Flat Fire Entrapment

Facilitated Learning Analysis

Entrapment of Firefighters on July 14, 2012

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Introduction and the FLA Process

What follows is a Facilitated Learning Analysis (FLA) report regarding an entrapment of firefighters on the Flat Fire in Northern California on July 14, 2012. A Facilitated Learning Analysis is a process used to capture salient factors of an event, helping participants and others see more deeply into future events; to make more informed decisions in the future. An FLA Team met with the crew involved on July 16, 2012.

As a means of introduction to the group, the participants of the Flat Fire entrapment event revisited the area on Division Z after the near miss event on the ground with the FLA Team. An open, forthright discussion of perspectives of the incident and reconstruction of the event helped Crewmembers, the FLA Team, and others to make sense of the unintended outcome of July 14, 2012. The intent of this analysis is to gain an understanding of the conditions that affected the

thoughts, decisions, and actions of the persons involved. We intentionally avoid finding fault and placing blame, as this often blocks opportunities to learn from the event. One goal is to use this event to aid firefighters in recognition of early developing situations and allowing firefighters to make decisions that will prevent near misses, accidents, and injuries on future fires. The details brought about in this report are meant to foster a learning environment across the firefighter community in order to prevent injuries and loss of life in the future. The single most important focus of the FLA is to have a facilitated dialogue with the participants of the event to learn why the decisions and actions of persons involved made sense to them at the time. Knowing why the persons involved did what they did can provide lessons learned to others without having to venture through a similar portal. If the perceptions, interpretations, decisions, and actions leading up to an accident made sense to qualified employees, then other employees could make similar decisions with similar or worse outcomes. Previous experience with accident investigations resulted in an initial reticence on the part of some members of the incident organization, once the purpose and intent of the FLA process was explained their concerns were mitigated.

This report contains a depiction of the conditions in which the event occurred, the location of the fire, a summary of the event, lessons learned that were identified by the participants, and several emphasis items that the FLA identified based on observations and conversations. Realizing that every fire incident is unique, the focus of the Facilitated Learning Analysis is not the Flat Fire, or the previous fire you fought, but the next fire you are about to fight.

It is hoped that firefighters will use the “Event Summary” narrative, the “Lessons Learned” and “Discussion Points” (either stand alone or together as time allows) during safety briefings and training sessions. A sand table can be used to help tell the story. For an interactive depiction of the landscape in which this event occurred, with constructed fire lines, fire perimeters, and landmarks, visit the Geospatial Equipment Technology and Applications Group Facilitated Learning Analysis Google Library at http://geta.firenet.gov/training/flag-library/20120714FlatFireEntrapment.kmz and select documents under the title “Flat Fire Entrapment”.

Note: No names will be submitted in this report. Again, the objective is to provide take home lessons to the wildland firefighter community with the focus on the next fire we fight.

Chronology of Events

July 11, 2012

1703 Flat Fire ignition reported.

1830 Flat Fire estimated to be 300 acres.

July 13, 2012

0600 Flat Fire command transferred to a Type 2 Incident Management Team, Flat Fire estimated to be 1,066 acres.

July 14, 2012

1400 Engine 1 arrives at ICP and receives briefing.

1430 Engine 1 departs ICP for staging at Del Loma.

1635 Slopovers reported on Division Z and units requested for suppression.

~1640 Engine 1 arrives at the slopover on Division Z.

1655 All units on Division Z begin moving to DP-2 after fire runs at Division Z line and entrapment occurs.

July 15, 2012

Engine 1 is transported off of the fireline by trailer to a repair facility.

July 16, 2012

1200 FLA Team arrives at the incident for in briefing.

July 17, 2012

Light rain falls on the area throughout the day.

