2017 Miller Complex Engine Rollover
Facilitated Learning Analysis
Southwestern Oregon

"This is the kind of road where if a tire goes off, you roll. We saw that the day before. There is little room for error." (IMT Safety Riley)

Miller Complex Engine Rollover Facilitated Learning Analysis

On 27 August 2017, a Type 6 contract engine was conducting structure triage assessments while assigned to the Miller Complex in southwestern Oregon, managed by a Type 1 Incident Management Team (IMT). The crew had just resumed their trip after a short break when the driver came too close to the edge of the roadway and rolled down a steep embankment into a shallow creek. The engine driver was not wearing his seatbelt and was seriously injured. Although not ejected, the driver was partially pinned underneath the engine, and partially submersed in the creek. The other two engine crewmembers were seat-belted, received minor injuries, and tried to radio for help. After unsuccessful attempts at radio communication, one crewmember set out on foot to find help. After over one hour searching for help, the crewmember found a nearby resident who helped the accident victim locate a heavy equipment boss assigned to the fire.

A Heavy Equipment Boss (HEQB) assigned to the Division was also EMT-B qualified and became the first responder and incident-within-incident commander (IIC). This IIC managed a large accident response effort which included a staging area manager, extrication team, paramedics, low-angle rescue team, and multiple aircraft resources. All three victims were successfully and rapidly transported to a hospital about 40 miles away due to a solid response plan implemented by a fireline leader with a calm demeanor and a strong command presence. Agency and IMT support for the injured contractor employee from the initial patient response to the patient's three-week admission to hospital was outstanding. Relationships between the Forest Service and the contracting community have been further strengthened by the post-accident patient support.

Seeking to understand the risk management process and cultivate a learning environment, the Regional Forester requested a Facilitated Learning Analysis (FLA) team to review the accident. The FLA team was interagency (Forest Service and BLM) and also included a local wildland fire contractor to provide contractor perspectives and serve as liaison with accident victims. The five-person team convened on 3 September to interview participants, conduct site visits, and gather information to prepare the FLA.

The FLA team interviewed 23 individuals involved in the incident to better understand the decision making or risk management processes and human factors that may have contributed to the accident, in addition to exploring the short- and long-term accident response. All names in this FLA have been changed to protect the privacy of the individuals involved.

Background

The sound of rushing water was deafening.

Jeff was an experienced wildland firefighter with 21 years of service, and was employed as the captain of a contracted Type 6 engine. As he regained consciousness he tried to make sense of what had just happened. The last thing he remembered was driving his assigned engine along a gravel road with a steep drop-off to his left. Now that engine lay on its side in the bottom of a steep ravine and partially submersed in a large mountain stream. Jeff's left leg was numb and he could not move it as it was pinned underneath the rolled engine. He was waist-deep in cold water and trapped. He tried to compose himself and sent his two-person crew for help. Typically an unemotional person, Jeff's mind started to race: "Am I paralyzed?" "Will I ever fight fire again?" "How is the crew?" "Will I get fired?" "Will I drown here?" "Will anyone find us?" As Jeff's heart began to race and tears started to roll down his face, he drifted in and out of consciousness.

Three and half hours later Forest Supervisor Bruce stepped out of his personal vehicle in the hospital parking lot. The smoke that had plagued his beautiful valley for the past several weeks still hung low and heavy in the sky, stinging his eyes. But he could make out the silhouette of a specialized helicopter used in medical rescue and saw it orbiting above the hospital helipad like a turkey vulture riding a thermal. He knew inside that helicopter was a code red patient, Jeff, immobilized and hopefully stabilized. Bruce knew nothing about Jeff's personal life, and only limited bits of information regarding the accident. But Bruce felt a sense of duty to be there at the hospital, to provide leadership, compassion, and assistance to the patient and his family. Bruce had been part of incidents that didn't have happy endings and he wanted to do everything in his power to ensure this one did.

