FIRE FIGHTER FATALITY
Glenwood Springs, CO
July 2, 1984

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The Whole Canyon Blew Up
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n the afternoon of July 2, 1994, lightning struck near Storm King Mountain outside of Glenwood Springs, Colorado, igniting a fire that burned for 8 days and claimed the lives of 14 fire fighters. Called the South Canyon Fire, it was the deadliest wildland fire in the United States since 1953, when the Rattlesnake Fire in the Mendoza National Forest killed 15 fire fighters.

The fire
The fire started on the afternoon of July 2 in a mountainous area about 7 miles west of Glenwood Springs, but it was not reported until 11:00 a.m. on July 3. By that time, almost 90 percent of the district’s resources had already been committed to 40 fires that had broken out over the previous 2 days. Authorities gave the highest priority to those that threatened homes, other structures, and utilities, and to fires that looked as though they would probably spread.

Fire fighting aircraft were hampered by strong winds, and the Denver Fire

Weather Office issued a red flag warning based on forecasts of thunderstorms with strong, gusty winds and dry lightning. Red flag warnings are meant to inform fire management agencies of the possibility or onset of critical weather and fuel conditions that could lead to extensive wildfire activity.

In most of the western United States, including the mountains of Colorado, the weather during the spring and early summer of 1994 had been drier than normal, causing extreme drought conditions. In fact, the Glenwood Springs area had received only 58 percent of its normal precipitation since October 1993. And to make matters worse, Colorado experienced record-high temperatures in June.

By the time July rolled around, the Bureau of Land Management’s Grand Junction District, in which Glenwood Springs was located, was in the middle of a severe fire season, and fire indices were at their highest level in 21 years. Fires occurred at twice the normal rate, and incident management teams responded to five times as many fires as they normally did.

The Garfield County Sheriff took the initial report of the South Canyon Fire, and he, in turn, reported it to the Grand Junction District Dispatch Center. Since most of the district’s resources had been committed to other fires, the dispatch center contacted the Western Slope Fire Coordination Center in Grand Junction.

This article is based on a joint report issued by the Bureau of Land Management and the U.S. Forest Service, entitled Report of the South Canyon Fire Accident Investigation Team.
and asked it to send eight smokejumpers, an air tanker, and a lead plane to the South Canyon Fire. The center also dispatched a Bureau of Land Management (BLM) engine crew.

The BLM engine crew met the sheriff at the scene and confirmed that the fire was on BLM-administered land. As the crew’s foreman, Clay Fowler, sized up the blaze, he saw the canopies of only two trees burning and felt that the fire would probably not spread far. He also noted that the fire was relatively inaccessible, straddling a ridge with Storm King Mountain at one end and Interstate 70 at the other. The ridge ran parallel to two canyons, called drainages, that led to the Colorado River just south of I-70. The slopes of the ridge were steep, and the soil covering them was loose and rocky. They were covered with vegetation, predominantly piñon-juniper and Gambel oaks 6 to 12 feet high.

The foreman recommended that the fire be monitored until more resources were available. The Grand Junction District Fire Control Officer Winslow Robertson, who arrived on the scene shortly afterward, agreed with him. As a result, the three aircraft dispatched to the South Canyon Fire were diverted to other fires in the district.

On July 4, the fire danger in the district was still very high, and five new fires were reported. More lightning was forecast for that evening, and red flag warnings were issued. At approximately 6:30 p.m., the incident commander, Butch Blanco, met with BLM and Forest Service fire fighters at the bottom of the hill to discuss their next move. It would soon be getting dark and the terrain was steep, so Blanco decided to wait until morning to begin their attack. By 10:00 p.m., the fire had grown from 3 acres to approximately 11 acres.

The next morning, the Western Slope Fire Coordination Center called for a red flag warning and a very high to extreme fire danger. After sunrise, seven BLM fire fighters hiked up to the fire area, where they found that the blaze now involved about 29 acres.

Some of them began clearing an area on a ridge above the fire, which they intended to use as a landing spot for helicopters, known as a “helispot.” This area was also to be used as a safety zone to which fire fighters could retreat, if needed. Other fire fighters began to cut a fireline downhill along the fire edge below the helispot.