1800 Flat Fire contained at 1,688 acres.

July 18, 2012

0600 Flat Fire command transferred to a Type 3 Incident Organization.

July 20, 2012

0700 Flat Fire command transferred to a Type 4 Incident Commander.

Fire Behavior Forecast for July 14, 2012, issued July 13, 2012 at 1700 hours

- Temperature: 96
- Minimum Relative Humidity: 26 to 29% and 40 to 50% under smoke
- Wind (at eye level): Light becoming 2 to 5 mph from southwest in the afternoon with gusts to 10 mph

General Fire Behavior:

- Light timber litter will see head fire spread rates near 10 chains/hour with approximately 4 foot flame lengths.
- Grass rates of spread could reach 60 to 70 chains/hour with flame lengths near 7 to 8 feet.
- Backing/flanking rates of spread approaching 2 chains/hour with 2 foot flame lengths.
- Spotting distance approximately a quarter mile.
- ERC is forecast at 66 for the Northwestern Mountains which is near average for this time of year.
- BI for the Shasta-Trinity National Forest is forecast at 56 which is near average for this time of year.
- Fine Fuel Moisture for today is 5% in clear air and 10% beneath smoke.
- Probability of ignition is 60% in clear air and 30% under the smoke.
- Live fuel moisture measured on 7/7/2012 in the manzanita is 140%.

Specific Fire Behavior:

- All Divisions: There is the possibility of some single-tree torching where consumption of jack-pots or ladder fuels generate sufficient intensity. Light winds have kept the fire area smoked in and helped to shade fuels. The fire continues to spread mostly in the conifer and deciduous tree litter. Some of the madrones have already begun to shed their leaves about four weeks early. Live fuel moistures in the brush are acting as a heat sink to help reduce fire spread. Rollout remains a concern with the steep slopes.
- Highlight: When the inversion lifts expect the fire to become much more active and have higher rates of spread.

Air Operations: Smoke may remain above the fire reducing visibility. This may work to limit the use of aircraft.

Safety: Generally, fire behavior has been slope driven. Where the wind over powers the slope or blows up slope you could expect a rapid change in fire spread direction and a sudden increase in fire behavior.

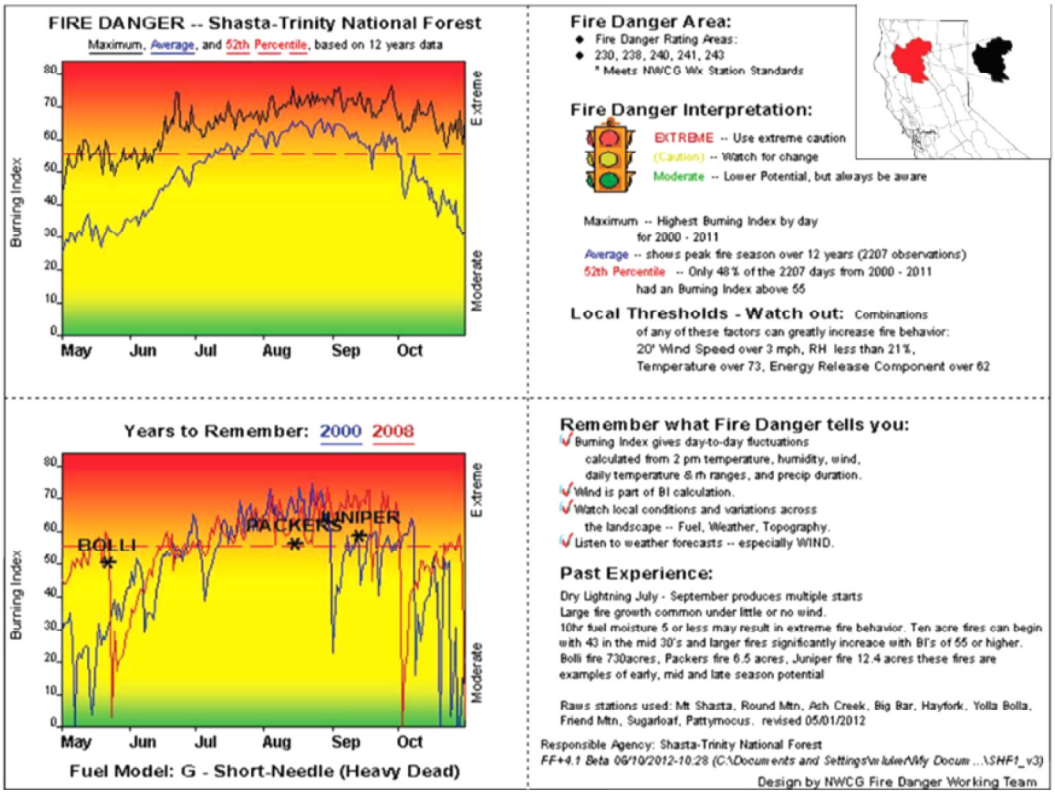

Figure 1. Fire danger pocket card for the Shasta-Trinity National Forest.

