

# Engine Rollover Lessons Learned Review



Fawn Fire  
Northwest Colorado District, White River Field Office

July 2018

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“The purpose of a LLR is to focus on the near miss events or conditions in order to prevent potential serious incident in the future. In order to continue to learn from our near misses and our successes it is imperative to conduct a LLR in an open, non-punitive manner. LLRs are intended to provide educational opportunities that foster open and honest dialog and assist the wildland fire community in sharing lessons learned information. LLRs provide an outside perspective with appropriate technical experts assisting involved personnel in identifying conditions that led to the unexpected outcome and sharing findings and recommendations.”

–[Interagency Standards for Fire and Fire Aviation Operations, Chapter 18](#)

## Leader's Intent

On July 10th, 2018, the Field Office Manager of the White River Field Office, Northwest Colorado District of BLM issued a Delegation of Authority for a Lessons Learned Review (LLR) team to review an engine rollover that occurred on the Fawn Fire July 8th, 2018.

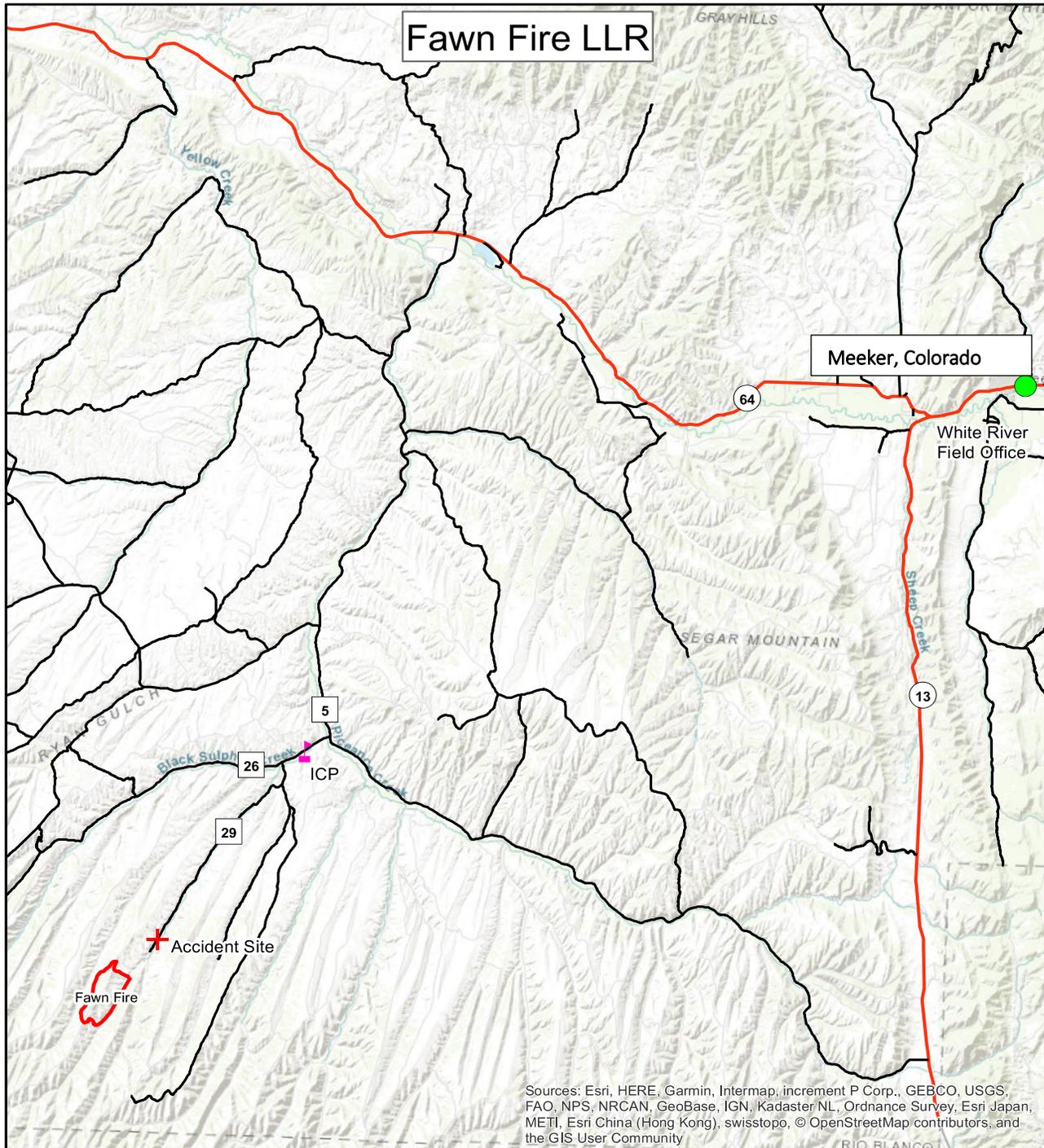
The Field Office Manager delegated the Lessons Learned Review Team to:

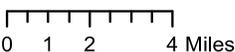
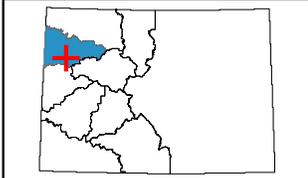
- Identify the facts, events and chronological narrative of the event
- Identify underlying risks
- Identify what was learned and what could be done differently in the future
- Identify what went well
- Identify the LLR team's observations which could assist learning by the firefighting community
- Complete a written report

## Executive Summary

On July 8<sup>th</sup> at approximately 2325, on the Fawn Fire near Meeker Colorado, a cooperating fire department engine (Engine 1) rolled off the roadway as they were travelling from the fire back to Incident Command Post (ICP). Due to a high volume of fire traffic and very dry conditions, the road surface was extremely dusty and visibility was often severely reduced. As Engine 1 was departing the fire area, they were the second to last vehicle in a convoy of 5 vehicles. Approximately a half mile after leaving the fire and headed back down County Road 29, Engine 1 encountered near zero-visibility due to dust and started to slow down. This reduction in visibility occurred in a short section of the road where the road bed narrowed due to erosional sloughing. Unable to see the upcoming road bed hazard, the engine operator continued driving straight as he was slowing the engine down. The front passenger tire travelled off the roadway, and the engine rolled off the embankment and down about 75 feet before coming to rest in the creek bottom back on its tires. Although there was substantial damage to the cab of the engine, all the vehicle occupants were wearing their seat belts and only sustained minor injuries (bruising, chest and back pain). Due to the heavy dust, none of the other convoy vehicles knew immediately that the rollover had happened. A rapid response from other vehicles in the convoy occurred after it was discovered that Engine 1 had rolled off the road. The 3 crewmembers of Engine 1 were assessed for injuries and then driven back to the ICP. At the ICP, an ambulance that had been called to respond met the Engine 1 crew and transported them to a local medical facility in Meeker. After a thorough medical assessment, it was determined that no serious injuries had occurred, and all 3 were released from the hospital at approximately 0630 on the morning of July 9<sup>th</sup>.