The incident commander asked Grand Junction Dispatch to send up another district engine crew, a helicopter, and a 20-person crew. Dispatch filled his request, but substituted eight smokejumpers for the 20-person crew.

Later that same day, an air tanker dropped retardant on the fire. Both the incident commander and the tanker crew agreed that further air drops would be ineffective because of the steep terrain, gusty winds, and the potential impact of rolling material on I-70.

At 5:30 p.m., the incident commander and the BLM crew left the scene to refurbish their equipment. About 15 minutes later, the eight smokejumpers parachuted onto the ridge. They radioed the incident commander, who told them to continue working the fireline that the BLM fire fighters had started from the helispot. Some time later, the jumper-in-charge, Don Mackey, told the incident commander that the fire had crossed the fireline and was actively burning. Shortly afterward, the smokejumpers started cutting a new fireline on the east side of the ridge. Mackey also requested two Type I crews, commonly referred to as “hotshots.” Hotshots are highly trained fire fighting crews used primarily to construct firelines.

By 7:30 that night, the weather forecast called for increasing winds throughout the next day with a passing cold front, and another red flag warning was issued. By 10:00 p.m., the fire had burned approximately 50 acres.

The morning of July 6

Around 12:30 a.m. on July 6, the smokejumpers stopped digging their east-flank fireline—they couldn’t see much, and rocks were falling from the steep slopes. The fire continued to flare up during the night, and the smokejumpers were worried that it might burn over the site.

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where they had landed and were now storing their parachutes and other equipment.

Later that morning, Blanco contacted the Grand Junction dispatcher, who advised him that the weather forecast called for wind and a passing cold front.

A BLM crew began its 3½-hour climb up the east drainage to the fire at approximately 4:30 a.m. About an hour later, Mackey ordered a helicopter to remove the smokejumpers' parachutes and nonessential gear from the landing zone. An hour after that, Grand Junction Dispatch assigned the Prineville Interagency hotshot crew from Prineville, Oregon, to the fire.

After the BLM crew arrived on the ridge, crew members began building a second helispot. At approximately 8:45 a.m., Blanco and Mackey discussed their plan for the day, agreeing to improve the fireline between the two helispots and to start building a fireline along the fire's west flank.

Fifteen minutes later, the incident commander and several smokejumpers programmed their radios to the National Oceanic and Atmospheric Administration weather channel, where they learned that the weather was forecast to be windy and cooler, with highs in the mid 80s, and that the winds were becoming west to northwest at 15 to 25 mph, with some stronger gusts. The morning would be sunny, and the afternoon partly cloudy. In the evening, the temperatures would drop, with lows of 50°F to 55°F, and skies would be partly cloudy, with isolated showers and decreasing northwest winds.

At about this time, Blanco also learned that he could keep the smokejumpers he already had and that eight more were on their way.

The helicopter Mackey had ordered at 5:30 a.m. arrived at the site at 9:30 a.m., but it was only available for 4 hours—limited resources meant that aircraft were being assigned only for brief periods to several fires. While the helicopter was in South Canyon, the incident commander, Mackey, and another fire fighter used it to observe the entire fire area.

Based on their observations, Blanco and Mackey decided that the eight smokejumpers should begin to dig a new fireline along the fire's west flank. Since the blaze was still burning toward the top of the ridge, this meant that the new fireline would be dug below the fire. The fire officers also decided to split up the hotshot crew when it arrived. Half could help the other fire fighters construct the fireline along the west flank of the fire, and the other half could improve the fireline on the ridge.

When Mackey presented this plan to the others, some of the smokejumpers expressed concern, noting the lack of safe areas. They discussed their fears, but the original plan remained in force.

**Reinforcements arrive**

The second group of smokejumpers parachuted into the fire area at 10:30 a.m. and were assigned to help construct the fireline. About 2 hours later, a helicopter ferried the first group of 10
**Fire Orders**

Through the years, information obtained during investigations into wild- fires that killed or seriously injured fire fighters has led to equipment changes and to new equipment designs that have reduced fire fighters' risks during fireground operations. They have also contributed to the development of a set of FIRE ORDERS and to general safety information, known as the "common denominators of fire behavior on tragedy fires" and as "watch out situations."