Event Summary

In mid-July 2012, northwestern California was experiencing seasonably hot and dry weather after a winter of below normal precipitation and a mild spring.

At approximately 1703 on July 11, 2012, two fires ignite adjacent to Highway 299 near Del Loma, California. One of these two fires is quickly contained and kept to 0.3 acres. The other fire is already 5 acres in size and rapidly spreading when the first engine arrives on scene. Additional resources are ordered to suppress the fire. By 2030, the fire is 300 acres and burning in timber with hardwood understory and grass on extremely rugged terrain, north of Highway 299 and the Trinity River and south of the Trinity Alps Wilderness. This part of the Shasta-Trinity National Forest is no stranger to significant fire activity, including the Iron Complex in 2008, the Pigeon Fire and Junction Fire in 2006, the Del Loma Fire in 2003, the Oregon Fire in 2001, and the Bar Complex in 1999, among others.

On July 12, a Type 2 Incident Management Team and additional firefighting resources are ordered. A southern California engine strike team departs their home unit on July 13 and spends the night in Willows, California in route. On July 14, continuing the trip to the incident, one engine from the strike team experiences mechanical issues and stops in Redding, California for repairs while the remaining four engines from the strike team continue on to the incident and arrive at the Incident Command Post (ICP) at approximately 1100 and receive a briefing from the Planning Operations Chief. Two engines are assigned to Division Z and two engines are assigned to the Structure Group on Division A. See Figure 2 for the Incident Action Plan Map for the July 14 operational period.

The operational plan for July 14 is to continue structure protection along Highway 299 and in Del Loma, improve and hold existing control lines on Division A, and construct indirect line and begin burn out operations on Divisions B and Z. Burn out operations begin at the Division A and B break, moving east towards Division Z and then south towards Drop Point (DP)-2. On Division Z, a Division Supervisor trainee (DIVS Z (T)) is assigned along with the Division Supervisor (DIVS Z). DIVS Z mainly oversees firing operations north of DP-2 while DIVS Z (T) oversees line preparation occurring south of DP-2 and down to Highway 299, including completion of hoselay from DP-6 to Highway 299. Division Z from DP-2 to Highway 299 is a long, narrow ridgeline with a dirt road (the B spur) running from DP-2 to DP-6 that is used for the fireline and is supplemented by a dozer line along part of it.

An Interagency Hotshot Crew (IHC) is assigned to Division Z (along with other units) and involved in the burn out operation as well as scouting the fire edge along Pelletreau Creek to the west of the fireline. After observing movement of the fire across Pelletreau Creek, the IHC Superintendent positions Squads along Division Z to help protect the fireline in case it is threatened by the fire if it were to run up from Pelletreau Creek, including a Squad positioned between DP-2 and DP-6.

At approximately 1400 on July 14, the fifth engine (Engine 1) from the strike team arrives at the ICP after completing repairs and receives a briefing from the Planning Operations Chief. This engine is then assigned to Division B and departs from the incident command post at approximately 1430. At about 1600, Engine 1 reaches DP-2. The fireline between DP-2 and Division B has a slopover and Engine 1 is directed to wait at DP-2.

