

Making Wildland Fire Safety Work: The "Arthur" Fire Experience ©

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Lotsa people have been saying lotsa things for lotsa times about safety on the fireline. And for good reasons, too! Fighting wildland fires is a hazardous occupation, as seen by the number of fatalities that have occurred year after year across the US, as well in foreign countries. From 1990 - 2000, 179 firefighters died and numerous others were injured while working as wildland firefighters. Aside from the high visibility fatalities that resulted from burnovers (Dude Fire, 1990; South Canyon Fire, 1994; Thirty Mile Fire, 2000), many of the other fatalities resulted from aircraft and vehicle accidents, physical ailments such as heart attacks, and miscellaneous other causes such as falling snags and electrocution.

These fire safety issues are not new to the 1990's. Although the 14 fatalities on the South Canyon Fire on Storm King Mountain riveted the attention of the US Fire world on the need for improving the safety of our operations, the same discussions have occurred throughout the entire 20th Century since the 78 firefighters died during the fires of 1910. Major studies of fire fatalities were undertaken in 1957 and 1980: the 1957 study resulted in the development of the 10 Standard Fire Orders and the 13 Situations that Shout Watch Out. The 14 fatalities on the South Canyon Fire, coupled with the other 20 fire fatalities that occurred in 1994 led to the creation of the Interagency Management Review Team (IMRT) and the chartering of the "TriData" study on the firefighter safety culture. The findings of that Study, and its recommendations for safety improvements, are a part of our everyday fire operations today: safety messages on the National Daily Situation Report; more radios on the fireline; human factors training packages; LCEs hardhat stickers; and fireline safety bandanas.

But the old saying that "talk is cheap" seems especially appropriate in the area of wildland fire safety: in spite of catchy slogans, hardhat stickers, T-shirts and coffee mugs, the real proof of the pudding for fireline safety occurs ON THE FIRELINE!!! If it doesn't work on the ground, it doesn't matter, and is irrelevant to the safety of firefighters.

The "Arthur" Fire Experience

In late July 2001, a lightning fire began in a remote area on the Eastern edge of Yellowstone National Park (YNP). When the first report came back to YNP Fire Management Officer Phil Perkins that the fire was 30 acres and moving, he immediately recognized the potential of the fire. Perkins has been at Yellowstone a long time, and "survived" the 1988 fires that burned nearly 1 million acres: the area of the newly named "Arthur" fire had not burned in 1988, and probably not for several hundred years before that. Not only was the

fire on steep and inaccessible ground, but there was heavy ground fuels, high temperatures and low humidities coupled with strong winds. There was also the East Entrance station to the Park, the main East-West travel route, and developments and improvements just to the East of the Park boundary on the adjacent Shoshone National Forest. Perkins had thought about a fire starting in this area before, and his initial Resource order indicated his level of concern about the fire's potential: close the Highway and the East Gate entrance station; order 10 Type 1 Interagency Hotshot Crews (IHC); order a National Type 1 Incident Management Team; and order 5 T-1 and 5 T-2 helicopters! There were a lot of factors that would complicate the management (and subsequent fire safety) of the fire: it was located in prime grizzly bear habitat; the East-West road to Fishing Bridge area was normally heavily used in the peak of the tourist season, and a lodge just east of the Park boundary was heavily booked with tourists throughout the summer. And, oh yeah, the Lodge's owner was in direct contact with the US Senator from Wyoming, who was in the area since the Congress was in its summer recess.

A Fire Safety Success Case Study

In spite of all the complicating factors for safely managing the "Arthur" fire, it was (in my opinion) an excellent example of making fire safety work on the ground, even under the toughest of conditions.

I believe that there were many factors contributing to the safe operations on the "Arthur" fire, but that they can be condensed into just 4 general areas:

1. Leadership at the IMT and ground-pounder level;
2. Fire Weather and fire behavior information;
3. Careful attention to LCES;
4. Providing for safety first, and then fighting fire aggressively as conditions allowed.

But "lumping" the factors that led to a safe operation doesn't allow us to learn from them like we can by dealing with the smaller successes that resulted in the final product. So, using the old "Harvard Business School" concept of looking at case studies, here's the reason I believe that Fire safety on the "Arthur" fire was so successful:

1. A Safety commitment from Top to Bottom: everybody on the "Arthur" fire was totally committed to safety. From Incident Commander Steve Frye to the individual firefighter, safety was the first and last thought that everyone had in battling this fire. At the 6:30 AM briefing, safety was emphasized multiple times (and not only by the Safety Chief). From driving the roads, to working with the numerous aircraft, to keeping a clean base camp (grizzly bears + food in tents = trouble!!), to keeping your distance from bison bulls: all aspects of safety on the Fire were addressed at the operational period briefings, in the Operational Period plans, and throughout the day and night. The IMT carried a Safety Chief and Deputy Safety Chief, as well as having Safety Officers on all active divisions in the field. The Safety Chief or his Deputy were highly visible

on the line every day, lending credibility to the safety emphasis of the IC and the IMT.