**FIRE ORDERS** is an acronym based upon the following safety guidelines:

- **F**: Fight fire aggressively but provide for safety first.
- **I**: Initiate all action based on current and expected fire behavior.
- **R**: Recognize current weather conditions and obtain forecasts.
- **E**: Learn that instructions are given and understood.
- **O**: Obtain current information on fire status.
- **R**: Remain in communication with crew members, your supervisor, and adjoining crews.
- **E**: Keep safety as your top priority.
- **D**: Establish lookout points and control lines.
- **E**: Lay alert, keep calm, think clearly, act decisively.

**The common denominators of fire behavior on fatal wildfires include the following:**

- Most incidents happen on smaller fires or in isolated area of larger fires.
- Most fires look small.
- Lightning, dry grass, and blowups.

**Watch out situations are those in which the following 18 conditions exist:**

- The fire has not been scouted and sized up.
- The fire is burning in country the fire fighters have not seen in daylight.
- Safety zones and escape routes have not been identified.
- The fire fighters are unfamiliar with the weather and local factors influencing fire behavior.
- The fire fighters are underestimating the size and behavior of the fire.
- The fire fighters are underestimating the chances of success and assignment aren’t clear.
- There is no communication between the supervisor or dispatch.
- The fire line is being constructed without a safe anchor point.
- The personnel have not been trained in working with fire engines.
- The incident commander or crew member in charge of the fire.
- There is unforced fire behavior and the fire behavior.
- The fire behavior.

Hotshots to the site, where they were assigned to the west-flank fireline with the smokejumpers.

The arrival of a second group of hotshots was delayed so the helicopter could be used to ferry the smokejumpers’ equipment and drop water on flare-ups. One flare-up on the west flank caused several smokejumpers to retreat up the fireline at around 1:00 p.m. The smokejumpers continued to talk about the safety of the fireline operation.

At 2:30 p.m., after a lunch break, three smokejumpers were told to walk back along the fire’s west flank to improve the fireline and extinguish hot spots. One jumper, who was functioning as a line scout, continued down the hill past the end of the fireline to size up the next section of line. A half hour later, the second group of hotshots was flown in and put to work widening the fireline and putting out hot spots along the ridge between the two helispots.

The arrival of the second group of hotshots brought the total number of fire fighters on the mountain to 49. Twenty of them were hotshots, 16 were smokejumpers, 11 were BLM fire fighters, and 2 were helitack personnel. Another four helitack personnel and one BLM fire fighter were working at the helicopter base, bringing the total number of fire fighters assigned to the fire to 54.

Fire activity began to pick up rapidly when a dry cold front passed through at approximately 3:30 p.m., bringing strong winds. Twenty-five minutes later, the fire had made several rapid runs, and fire fighters could see flames 100 feet high in the burned area just above the line scout. A short time later, the crew asked a helicopter to drop water on the west drainage and on the ridge. By then, however, the fire was so intense that the water was not effective.

Shortly after 4:00 p.m., a strong wind came out on the water face of the west drainage ignited. Within seconds, the fire began to spread rapidly up the drainage wall to a ridge west of the original fire area.

"The whole canyon had blown up," smokejumper Eric Hipke later told reporters. "We get prepared for stuff like this, but we'd never seen it, we'd never experienced it."

A smokejumper who saw the blowup told the line scout to get out of the area and called Mackey to tell him that the fire had crossed the main drainage and was rolling.

When he heard what was happening, the incident commander told Mackey to bring the fire fighters up from the bottom of the fireline. By this time, however, 30-mile-per-hour winds had pushed the fire on the west side of the drainage to a point across from the fire fighters,
who had begun to hike back up the steep slopes to reach their safe area.