At 1635, DIVS Z (T) observes a tree torching on the B spur road resulting in another slopover on the B spur on Division Z that he estimates to be 3 to 4 acres. DIVS Z (T) requests multiple units to contain this slopover. Engine 1 and a dozer staged at DP-2, and an engine from DP-6 (Engine 2) are assigned to this slopover by DIVS Z. Engine 1 arrives at the slopover within minutes and DIVS Z (T) asks Engine 1 to position the engine so that the B spur will remain open for vehicle traffic, which Engine 1 does by positioning the engine facing north against a cut bank on the west edge of the B spur. There is another cut bank on the west edge of the B spur about 200 feet to the south of the position of Engine 1.

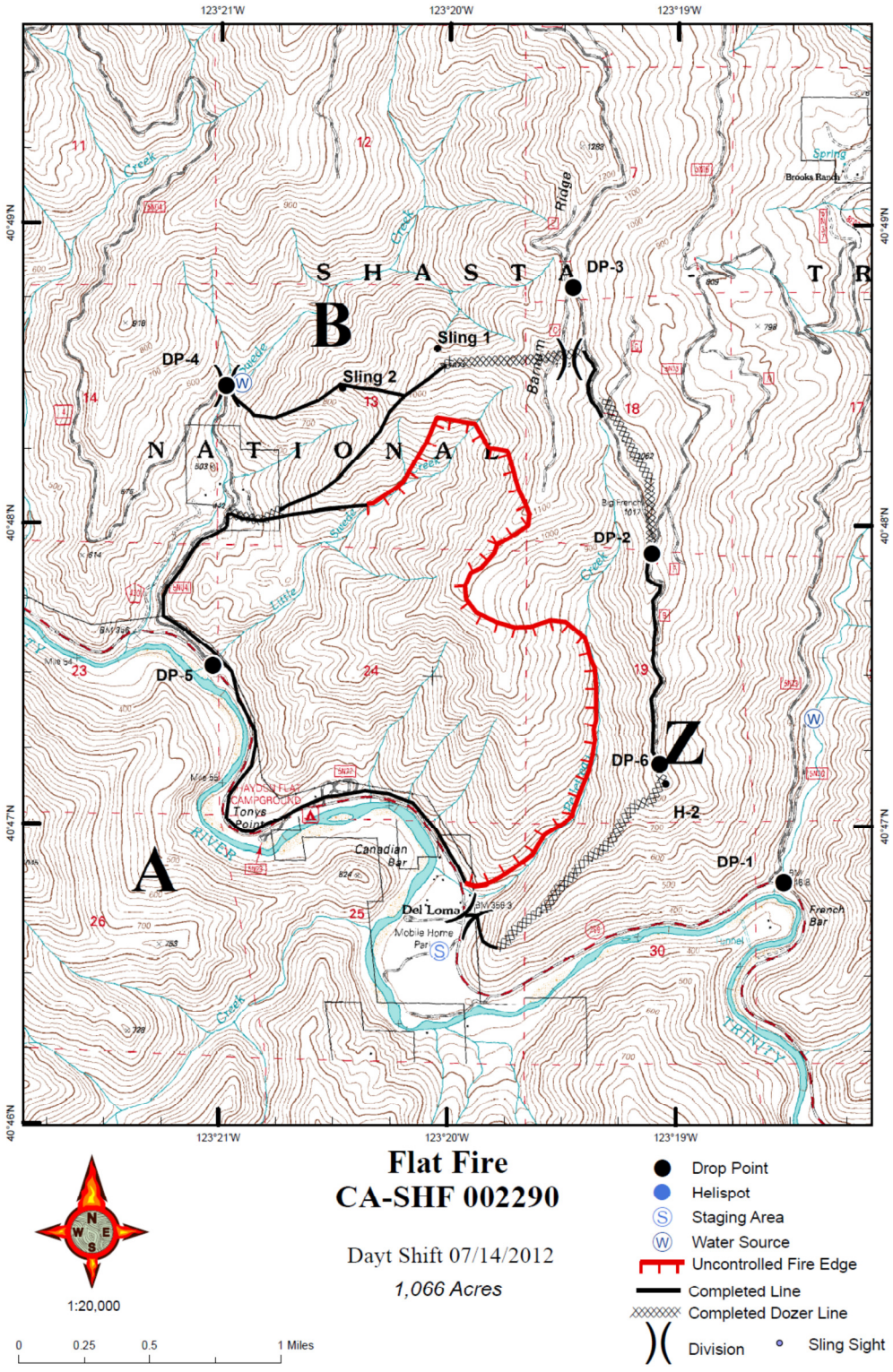

Figure 2. Incident Action Plan (IAP) Map for the July 14 operational period showing the fire perimeter and established firelines as of the evening of July 13, 2012. Contours are 20 meter intervals (3.28 feet per meter).