Since July 2017, southwestern Oregon, like much of the state, was pummeled by recurring thunderstorms, causing multiple fire starts on private and public lands. On August 14, 2017 a series of thunderstorms moved through the area igniting 25 wildfires on the Siskiyou Mountains Ranger District of the Rogue River-Siskiyou National Forest. To efficiently manage the increased complexity of the incident, the Miller Complex was established and a Type 2 Incident Management Team (IMT) was ordered to facilitate firefighting efforts in the area. Shortly thereafter a Type 1 IMT was ordered and took command of the fire on 25 August.

Due to high fire danger, and limited resources the Pacific Northwest region was in Preparedness Level 5 for almost two months. The demand for firefighting resources across the nation this year had been unusually high since mid-July. Region 6 is known for their high use of private contractor firefighting resources and this year especially, contractors were feeling the high demand for resources and doing their best, along with agency and other resources, to respond safely and efficiently.

At the time of the accident, the Miller Complex, 22 miles south of Medford and 25 miles east of Cave Junction on the California-Oregon border, covered more than 19,000 acres

and was approximately 25 percent contained. There were 25 fires in the complex, with 6 actively burning and growing on the day of the rollover. Fire behavior was consistently active, making uphill runs with short crown runs and short-range spotting observed. Use of aviation resources was extremely limited due to unsafe flying conditions caused by smoke. Structures in the area, including primary residences, were threatened. Evacuations, road, trail, and area closures were in effect. Observed fire effects were displayed by the mosaic pattern of varying severity typical of the Siskiyou Mountains ecosystems. During late August, the Miller Complex was one of three large fires being managed on the Rogue River-Siskiyou National Forest by Type 1 and Type 2 IMTs.

"In April and May this year we were told this would be a normal fire season. It's been anything but!"
(Deputy Fire Staff Carl)

"From the time we took the fire I knew we were challenged."
(Incident Commander John)

Accident Narrative

On 27 August 2017, between 1530 and 1545, a contracted Type 6 engine assigned to conduct structure protection assessments on the Miller Complex rolled off Forest Service Road (FSR) 1035. The engine was approaching the intersection of FSR 1035 and County Road 777. Vehicle speed was estimated less than 20 mph. The vehicle drifted to the left side of FSR 1035 and travelled about 200 feet before rolling off the road. The engine rolled 1.5 times down a steep, approximately 30-foot-high embankment into Carberry Creek before coming to rest on its driver's side. Three firefighters were seated in the front of the vehicle at the time of the accident (Driver and Crewmembers 1 and 2).

