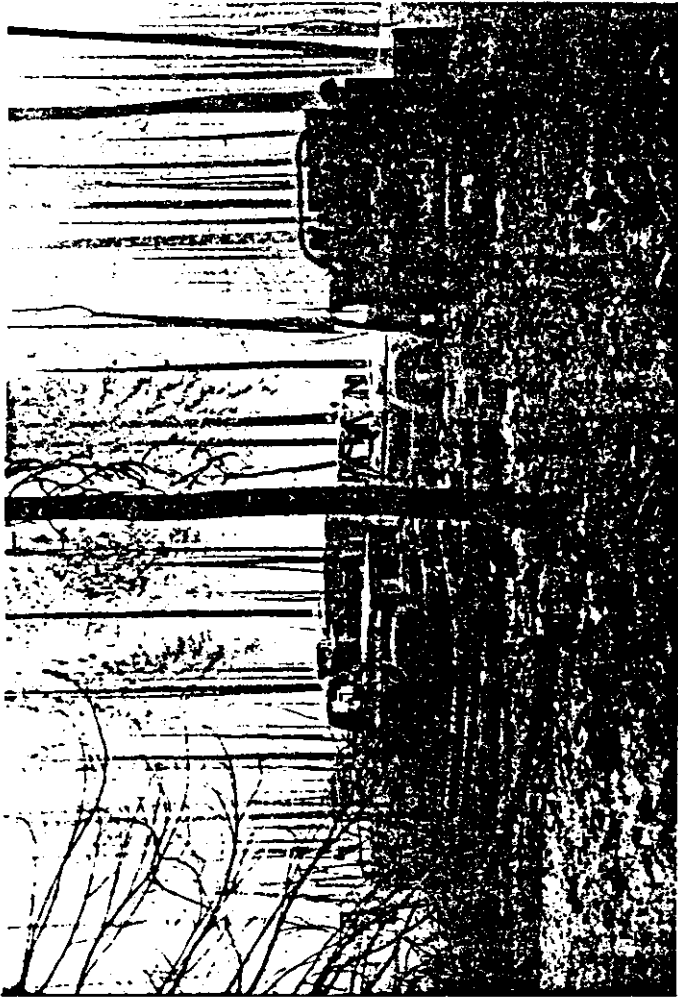
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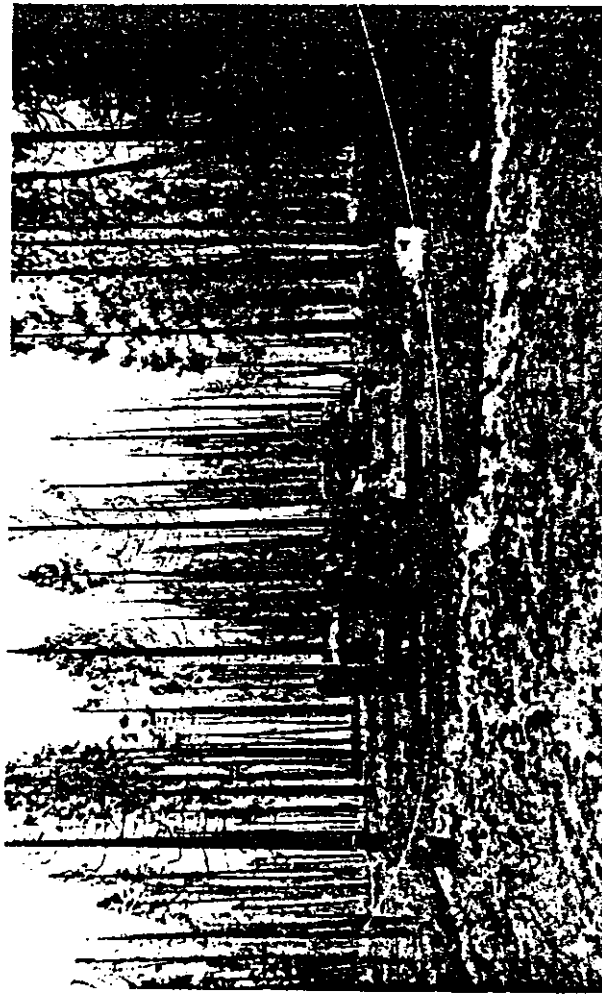
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