2. Direct interaction between the Division Supervisors (DIVS) and their assigned personnel a key factor in safe performance on the fireline. After the Operational Period briefings, individuals had to get their plans from their DIVS: this allowed the kind of one-on-one communications that is essential for a safe operation. And, the Division Sup's were out on the ground every day, working with the firefighters and recognizing safety concerns before they caused injuries or worse. Safety officers were out on the line daily, adding another set of eyes to watch for the indicators of safety problems before they got out of hand.
3. Fire weather and Fire behavior information awareness were important components of the fire safety program: several of the crews assigned to the fire took hourly weather observations and reported them back to the Incident Meteorologist (IMET) over the Command radio frequency. Everyone from the crew supervisor level on-up who was monitoring "Command" got current information about temps, humidity, wind speed and direction on an hourly basis. Coupled with the detailed briefings by the IMETs at the beginning of the operational periods, and "as-needed updates to the fire weather forecast that were broadcast to the entire fire when conditions changed, no one on the fire experienced any surprises from the fire behavior. When an update to fire weather conditions was broadcast, the Incident Dispatcher requested verification from the Ops section that all personnel down to the crew supervisor level acknowledge receiving the message! Again, the emphasis on communications between resources on a Division helped insure "no surprises" in a period of significant fire behavior.
4. Night Shifts (or, the lack of.....): because the "Arthur" fire area was steep, rocky, inaccessible by vehicles, with decadent timber stands and falling snags, in an area frequented by Grizzly bears, the safety concerns for the firefighter precluded fighting fire at night. With the higher potential for injuries in the dark, and limited resources to assist in a timely medical evacuation should one be needed, the decision not to staff the fire at night was important to insure firefighter safety.
5. Road Closures on Public lands are controversial at best, but take on a whole new dimension when they occur in the middle of the summer in Yellowstone National Park. But, in spite of the political sensitivity, the closure of the road from Fishing Bridge to the east Entrance Gate, and on down the highway towards Cody, Wyoming was essential to insure the safety of both the firefighters and the general public. Because of the steep, mountainous terrain on the east side of the park where the fire occurred, drop points for the fire crews were the turnouts usually filled with tourist cars, trailers and motor homes during a normal August. Having these turnouts available for crew movement, and allowing the crews and fire overhead to safely cross the highway, could only be accomplished by a road closure. The proximity of the fire to the highway, with prevailing winds and terrain that could quickly move the fire front onto the road made it critical for the public's safety that they not be traveling the road.

There were significant pressures to re-open the road as soon as possible: many tourists had planned their Yellowstone trips months in advance, and arrived at the roadblocks to find that portion of the Park closed to them; nearby resorts. Towns as far away as Cody, Wyoming felt the economic impact of lost tourism business, and kept the pressure on to open the road. The Incident Command Team and Park administration stuck by their guns, monitoring the fire and firefighter use of the roads and turnouts until they deemed it safe to re-open. When the decision was made, National Park Service police escort cars led a parade of cars, motorcycles, campers and motor homes through after the peak use periods by fire personnel. As a result, no injuries or accidents occurred in what could have been a high-risk scenario.

6. The essence of fire safety has been consolidated into the key acronym of LCES: Lookouts, Communications, Escape Routes and Safety Zones. Pay attention to those 4 key factors and a safe operation should result. The "Arthur" fire paid close attention to these elements, and the results were obvious in the fire's safety record.
 - Because of the active fire behavior that was occurring, high quality lookouts were an important component of the LCES implementation. The availability of numerous Strike Team Leaders (Crew) allowed the IMT to assign them as lookouts without having any supervisory responsibilities.
 - In mountainous terrain, the reliability of radio systems may often be suspect, especially in areas with out an extensive system of radio repeaters. On the "Arthur" fire, human repeaters were utilized down to the crew level to insure that open channels of communication were working among all the resources on the fire.
 - With the fire burning actively in a timber fuel type with heavy ground fuels, the potential for high intensity fire was well recognized. To insure that firefighters were not trapped in a situation that they could not escape from, weather threshold values and trigger points were established for each division, based on input from the Fire Behavior Analyst (FBAN), with the information widely disseminated to all the resources on the ground.
 - Based on the projections developed by the FBAN, escape routes were tested early in each operational period to determine the lead-time needed to reach adequate safety zones. Individuals from the crews working a portion of line were tasked to walk out the planned escape route to the safety zone at a normal walking pace. The trigger points for evacuation were then determined, based upon projected fire spread rates under forecasted conditions. In my first two operational periods on "Arthur", we reached our threshold values by 1330 hours on the first day, and by 1130 hours on the second day. In both instances, all personnel pulled off the line for the remainder of the operational period, with the full support of then entire IMT.
 - There was frank and open discussion among the various crews about the suitability of an area as a "safety zone" versus working only as a "survival zone", and acceptable safety zones were well known to all personnel on

the line. In addition, the definition of "good black" was also clearly understood by line personnel, an especially critical safety concern on a fire that had burned "dirty" in many areas.