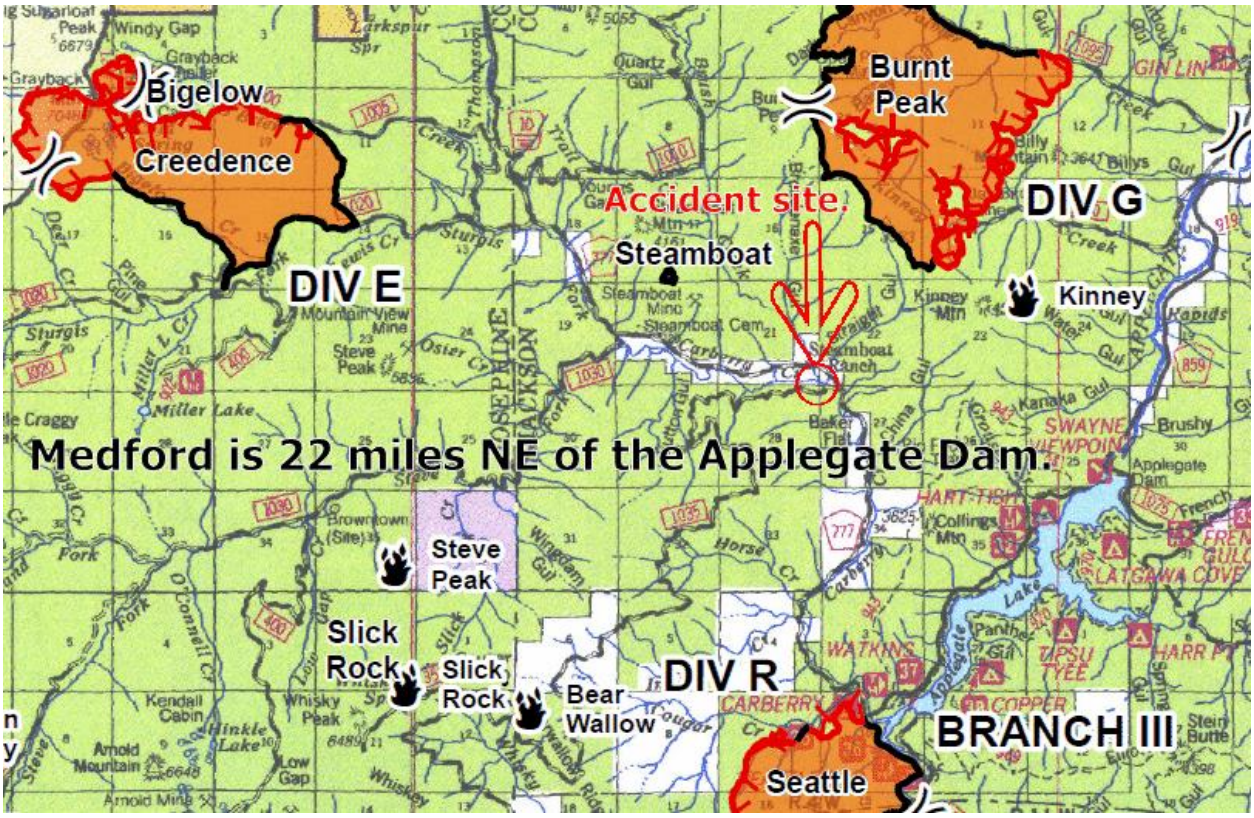
"All I felt was the 350 gallons in my tank shift. The next thing I felt was my head on the roof." (Engine driver Jeff)

Crewmembers 1 and 2 were immediately able to exit the vehicle. The Driver remained trapped in the vehicle and partially submersed in a cold stream, with his left leg pinned underneath the vehicle. The Driver directed Crewmembers 1 and 2 to call for help, however, several attempts to contact help by radio were unsuccessful.

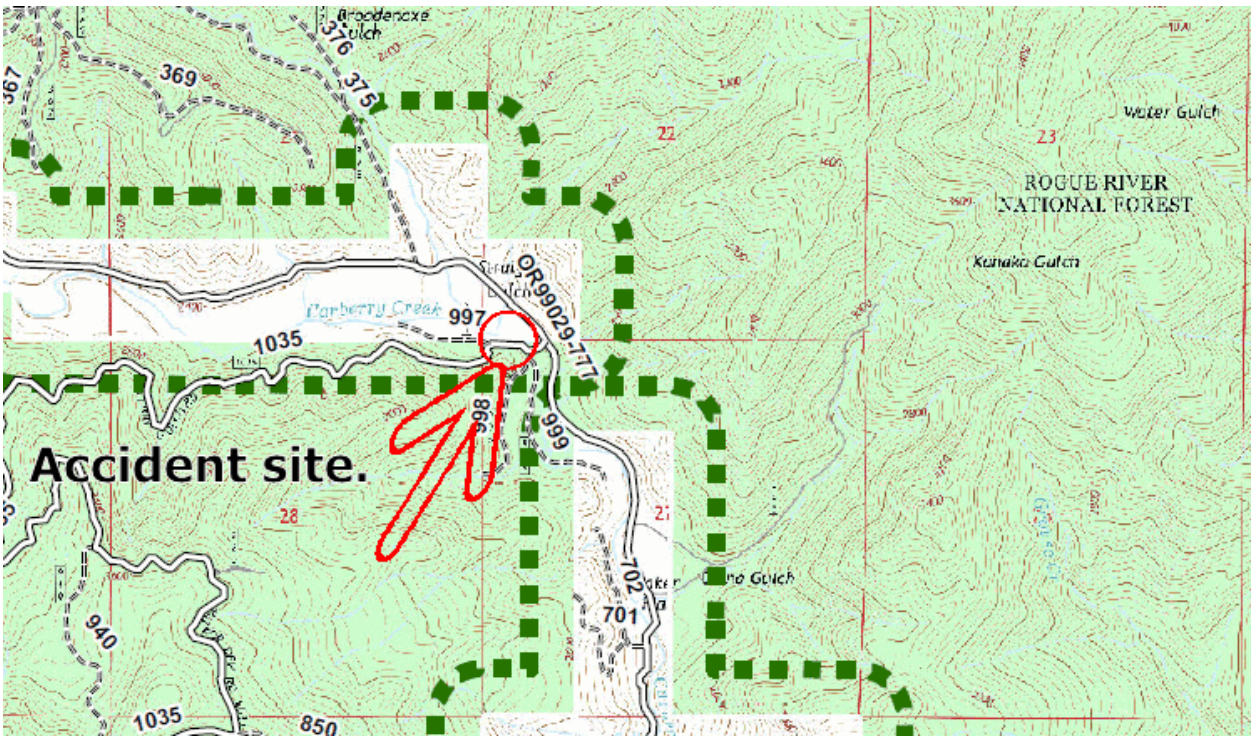
"I've dedicated my life to fighting fire. Some days you win and some days you lose. I'd consider this one a draw." (Engine driver Jeff)