Map 1



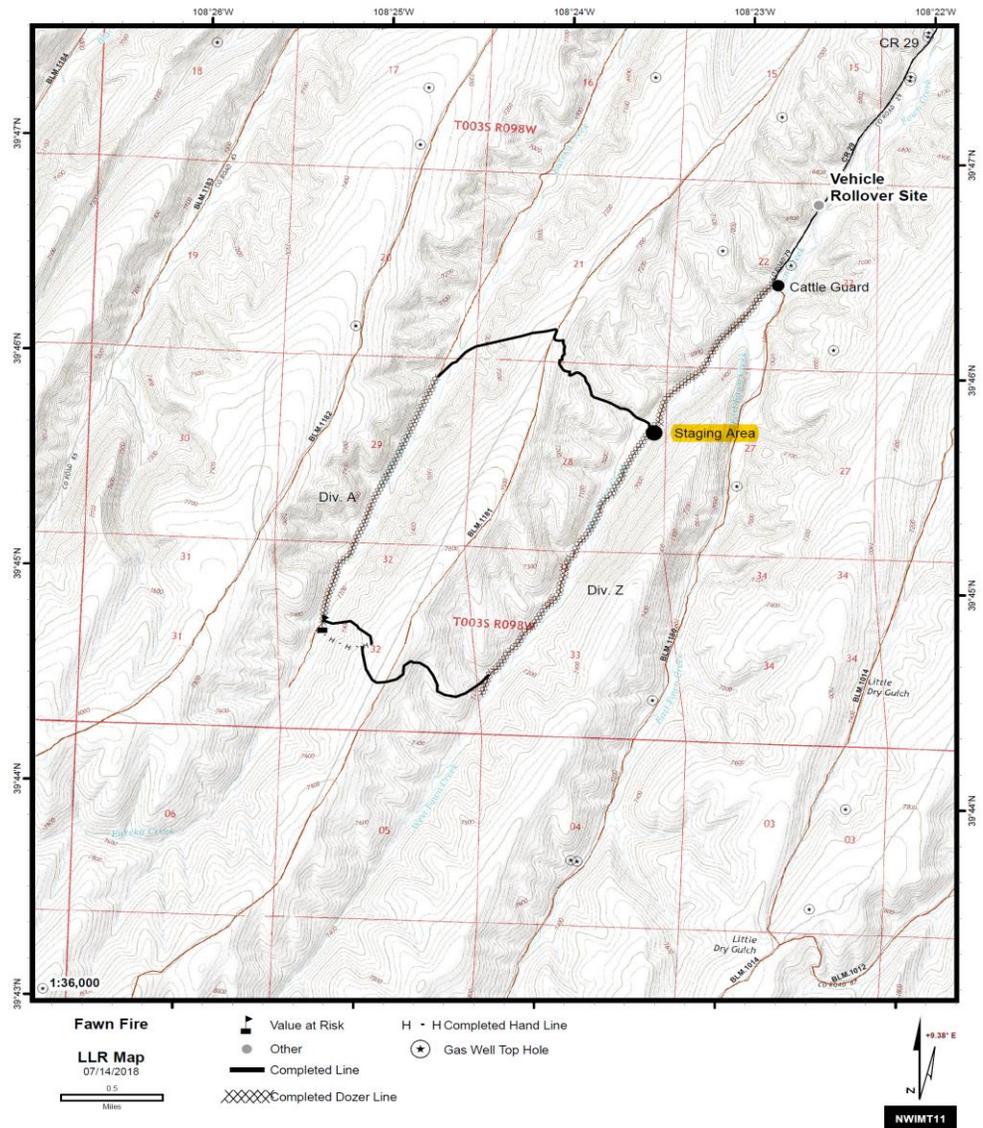
 ICP	 		 Date: 7/13/2018 Time: 5:25:30 PM
 Accident Site			
 WRFO			
 Fawn Fire			

## The Firefighters Story

On the morning of July 8, 2018 a Type 6 local government wildland engine (Engine 1) started their day with a morning briefing at 0700 hours on the Divide Fire near Craig, Colorado. The crew was assigned to mop up and patrol on Division B. The three-person crew was made up of a firefighter, engine operator and an engine boss. At approximately 1130 hours, the crew received word that they were reassigned to another fire near Meeker, Colorado, as part of a five-engine taskforce.

Between 1400-1500 hours, the crew met with other members of the taskforce and drove toward Meeker. On arrival in Meeker, the engine crew stopped in town for fuel and food, then checked in at the ICP around 1700 hours. After discussing their assignments with the Type 3 IMT personnel at ICP, the engine crew along with the rest of the taskforce drove to a staging area near the fire arriving at 1745.

The taskforce was going to be used to help conduct a burn out operation on the east side of the fire in Division Z. Due to observed fire behavior activity that the local unit had been experiencing on fires in the area recently, burn out operations later in the burn period were expected to have a higher chance of success, with fewer holding problems. On the drive into the fire, Engine 1's crew



“We were pretty excited and fist pumping each other about the great day we had burning when the Engine Boss trainee said “We still need to get back to camp tonight”

—Engine 2 Crew

noted that once County Road 29 ended, the drivable dozer line leading to the staging area was very dusty and had a significant drop on one side.

After completing burn out operations on Division Z, the taskforce and overhead gathered up at the Division Staging Area. At 2321 hours, the Operations Section Chief trainee (OSC3(t) advised

dispatch that “all crews are off the line and headed back to ICP.” The convoy of fire vehicles was led by a Type 4 engine and included 2 additional type 6 engines, a chase truck and the Taskforce Leader (TFLD’s) command vehicle.

The visibility quickly went from “tough to see” to “can’t see at all” as the dust from the road obscured virtually all visibility in front of the engine.  
–Engine 1 Driver

Engine 1 was the last engine and directly in front of the TFLD who was at the rear of the convoy. Before starting to drive back to ICP, the engine operator of Engine 1 mentioned to the other crew members that he was going to stick to the left side of the dozer line on the way out, articulating that while this might lead to some branches scraping the side of the engine, or scraping the mirror on the high side bank, it would help them avoid the drop on the other side of the road.