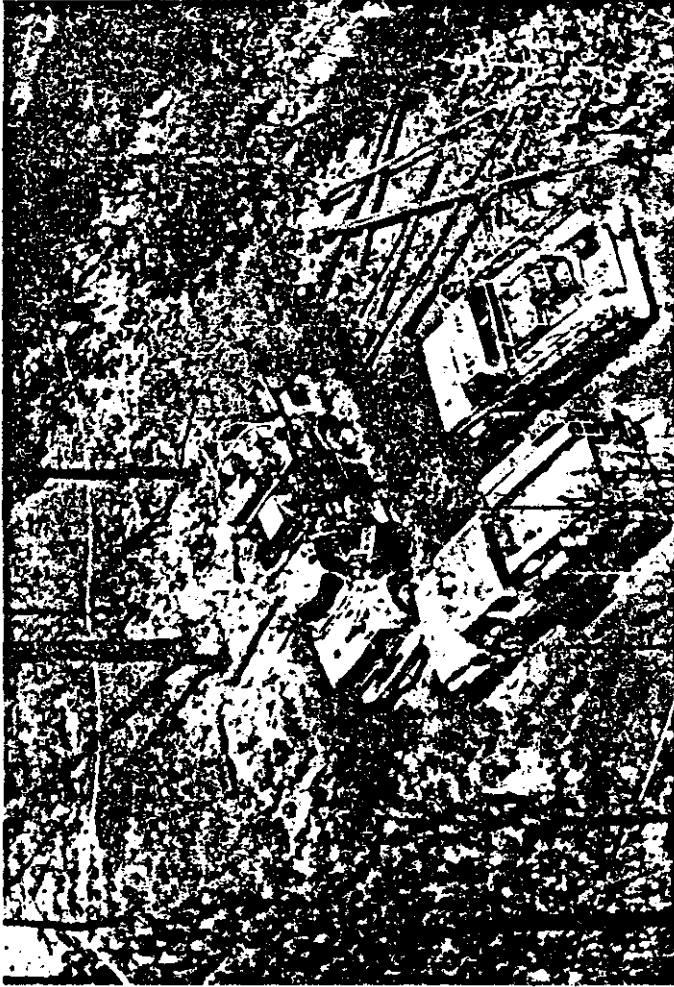
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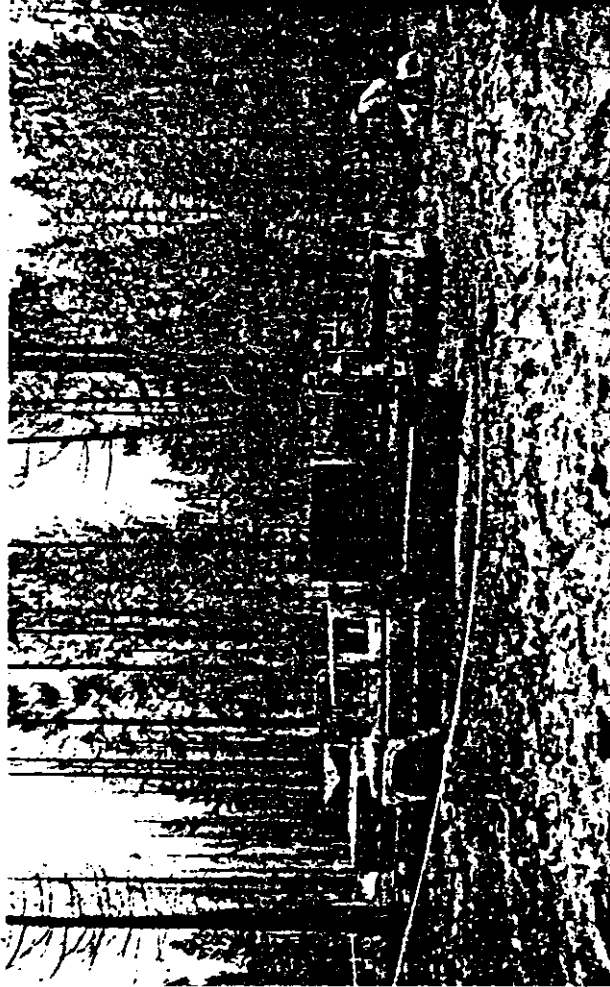