Crewmember 1 was able to walk and search for help and was unsuccessful in contacting two adjacent landowners. Approximately one hour after the accident, Crewmember 1 found a local resident who helped him find a Heavy Equipment Boss (HEQB) assigned to the fire, who was also EMT-B qualified.

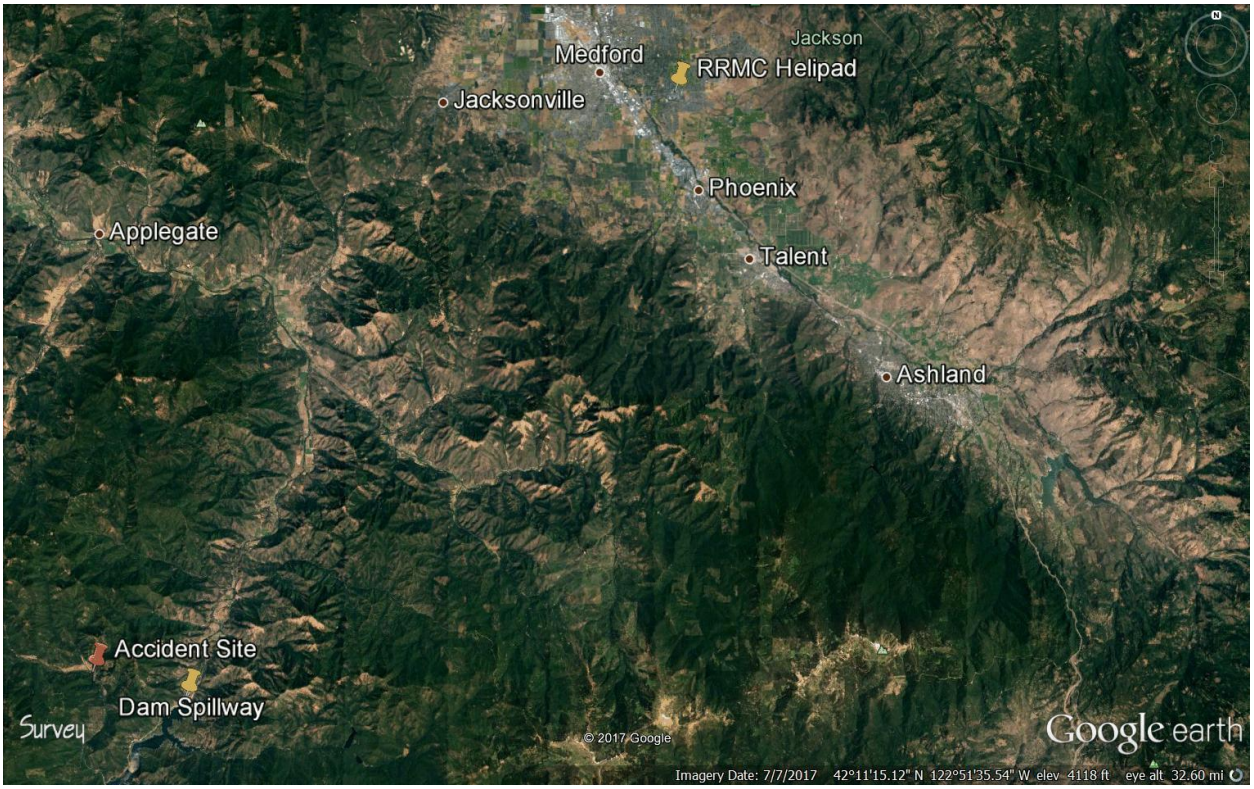
At 1704, the HEQB, who became the Incident-within-Incident Commander (IIC), radioed the news of the rollover to the Incident Management Team (IMT) managing the fire. A local fire district extrication team, paramedics, and multiple IMT resources responded with assistance from a local ranch owner. The IIC used the Incident Command System to efficiently manage 55 personnel involved with the accident response. Extrication required removing the roof of the engine to rescue the driver and using a low-angle rescue team to carry the driver to a nearby landing zone. At 1848 the driver was airlifted to a local hospital, and arrived at 1902. The two crewmembers were also driven by ambulance to the hospital. Crewmembers 1 and 2 were treated and immediately released. The driver remained in the hospital for 20 days with back and leg injuries, including fractured T11 and T12 vertebrae, and a related infection.