Approximately one-half mile from where the dozer line ends country road 29 begins, the engine operator mentioned that the visibility quickly went from “tough to see” to “can’t see at all” as the dust from the road obscured virtually all visibility in front of the engine. As the engine operator slowed the engine down, Engine 1’s passenger side front wheel traveled off the edge of the road, and the engine departed the roadway, and rolled 75 feet, coming to rest on its wheels at the bottom of the hill.

“There was no wind, the dust hung.”  
–Engine 3 ENGB

The remaining vehicle in the convoy traveling toward ICP did not see Engine 1 roll down the hill. The thick dust on the road made it impossible for the TFLD to see that Engine 1 was no longer in front of him.

Once Engine 1 came to a rest, the crew found a radio inside the truck and tried to contact dispatch or other units on the fire. The crew reported making 5-7 attempts, and finally reached the lead Engine in the convoy (Engine 2). Engine 2’s chase truck turned around and went back to render aid. While Engine 1 was attempting to make radio contact for help, the on-duty night dispatcher heard part of one of the radio transmissions and started organizing a response to the incident. The first radio transmission with information about the accident was received by dispatch at 2326 hours.



The crew of Engine 2 chase was the first to arrive on the scene of the accident with the TFLD arriving shortly thereafter. There was some difficulty locating Engine 1 due to the darkness and Engine 1’s resting position below the road. The damage to the cab of the engine was extensive, especially on the driver’s side.

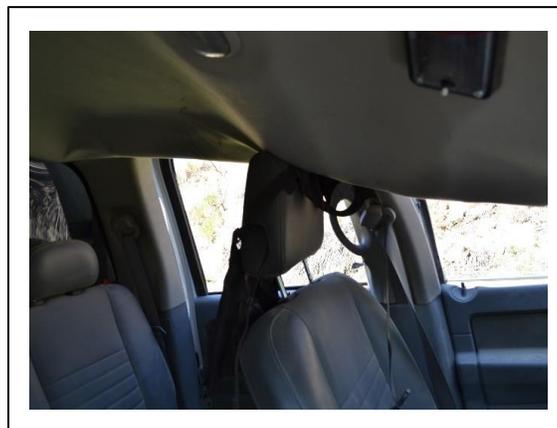
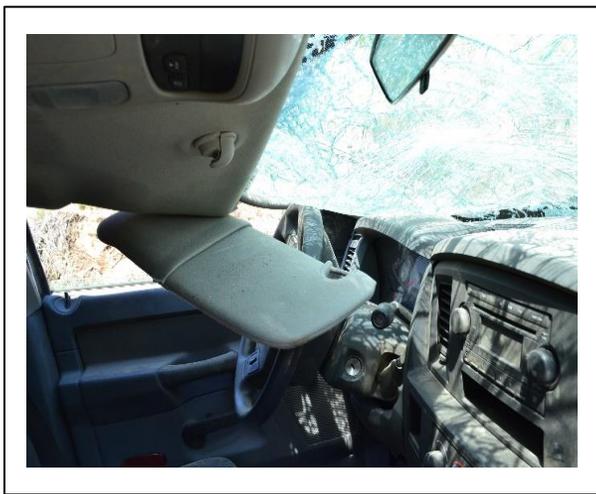
"It went from our best day ever fighting fire to our worst."

—Engine 1 Crew

An initial assessment revealed no serious injuries, although Engine 1's operator complained of back and chest pain. All members of the crew underscored the role of wearing seatbelts in minimizing injuries during the rollover.

The 3 injured firefighters were transported in the overhead's vehicles to ICP after the accident scene had been secured. An ambulance had been ordered and met the firefighters at ICP where they were loaded and transported to the hospital in Meeker.

Local Fire Management personnel responded to the hospital to function as Hospital Liaisons. During the night, the Fire Chief from the department of the injured firefighters made the 5 hour drive from their jurisdiction to Meeker. All three firefighters were released by 0630 the next morning.