7. An important aspect of safety on the "Arthur" fire was crew selection and assignment: because of the steep, rocky, high-elevation nature of the fire, the decision was made early-on to request a preponderance of Type 1 Interagency Hotshot Crews (IHC) for "Arthur". Of the 20 crews assigned to the fire, 18 were T-1 or the T-1 (Trainee) crews in the National pool, and their performance was an important factor in the fire's safety record. The training, fitness and discipline of those crews helped insure safe performance under difficult conditions.
8. The Safety awareness of the IHC's demonstrated itself in several highly visible ways: first, the crew superintendents gave detailed briefings (tail-gate safety sessions) to their crews before hitting the line at the start of each operational period. Secondly, at least one crew took a hourly "LCES break" when one crewmember would transmit a one minute safety update on the crew communications net about safety concerns for that operational period. This constant and continuing commitment to safety paid off at the end, since only minor injuries (and no fire entrapments) occurred on more than 15-day operational periods.
9. Besides the fire activity and the terrain, other natural features of Yellowstone National Park could have caused safety concerns, but these too were dealt with successfully: the fire area and the Incident Command Post (ICP) at Fishing Bridge were both areas frequented by Grizzly bears. Probably the greatest concern to Park Service Bear Specialists were the hundreds of firefighters and support personnel having food on the fire line and in the ICP, as well as in the Spike camps and Coyote camps that were used extensively. Through close cooperation with the NPS Resource advisors, techniques and methods were used to minimize the enticement for bears to visit our camps. For example, when spike camps or coyote camps were established, metal bear traps were flown in, along with the MRE's, water and sleeping bags. The traps weren't intended to trap a Griz: instead, they were set several hundred yards away from the main camp area, and all garbage and left-over food was locked inside to prevent both the bear from becoming habituated to human food, and to avoid bear-human conflicts. Each crew and all line overhead carried bear repellent spray, and although Grizzly bears were seen both on the fireline and in the ICP, no direct confrontations occurred. Bear specialists were an every-day part of the operational period briefing, and failure to follow the "no food in tents" rule got firefighters a quick trip to the Demob tent.
10. The rugged and inaccessible terrain of "Arthur" mandated large air operations: a high-risk endeavor at high elevation and with 15 rotary wing aircraft operating over a relatively small fire area. Management of the aircraft was facilitated by the continuous presence of an Air Tactical Group Supervisor (ATGS) over the fire at all times during daylight hours. A Helicopter Coordinator (HELCO) was also assigned to better management multiple rotary winged aircraft working out

of the same dip sites and on the same hotspots on the fire. This in-depth management of the air resources was essential given the numbers of aircraft assigned, and resulted in no serious accidents or incidents for the duration of the fire. The use of dip sites and portable "heli-well" units that were immediately adjacent to the main road required the copters to fly directly over travel routes on most missions: the use of traffic control personnel to stop even the fire traffic using the road insured that no one was at undue risk from a dropped bucket or possible engine failure while dipping.

11. Although safety was a paramount concern on the "Arthur" fire, good management requires that a workable medical evacuation plan be prepared and in place should an injury occur on the fireline. Given the distance off the road, and the steep, rocky trails into the fire area, helicopter evacuation was a primary method in the Medical plan. An especially valuable tool in the Yellowstone Park area is the presence of a trained and experienced "short haul" crew and helicopter for making evacuations of injured personnel without having to land the helicopter. The opportunity to utilize this asset occurred when a Type 2 fire crewmember suffered a badly sprained ankle nearly two miles from the nearest road. As soon as the injury was reported, the Division Supervisor and two safety Officers arrived on the scene, as well as three EMT's from adjacent Hotshot crews working in the area. After stabilizing the patient's injury and working with HELCO about the opportunity to construct a helispot, it was determined that a "short haul" mission was the safest and best option for evacuation. The Yellowstone Park helicopter paramedic flew in under their ship, secured the injured firefighter to the longline under the helicopter, and gave him "the ride of his life" to an ambulance waiting on a nearby road.

The "Arthur" fire wasn't big compared to recent wildfires in the Rocky Mountain area, and especially compared to the fires that burned in Yellowstone in 1988: it was only 2800 acres, and had 18 Type-1 crews and two Type-2 crews assigned. But the complexity of the terrain, fire behavior, air operations and the social/political aspects of Yellowstone gave it the potential to have significant safety problems. By addressing these issues from the earliest stages of the fire, and because of the full commitment of Park management, the Incident Management Team and all the assigned firefighters, none of the potential safety problems became reality.

The "Bottom Line" for the "Arthur" fire:

- No firefighter or public fatalities;
- No major injuries to firefighters or the public;
- No burnovers or entrapment events;
- No major vehicle accidents;
- No serious "close calls";
- No aircraft accidents;
- No wildlife conflicts.