**Things start to deteriorate**

Sometime between 4:14 and 4:18 p.m., the fire spotted back on the east face of the west drainage, igniting materials below the escaping fire fighters, and raced up the east face of the drainage, pushed toward the fire fighters by winds of 40 to 45 miles per hour. Two minutes later, the fire apparently reached the ridge, overrunning the nine hotshots and three smokejumpers who were still on the east face of the drainage trying to follow their fireline up the steep slope to their safe area. The fire was estimated to be traveling between 3 and 11 miles per hour at the base of the east face and 18 miles per hour at the top.

Three other fire fighters who had been walking out with them realized that conditions were rapidly deteriorating and ran ahead of the group. The three—Brad Haugh, Kevin Erickson, and Eric Hipke—reached the ridge just moments before the flame front.

"It appeared to me that the crew was unaware of what was behind them," Haugh later reported, "as they were walking at what I considered a slow pace, tools still in hand, packs in place, and the Sawyer [person who operates a chainsaw] still was shouldering his saw... . . . There was a slight ridge behind the crew which obscured our view of the bottom of the fire. The fire roared behind the ridge, and that was the first indication of how bad it had gotten. The fire storm literally exploded behind the ridge with approximately 100-foot flame heights.

"At this point, I decided I had to run," he said. "I can't recall if anyone was ahead of me or not, nor can I recall what the crew's reaction was to the blowup. As I neared the crest of the ridge, the heat was intense. I tipped out and headed down the other side about 150 feet. Then I turned around, a wall of flame 160 feet tall and a quarter of a mile wide was on the ridgetop and starting to roll down the east side of the ridge."

Before the blowup occurred, Mackey met eight of his smokejumpers at their lunch spot and told them to go up the slope to areas that had already been burned. Then he left the group so he could check on the line scout and the fire fighters working on the fire's west flank. He died when the fire overran him and the fire fighters on the east face of the west drainage.

"Don Mackey saved my life and the lives of seven other smokejumpers," Quentin Rhodes later told reporters. "And he almost saved the lives of the rest of the crew. He perished when he didn't have to. He's a hero."

In an attempt to reach safety, the eight smokejumpers with whom Mackey had spoken headed up the steep slope from the lunch spot. Part of the way up, they dropped their chainsaws and gasoline—they knew that they were in trouble. As they climbed, they were enveloped by smoke and flying embers and deafened by the roar of the fire. By then, the wind was blowing so hard that they had to use their chin straps to keep

Once they reached a spot they thought might serve as a deployment site, the eight fire fighters opened up their fire shelters, six in one area and two in another. They all had difficulty deploying the shelters because of the high winds.

"When we were in the shelters, the fire made three different runs on our right side, approximately 200 yards away," said Anthony Petnelli. "Inside the shelter, it heated up to 110 degrees. During the hottest run, there were glowing fire brands blowing into the shelter. Between fire runs, we would peek out of the shelter. There was still heavy smoke coming from below us. The wind was still blowing ash and dust."

About 1½ hours after they deployed their shelters, the eight smokejumpers emerged and met the line scout, who had taken refuge in an area near the lunch spot. He had not used a shelter.

Sixteen other fire fighters working on the ridge, including the incident commander, the hotshot superintendent, 10
hotshots, and 2 smokejumpers, also managed to survive the blowup. The incident commander told the hotshots and the smokejumpers to go to the safety zone at the first helispot. Before they could reach it, however, the fire cut them off. Several of the crew leaders then ordered everyone to reverse direction and head for the second helispot. When it became clear that conditions were deteriorating rapidly and they would never make it, the incident commander and crew leaders told everyone to head for the east drainage and I-70, which was at the base of the drainage.

As they moved through the east drainage, flying brands ignited spot fires, and the winds fanned the flames through the drainage. Thirty to 40 minutes after the last fire fighter escaped, the fire reached the mouth of the east drainage and consumed it.

Rob Browning and Richard Tyler, the two helitack personnel who were reportedly yelled to them to follow them into the drainage. Browning and Tyler must have felt that the drainage was not safe, however, because they chose to run along the top of the ridge above the jump site. Unfortunately, the fire funneled through a saddle near the jump site and cut off their escape routes to the east. Looking around for a way out, they saw a slope to the northwest that appeared to be relatively flat, with rocky outcrops. It must have looked good, because they headed in that direction. Approximately 150 to 200 yards away, a steep, rocky chute about 50 feet deep blocked their escape. Evidently, they jumped into the chute to try to cross it and were killed when the fire overran them.