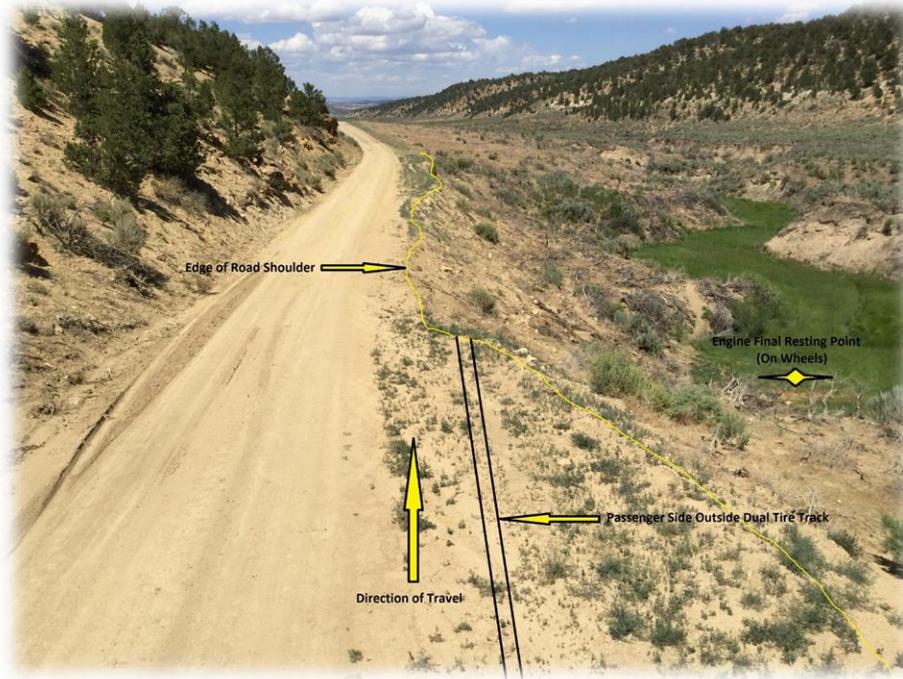


## The Road – A Perspective in Hindsight

When the Lessons Learned Team arrived at the accident scene they discovered some interesting factors which may have had an impact upon the accident. There is a dozer line that connected Division Z with the county road. The resources were using that dozer line to access the fire. It was a typical dozer line

with narrow clearances, rough roadbed and some potentially dangerous drop offs. Personnel assigned to Division Z were well aware of the dangers of traveling on the dozer line.

It might be expected that everyone's attention would be focused on the worst part of their travel between the fire and ICP. Once down off the dozer line and onto county road 29 traveling back toward ICP, the roadbed is graded and maintained. However, after having several pieces of heavy equipment, watertenders, multiple engines and pickup trucks, the roadbed turned into



deep dust typical to many areas of the arid west. The roadbed in most places, including on both sides of the accident site, is approximately 25 feet wide. There are some spots on the county road however, where past erosion caused the roadbed to narrow to approximately 16 feet. As illustrated in the photos above and below, the narrowing of the roadbed is quite dramatic. Additionally, there is a slight uphill and a curve to the left immediately preceding the narrowing of the road. With reduced visibility from the dust and the darkness from the late hour, that change in roadbed width could have had dramatic results.



## Firefighters Lessons Learned

The following points were developed from discussions held with the Rollover Engine crew and others who directly participated in the Incident within an incident. What do you think? What would you do in a similar situation and how do these apply to your current methods of operation?

- **Have the Type 4 Engine (or all Engines) water down the road behind themselves”**

Some of those interviewed speculated that having the engines turn on their spray bars to water down the road as they were departing may have helped keep the dust down. Others disagreed and said that they never wanted to be without water in the event they were called to quickly respond to an unforeseen fire need.

- What would you choose to do, and why?

- **“Seat Belts Work”**

The crew from the Engine 1 was very thankful for the integrity of the seatbelt system, and that it worked as designed. The crew also recognized that seatbelts don't always get worn in those situations where an engine just needs to get re-positioned a short distance away, like during a burnout operation. Having just survived a rollover accident, the value of using seatbelts every time was evident to this crew.

**“Seat belts are not always used when bumping down the line.”**

–Engine Crew Member

- Do you use always yours? Every time?

- **“The Headache Rack saved the cab from crushing worse than it did.”**

The Engine 1 crew reflected on the value of the headache rack in this particular accident, and how it appeared to have kept the cab from getting crushed any worse than it did. While not all Type 6 engines may have a headache rack or a roll bar, this one did, and it could have been a life saver.