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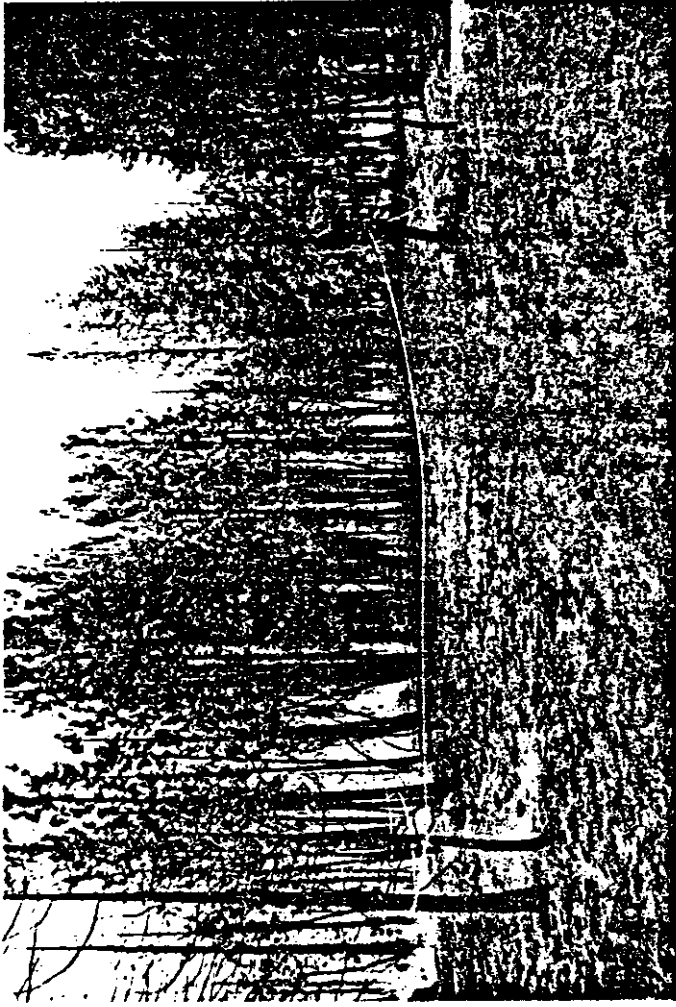
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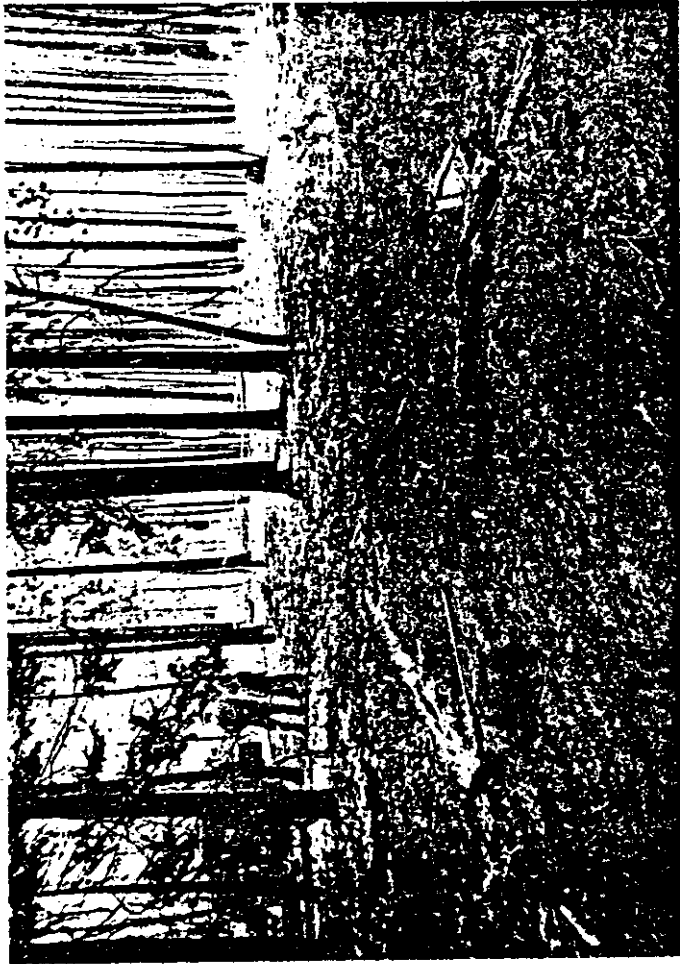
11.