By the end of the afternoon, 14 hotshots, smokejumpers, and helitack personnel were dead. The hotshots were Bonnie Holtby, age 21; Jon Kelso, age 27; Tami Bickett, age 25; Scott Blecha, age 27; Levi Brinkley, age 22; Kathi Beck, age 24; Doug Dunbar, age 22; Rob Johnson, age 26; and Terri Hagen, age 28. The smokejumpers were Don Mackey, age 34; James Thrash, age 44; and Roger Roth, age 30. And the helitack personnel were Rob Browning, age 27, and Richard Tyler, age 33.

### Fatality Sites

The BLM, the U.S. Forest Service, and several other federal agencies investigated this tragedy and prepared the Report of the South Canyon Fire Investigation Team. This report stated that a number of factors led to the deaths of the 14 men and women who perished that July day in the South Canyon Fire.

First among these was the behavior of the fire itself. The fuels in the South Canyon that day were extremely dry and susceptible to rapid and explosive fire spread. And to make matters worse, the fire fighters did not seem to recognize the potential for extreme fire behavior and return in the Gambel oak that covered the slopes of the ridge. The slopes themselves were very steep, which magnified the effects of the fuel—and the weather. A cold front, with winds of up to 45 miles per hour, passed through the area that afternoon.

On the basis of the fuels, the topography, and the weather, the behavior of the fire on July 6 could have been predicted. But none of the fire fighters seems to have asked for, or received, this information, according to the report. As a result, information critical to developing a safe suppression plan that included an escape strategy was not available, and the escape routes and safety zones were inadequate for the conditions that prevailed. Strategy and
tactics were not adjusted to compensate for the extreme fire behavior. Nor were they modified when Type I crews and air support failed to arrive on time on July 5 and 6.

In addition, building the west flank downhill fireline was hazardous, in part because the fire fighters did not follow most of the guidelines found in the Fireline Handbook for reducing the hazards of downhill line construction. Given the potential fire behavior, the escape route along the west flank fireline was too long and too steep. Even those who saw the danger of the situation and were concerned about building the west flank fireline chose to continue construction—on a steep hillside where rolling material could, and did, ignite below the fireline.

Adding to the problem was the "can do" attitude of the supervisors and the fire fighters, which led them to compromise eight of the standard fire fighting orders and to fail to recognize most of the 18 watch out situations.

According to the report, the first of the fire orders they violated was "fight the fire aggressively but provide for safety first." As implemented, their tactics provided for aggressive suppression, but they overlooked many critical safety factors. For example, their downhill fireline was not clearly anchored to a safety zone, and they allowed a significant area of unburned aerial fuels to get between themselves and the fire. They also encountered some problems with spot fires on July 5 and 6.

Smokejumpers who were not part of the hotshot crew watch the South Canyon Fire blow up.

In addition, the fire fighters failed to initiate any action in response to the current and expected fire behavior. They continued their aggressive attack, in spite of indications of extreme fire behavior and increasingly stronger winds. The Prineville hotshot crew was not briefed on the local fuels, conditions, or fire fighters had no clear idea where to go to save their lives.

Although their personal protective equipment performed within design limitations, the wind and the intensity and rapid advance of the fire exceeded those limitations or prevented the fire fighters from effectively deploying their fire shelters. And one of those who did manage to deploy his shelter took a pack with fusees into it, thus compromising his safety. Furthermore, the fire fighters' tools and packs significantly slowed their escape efforts.

Fire fighters who battle wildfires are taught to stay alert, keep calm, think clearly, and act decisively. The fire fighters at the South Canyon Fire were alert, but they failed to adjust their strategy and tactics as quickly as they should have. They failed to recognize the signs of a blowup and were trapped when it occurred.

"We are painfully learning that mistakes were made during the South Canyon Fire," said Mike Dombeck, director of the Bureau of Land Management. "They're the same sort of mistakes people make every day... only this time, the fuel and weather and fire burned magnified human error with deadly and tragic consequences."

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