- **Not having water in the tank during the rollover was beneficial”**

In retrospect, the crew of Engine 1 felt that not having the full weight of a completely topped of water tank as they rolled down the embankment worked out to their benefit. They thought that the added weight of a full water tank may have created more inertia and additional crushing forces as the rolling took place. Some of the others interviewed speculated that a half full tank may actually produce more inertia action, especially if the tank doesn't have a baffle system.

- The 300-gallon water tank was approximately half filled when the engine came to rest.
- What are your thoughts on travelling with a full tank as opposed to an empty tank? How about with a partially filled tank?

- **“Flagging bad spots in the road”**

In hindsight, one of the fireline overhead told the Review team that he wished he had flagged the section of road where the rollover occurred. He had noticed this particular section of road earlier in the day. This observation spurred a discussion of whether or not flagging would even be visible in the dark and dusty conditions. One of the Review team members retrieved a roll of flagging from his work truck. It was a silver mylar reflective type of flagging that is much more visible in the dark.

- Identifying potential hazards...What are some effective methods? Would they be effective at night? Would they be effective under similar conditions to those in this rollover? Do you use or have you seen reflective flagging?



- **“Spacing of Engines as they head down the road”**

Driving multiple vehicles simultaneously on dark and dusty roads can be challenging. Visibility can be reduced for several minutes after just one vehicle passes. Everyone needs to return to camp at the end of shift, but putting some thought into how that is going to happen ahead of time can pay off in situations like what occurred on the Fawn Fire. “Choreographing” the convoy exodus may help prevent near zero visibility driving conditions.

- How do you pre-plan for a convoy? How do you space vehicles? By time of departure? By communicating your arrival at a predetermined location on the route?

## Things Done Well

**Professional, Calm, and Organized.** Throughout the review process several firefighters and managers shared that the professionalism and calmness of all parties involved contributed to a successful outcome. The professionalism of Engine 2 had a real calming effect on the occupants of Engine 1. Communication with dispatch was clear, calm, and concise.

**Seat Belt Use.** The use of seat belts in this rollover prevented serious injuries to the occupants.

**Notifications.** Due to following standardized notification procedures, timely notifications were made to all necessary parties. The notification process started within 20 minutes of the accident taking place. This resulted in the incident being managed in an effective and professional manner following their arrival at the medical facility.

**Agency Administrator and Zone FMO.** The use of two individuals working together at the hospital proved to be highly effective. Working together they were able to ensure that all needs and tasks were complete.

**Medical Response.** A timely appropriate medical response was provided in order to best care for the three patients. An ambulance was ordered within approximately eight minutes of the accident occurring. Patients were transported by fire staff in order to meet the ambulance at ICP. It was beneficial to transport the three patients by ambulance from ICP to the Hospital to ensure no unnecessary risks were taken. The timely and professional actions taken by all parties involved led to a positive and efficient medical response.

**Training.** It was recognized by the LLR team that the non-federal personnel involved in the incident exceeded NWCG requirements by utilizing ENOP task books prior to working on an ENGB qualification. In addition, BL-300 BLM Engine Driver Orientation had been utilized, which is above and beyond their red card requirements.

**We couldn't have done it  
without the Engine 2 crew.**

**—Engine 1 Captain**

## Review Team Lessons to Share

### The Medical Incident Report

The Medical Incident Report is the standard for reporting medical emergencies on wildland incidents. Although there were no known serious injuries at the time of the rollover report to dispatch, it is conceivable that an undetected injury could have occurred, only to later manifest itself. The information that is provided to Dispatch via the Medical Incident report would then be very beneficial in the event an emergency medical response needed to be initiated.

### Distractions

In any vehicle accident these days, it is natural to ask whether there were distractions causing a lack of attention. While it does not appear to be the cause of this accident, photographs were being looked at on a phone by a passenger in the engine at the time of rollover. Could this have distracted the driver? Other distractions are plentiful in the cabs of our modern fire engines. Computer terminals, phones, GPS monitors, tablets and any number of lighted displays. When road conditions become critical due to smoke, terrain, dust and darkness, this is a time of heightened awareness for potential distractions to the driver.