Map 1. Vicinity Map including three large fires in the Miller Complex and accident site.



Map 2. Location of accident site.



Map 3. Area map showing Rogue Regional Medical Center, Applegate Dam Spillway, and the Accident Site.

Picture 1. Extraction begins with assistance from local ranch owner. IMT photo credit.

Picture 2. Local fire district on scene with jaws of life to complete extraction. IMT photo credit.

Picture 3. Driver's leg was through their window and pinned under the cab of truck at the driver side window pillar (A pillar). IMT photo credit.

Picture 4. Crewmembers being treated by medics assigned to fire. IMT photo credit.

Picture 5. Driver is packaged and low angle rescue begins. IMT photo credit.

Picture 6. Looking across creek at hose reel and spare tire thrown from engine with truck resting on its side. IMT photo credit.

Picture 7. The FLA Team investigating the accident site.

Picture 8. FLA Team's view looking down to creek at accident site after engine was removed.

Lessons Learned From FLA Participants

- "Before you do a task make sure you're good to go." This quote from the engine driver speaks to staying attentive during wildland fire operations even when performing those potentially perceived as "low risk", such as structure prep and triage far from an active flame front. The deliberate risk assessments produced by the IMT quantified risk related to driving and identified appropriate mitigations. The observation that none of the three engine passengers could explain how the accident occurred suggests how quickly things can go wrong in the fire environment and reiterates the importance of a situational awareness feedback loop.
- The incident command system was invaluable in managing complex medical responses. The use of an IIC and the creation of five branches greatly expedited and facilitated the extraction. The IIC stated "This thing got so big so quick," referring to how quickly resources arrived and how many arrived to the accident response. The use of a staging area director, air contact, extrication team, medical, and litter carry divided those resources into smaller group supervision and oversight.
- There is a need for close coordination with the local dispatch center when trying to locate and manage aerial resources. When the IMT took control of the fire, making contact with local fire departments equipping them with IMT radios at the outset paid off when the accident happened.

- "Having quality people [with accident response] paid off. Having a strong command presence was super helpful." This quote demonstrates the benefit of having collateral duty medical response experience in the wildland fire environment.
- There is a need to stay in radio or cell phone contact at all times. At one point during the extrication the agency administrator was unable to make contacts and immediately after the accident the engine crew could not make radio contact with Division or ICP for over one hour. Communication is one of the anchor points in the LCES model of wildland fire risk management. If the agency administrator is unavailable, consider using a delegated representative to make key notifications.