18.



17.



19.





20.



21.

ORE FLIGHT

TIME BASED ON VIDEO TIME CLOCK

CRANK FIRE BURNOVER

<u>Time</u>	<u>Narrative</u>
1730	Start Flight
1733	Spots 1/4 mile ahead of head
1735	Wind change - back toward meadow
1736	Togstad - 3 engines damaged - everyone appears to be all right
1737	180 degree wind shift
1738	Togstad - some burns - deployed shelters
1739	Togstad - Intermountain 4 deployed in shelters next to engine
1741	Togstad calling out - no answer
1742	2213 - keep air clear for trapped people
1743	Wind from North - covering crews
1744	Intermountain 1 - must be in shelters - hear explosions
1745	ORE making their helicopter available for medivac
1746	Wind shift from South
1748	Copter 202 - 5 minutes out
1748	2213 request Copter 202 and Air Tanker to drop water retardant on trapped crews - put 202 crew on ground
1751	Togstad - all personnel in shelters
1752	Still in shelters - all equipment abandoned
1759	Togstad - Copter 202 just went over
1801	Togstad - 2 or 3 with second degree burns - prepare medivac
1801	1st drop by Copter 202 missed
1804	2276 to Intermountain 1 - no contact
1804	Togstad - coming out - most everyone OK - some faint

1805 Susanville jamming frequency
1806 Togstad - Copter 202's drop just off to the right
1809 Togstad - drop, direct hit
1809 Crew on edge of burn
1810 Having trouble with count
1811 All crews in unburned area - fire going to northeast
1814 Count OK - slight injuries - smoke inhalation

USFS TEAMS
 TIME EVALUATION
 BASED ON DISPATCH RADIO/TIME
 CRANK INCIDENT

<u>TIME</u>	<u>FROM</u>	<u>NARRATIVE</u>
1458	HC	USFS - Initial Report
1505	HC	CDF - Initial Report
1508	FS-D	Notification to SIFC
1510	CDF-D	2276 dispatched
1515	HC	CDF - building some flame
1534	CDF-D	Intermountain 4 dispatched
1602	CDF-D	2213 dispatched - Quigley - Bieber IC
1607	CDF-D	MDF Engine 4, LEngine 6 dispatched
1610	FS-D	FS Engine 4, Engine 6, 430 dispatched Ground contact 2276 on 151.265
1612	CDF-D	Intermountain 1 dispatched
1613	AT-140	10 acres - spotting - hot
1625	HC	USFS - 3-4 acres crowning
1630	CDF-D	Stevenson (?) dozer dispatched
1633	HC	USFS - 2 drops have reached their effectiveness - looks to be spreading into flat
1639	HC	USFS - about 15 acres - spreading to the East - almost into flat
1645	CDF-D	2242 dispatched

1650	FS-D	FS Engine 4, Engine 6 at scene
1700	2213	Possible blow-up, 8-10 acres - high winds
1704	HC	USFS - South wind. lots of spotting - coming to meadow
1708	FS-D	43 dispatched (Dave Sherwood)
1723	430	At scene - 2 fronts - 35 acres - crowning - torching - thunderstorm cell blowing it
1729	43	Large volume black smoke - needs traffic control at Highway 91 and North Main turn-off at Long Bell
1739	FS-D	CHP notified
1740	430 to 43	Evans and Cavasso overheard Intermountain crew deploying shelters
1741	?	USFS - spotting to East side of Kenney Flat
1755	2213	Engines burned over - no report on personnel
1803	43	Need clear channel - injuries 3-4 people - second degree burns. There are 2 helicopters available for medivac - 2 ambulances, 1 Adin, 1 ARS to Highway 91 and Hess Flat area - T41, Rng 7, Sec 8 - ORE-1, H202 for medivac - explosions from engines - 6 people for medivac - not as extensive as first thought - want to pursue as if 6 critical - need 2 ground ambulances plus Mercy Air One - SIFC to get MA-1 - MDF to get 2 ground ambulances

1807 Dan to 6 injuries could be critical - don't
FS-D know if they are USFS

1812 430 to People coming out with shelters - called 911
FS-D at 1810 for ambulances (Adin-Alturas)

1818 430 to Everyone accounted for - mostly smoke
FS-D inhalation - 2 engines totaled - 1 FS engine

1820 2210 No injuries - 1 red engine - 2 green burnt

1828 SIFC-Jack Quigley wants ARS ambulance canceled -
Elizabeth told Jack MDF will continue with
ambulances ordered by 430

1829 430, 41, 52 Summarized injuries - minor burns, smoke
to inhalation (toxic) eye irritation.

1830 Officially removed from fire, notified
families, transported to Modoc Medical Center.
2 CDF to Alturas.