The review team discussed the “sterile cockpit” concept that aviation resources utilize, and how that could be applied to ground resources. As specified in *U.S. FAR 121.542/135.100, "Flight Crewmember Duties"*

*No flight crewmember may engage in, nor may any pilot in command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft.*

It may be worthwhile considering a similar approach for ground vehicles while they are operating during “critical phase” activities. The review team recognizes that defining what critical phase is driving (and what is not) is very subjective, however, having the discussion with our drivers and crews will probably spur some worthwhile dialogue regarding aviation sterile cockpit concepts as they relate to driving distractions for ground vehicles.

### Hospital Liaison roles

The medical response and hospital liaison roles that the local unit employees filled were very effective and well executed. With the benefit of hindsight, the Review Team believes there is value in examining the hospital liaison role, especially as it relates to the administrative paperwork responsibilities that are inherent with hospital admissions. In this incident, the firefighters were from a fire department that is a five-hour drive away, and it was unclear to those performing the liaison role at 1:00 am, what kinds of forms that fire department required of their employees. It is helpful if all agencies carry their required forms and procedures to deal with injured firefighters.

Utilizing local administrative support personnel, or incident business specialists as the hospital liaison could help ease the burden of acquiring the necessary paperwork in a timely manner.

### **Risk Perception**

Throughout the day, and prior to the accident, briefings included driving concerns on the road between the incident and ICP. Several drivers recognized the steep drop off sections of the county road on the way in and made mental notes of those locations. During briefings, specific attention was on the dozer line because like most dozer lines on fires, it was a particularly difficult route. The Review Team discussed the likelihood that once down off of the dozer line, most personnel considered the dangerous and difficult part of their drive complete and the county road was the safe portion of their drive back to ICP.

On Type 1 and 2 fires, a Safety Officer locates those types of hazards and Ground Support goes to the field to mark those hazards with signage to alert drivers. How do we handle these same types of hazards on initial attack or type 3, 4 and 5 fires?

### **Evaluating Risk (Risk vs Reward)**

During emergency response, wildland firefighters are trained to always evaluate risk, mitigate risk any not take any unnecessary risk. Unnecessary is a subjective term, and like risk, everyone will have a different idea of what it means to them. After the emergency response is complete, there should also be mindful evaluation of the potential for incurring additional, or unnecessary risk. Long work shifts, high levels of excitement, adrenaline or anxiety, can all affect the way we define risk and the necessity of accepting risk.

In this particular incident, several employees who had already worked long shifts, were out driving on the roads until early morning hours. No bad outcomes resulted from these activities, but mindfully evaluating the risk versus the value of the action should always be considered.

## Timeline

### 07/08/2018

- 0700 Engine 1 operational briefing on Divide Fire, assigned to DIV B for mop-up and patrol.
- 1130 Engine 1 notified of reassignment to Fawn Fire, SW of Meeker, CO as part of 5-engine taskforce.
- 1714 Arrived at Fawn Fire ICP for check in.
- 1800 Assigned to firing operations in DIV Z. The taskforce moved to a forward staging area that was southwest on County Road 29 then onto a dozer line leading to the fire.
- 1840 OSC3 and OSC3(t) briefed TFLD and engine crews at forward staging area. OCS3 and OSC3(t) stayed at the staging area and crews moved to the fire for firing operations.
- 1940 Firing operations began.
- 2215 Firing operation were completed successfully, followed by minor mop-up.
- 2255 All resources move back to the forward staging area for a quick debrief. Safety concerns including road conditions and dust/visibility discussion were directed at the dozer line specifically but not county road 29.
- 2300 OSC3 and OSC3(t) (same vehicle) left the staging area to return to the ICP.
- 2315 TFLD and Engine crews left the staging area to return to the ICP. Engine 1 was the fourth vehicle in the convoy of 5 with the TFLD in the rear.
- 2321 OSC3(t) called dispatch "all crews off the line and in route to ICP".
- 2324-2326 Multiple broken radio traffic transmissions between TFLD, OPS(t) and Dispatch confirm an Engine in the convoy has had a rollover accident and crews would be turning back to the scene to report on the condition of the personnel.
- 2327 TFLD reports to Dispatch that all parties are out of the Engine with minor injuries
- 2334 TFLD requested an ambulance through Dispatch to respond to the scene. (The ambulance was later diverted to ICP)
- 2349 Engine 1 crew members taken from the scene to the ICP for further medical attention

### 07/09/2018

- 0045 Ambulance response transported Engine 1 crew to the local medical center
- 0626 Engine 1 Crew was released from the hospital

## Fawn Fire Rollover Lessons Learned Review Team

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