FLA Team Lessons Learned and Observations

- Regardless of distance or speed of travel, wearing seatbelts will reduce injuries and increase the probability of survival in a motor vehicle accident. At a low rate of speed in a short amount of time things can get away from the operator. The wildland fire environment is dynamic even when not on the active fireline and staying inside a vehicle reduces probability of injury during an accident. Seatbelts are a proven device to reduce the chance of injuries or fatalities and should be worn by all fire resources all the time. Interviews demonstrated a mixed culture on seatbelt use in wildfire situations depending on the task at hand. This FLA demonstrated how quickly a serious accident can occur even while performing relatively mundane tasks over 10 miles away from the active fire.
- It is important to have and train with an incident-within-an-incident plan for those low frequency, high severity occurrences. This IMT has had previous experience with serious accidents and fatalities. They practice following this IWI plan on every incident, sometimes twice per incident with detailed simulations so they are prepared if and when a serious accident occurs. The plan includes a decision-making process and log so all key decisions are tracked, and the plan requires that all communication be over a command channel. On the field side, resources with

> *"We have to ground truth this stuff. If the stuff we are doing in here [in the safety yurt] doesn't make sense on the ground, we shouldn't be doing it." (IMT Safety Riley)*

> *"We are always trying to make ourselves better. We have unfortunately learned from experience." (IMT Safety Riley)*

> *"Had a good plan, safety plan was tight. Had the unfortunate opportunity to exercise that plan."*
> *(Incident Commander John)*

collateral EMS backgrounds can fill the role of IIC and ensure the plan is implemented smoothly on the ground. IMTs may want to consider implementing these practices if not already used.

- In terms of safety oversight, the IMT used deliberate risk assessments for each shift and each division to manage and mitigate risk. Two-way communication between IMT C/G, line leadership, and operational resources was valuable in providing real feedback, rather than just "box-checking" to develop these deliberate risk assessments.

> *"We knew coming in that we were going to have some stuff go bad, or potentially. I told the IC the first night here that we have type 2 crews and engines in Type 1 country. We are going to have injuries. We are mitigating as much as we can. Before this accident there were other vehicle accidents on this fire." (IMT Safety Riley)*

- During times of resource scarcity, divisions may be larger than normal with less overhead present to supervise supporting resources. When direct supervision is reduced, trust must exist between leadership and resources. Clear instructions and leaders intent must be given by line leadership, and must be understood and followed by supporting resources. In this FLA some different perspectives were revealed that questioned whether all resources were in the right place doing the work that was assigned. For instance, some division resources felt the rollover engine was outside of its assigned area and that the engine had been directed to stay out of the area it was in. Other resources felt that the accident occurred close enough (less than ¼ mile) to the assigned area and only a couple hundred yards from where the engine crew ate lunch with overhead.

> *"It's very hard for teams to manage fires when they have no resources." (District Ranger Bonnie)*

- In serious accidents, rapid response and extraction is essential to increase probability of survival (see Dutch Creek protocols). The FLA team determined that it took longer for the accident victims to locate help than it took for ALS to arrive on scene and complete extrication (see timeline). Preliminary information suggests the crew members with minor injuries may not have understood how to communicate over the fire radio system. An opportunity may exist for improved radio training for subordinate resources below the levels of engine boss, crew boss, or squad boss. The FLA process revealed that many resources who receive an Incident Action Plan (IAP) at operational briefings may not pay attention to the communication plan or other relevant parts of the IAP and brief their subordinates with this important information This finding may be a hard truth, possibly related to information overload, and could be further investigated as a programmatic issue outside the scope of this FLA.

- Agency and IMT support at the hospital was very valuable in comforting the injured patients and in strengthening relationships. The local forest delegated two hospital liaisons to interact with the seriously injured patient. In addition the highest level forest line officer/agency administrator was at the hospital to receive the medevac transport of the code red patient. The IMT also sent leadership and followed up by checking on patient's healing progress daily. The hospital liaison worked with the Wildland Firefighter Foundation to arrange transportation for the victim's spouse.

> *"It didn't matter to me whether they were contractor employees, or Forest Service, or Park Service. I show up to the hospital to support them and thank them for the important work they do for the forest." (Forest Supervisor Bruce)*

- The possibilities of integrated training between contractors and agency personnel were explored during this FLA. Some examples were including contractors in local preparedness reviews, fire refreshers, radio trainings, and simulations, including driving proficiency, local road conditions, and potential radio dead spots.
- An issue raised during this FLA was ensuring that Agency representatives do not extend the same expectations to contractors as agency employees. For example, an agency delegation provides agency employees with a level of immunity from reprisal and discipline unless willful disregard for human safety occurs. This assurance is central to the learning and understanding process; however, federal agencies cannot tell contractors and private owner/operators on how to manage their own employees. As more contractors become involved in FLAs and FLA teams this issue may need to be formalized in policy or letter of direction.

> *"Are we asking too much of our contractors? We rely on contractors so much, they are here, we have to use them. What can we do to bring up a level of training? What are the required trainings? We are putting contractors in the place that we might normally put hotshots when we are in the PL 4 or 5." (IMT Safety Riley)*

What Went Well

- Accident Response
    - Air Attack (ATGS) coordination for Medivac. An Air Attack quickly established communications for identifying a landing zone at the incident scene for the MEDIVAC helicopter. Despite not having any visibility at the incident scene, the Air to Ground contact was able to provide coordinates to the ATGS for the Landing Zone.

- An all hands on deck approach (including adjacent landowner who contributed a reciprocating saw and a box of extra blades) to the rescue response (the reciprocating saw worked well before the local Fire District extrication team arrived on scene.
- Use of ICS to manage extraction and medevac. Dividing up the tasks on scene and placing someone in charge of them brought resource management into an appropriate span of control. Using ICS was an effective, efficient way to utilize/coordinate the 55 personnel on scene. As resources completed their tasks, they were either reassigned to other tasks or released back to their original duties on the fire.

- Follow-up support of injured contract firefighters.
  - The Forest Supervisor received the patient at the hospital in the evening and delegated two hospital liaisons to tend to the patient throughout his stay.
  - The Deputy IC and IMT comp/claims also arrived at the hospital on 1st night and continued to interface with the patient.

> *"It is the IC expectation that the team will be there [at the hospital], regardless of [patient] affiliation." (IMT Comp/Claims Bo)*

  - Coordination with the Wildland Fire Foundation to arrange for spouse travel across country to be with seriously injured patient.
- Good coordination and sharing or resources between Oregon & California GACCS for ordering medevac helicopters during the accident response.

> *"I have never, ever, and I mean ever, had someone from a team show up [at the hospital]." (Administrative Officer Dianne)*

  - Daily communications and positive relationships between neighboring dispatch centers about resources helped in the managing the medevac response.
- Local interagency dispatch supported the incident and problem solved.
  - Dispatch center leadership supported problem solving during a multiple emergency event day. The Miller Complex was one of three other medevacs (non-fire) the local dispatch center dealt with on August 27.
  - Empowering and trusting trained people on scene increased the probability of success.
- Buy-in to the FLA process by the contractor and all parties interviewed

- Post-accident integration strengthens communication and promotes learning environment.
- Honesty and professionalism and a desire to learn was observed by the interviewees.
- Involving all levels of resources during the FLA and giving each of those resources a voice brings out many different perspectives to maximize growth and learning in an organization.
- Having a local contractor representative on the FLA team was also important to manage potential agency biases and help identify "blind spots."

FLA Team

Kevin Fecteau, Rogue River – Siskiyou NF Fleet Manager, Automobile Subject Matter Expert

Tim Gonzales, Rogue River – Siskiyou NF Safety Manager, FLA team liaison

David Heard, Peer / Wildland Firefighter Contractor Perspective

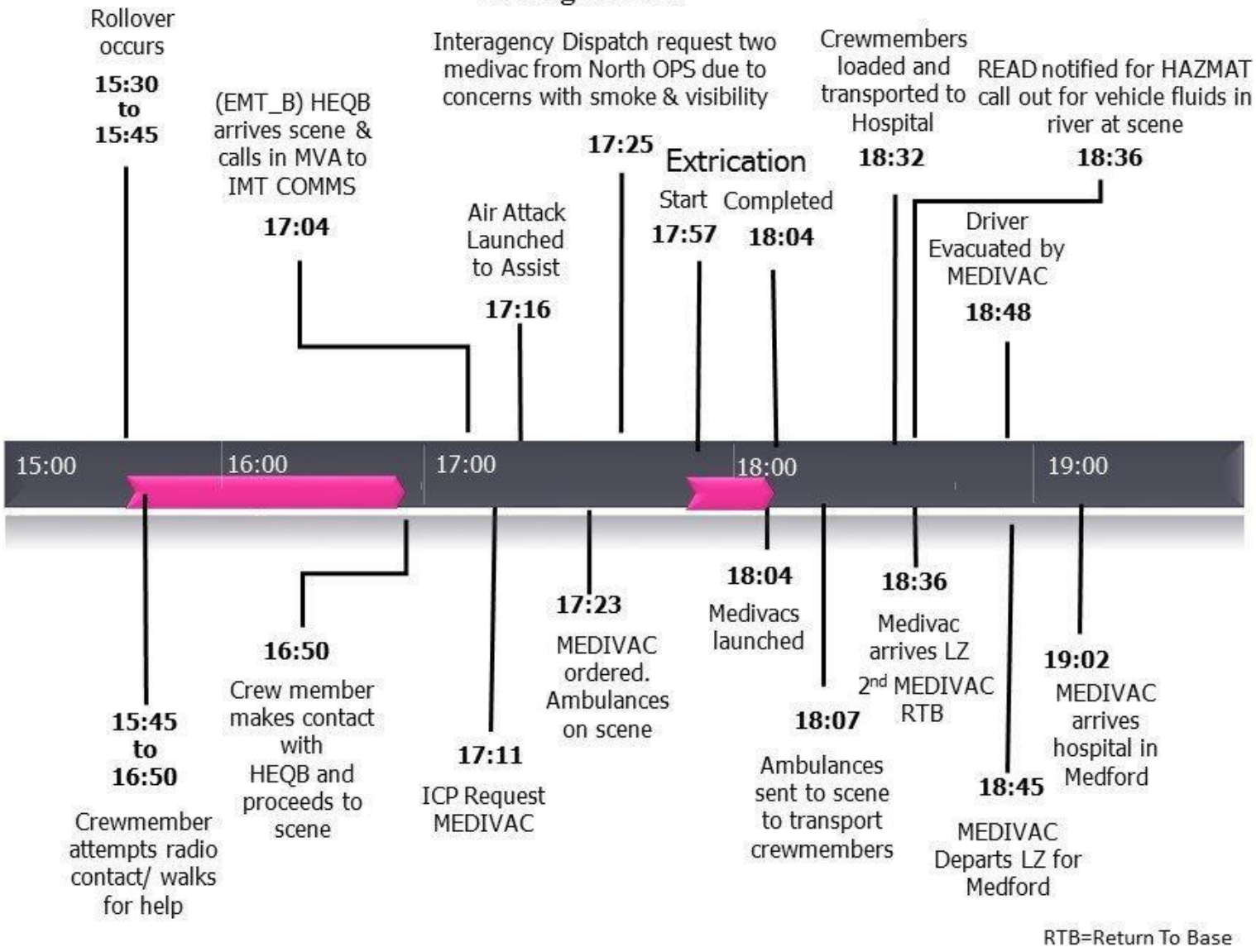
Ian Reid, North Fork John Day District Ranger, Umatilla NF, FLA team lead and lead facilitator

Shelly Steiner, Rogue River – Siskiyou NF Acting Interagency Training Officer, Engine Boss

Nicky Webb Smith, Medford BLM Realty Specialist, Dispatch Subject Matter Expert

Technical reviewers: Alex Viktora and April Barron

Engine Rollover Response Timeline
27 August 2017



RTB=Return To Base