The Fire Engine Operator (FEO) is the Engine Boss (ENGB) on Engine 1 (The Engine 1 Captain was assigned as the Strike Team Leader before departing their home unit for the incident). Sizing up the slopover, the ENGB estimates the slopover to be about 0.25 acres with minimal fire behavior and one foot flame lengths at this point. He also observes smoke coming up and over the ridge from Pelletreau Creek and down to the drainage. The escape route is identified as the hoselay, back to the engine, and then up the B spur to the safety zone at DP-2. The Assistant Fire Engine Operator (AFEO) from Engine 1 is functioning as the Engine Operator (ENOP) and is assigned to stay with the engine and to act as a lookout for the engine crew, while the ENGB and the three other engine crewmembers begin work on a progressive hoselay downhill along the south end of the slopover. The ENGB expects that another engine will begin working the slopover from the north side so the slopover could be pinched off. In reality, the dozer begins working down the north flank of the slopover from the B spur. See figures 3 and 4 for a map and aerial imagery showing the burned area before and after the slopover and fire runs, as well as firelines and other landmarks.

Knowing that there is limited turning space for vehicles, the Engine 2 Captain walks ahead of the engine, up the B spur to the south of Engine 1 and the slopover to size up the situation. The Engine 2 Captain observes that the fire is making a run up the hill from Pelletreau Creek and informs DIVS Z (T) and also radios Engine 1 but receives no acknowledgement from Engine 1. Engine 2 remains to the south of the slopover on the B spur to wait until fire behavior moderates.

The DIVS Z (T) and the Division Z Safety Officer are also positioned near Engine 1. Within minutes, Engine 1 completes a 300 foot hoselay and one crewmember goes back to the engine and returns with a hosepack. Hearing increased radio traffic from units below DP-2 on Division Z, DIVS Z drives south on the B spur to assess the situation and continues past Engine 1 while the crewmember is at the engine retrieving the hosepack. DIVS Z continues past and reaches the other units to the south of Engine 1.

At this point, there is significant radio traffic on Command, Division Tactical (Tac), and Air to Ground channels due to increased activity on the incident. At 1640, a bee sting with an allergic reaction is reported to Communications and an evacuation is begun for the patient. In addition, there are two helicopters working to control the fire perimeter at Pelletreau Creek using bucket drops. The bucket on one helicopter malfunctions, leaving one helicopter, which is not sufficient to hold the fire at Pelletreau Creek. These events, along with the planned operations, create heavy radio traffic.

The fire makes a run up from Pelletreau Creek, hitting the B spur about 200 feet south of the location of Engine 1 where the IHC squad is positioned. Trees start torching along the B spur and ignite a small spot fire to the east of the B spur, near the IHC squad.

The fire begins to make another run up the hill from Pelletreau Creek towards the location of Engine 1 and the IHC Squad Boss begins defensive lighting of the line along the west side of B spur, starting from the cut bank about 200 feet south of Engine 1 and continuing north just past Engine 1 with the objective of reducing the fire intensity and protecting the fireline as well as Engine 1. The Engine 1 ENOP takes substantial heat from the fire run and takes shelter in the engine, then gets out and begins defensive engine protection with a 1.5 inch hose. This run hits the fireline and ignites additional spot fires east of the B spur to the south and east of the position of the Engine 1 crew and the original slopover. Flame lengths and rate of spread on these fires increase dramatically. The amounts of smoke and noise on the B spur increase also with the increased fire behavior making communication over short distances nearly impossible. The Engine 1 ENGB calls DIVS Z (T) and states that they are abandoning the hoselay. This transmission is heard by Engine 2 and the engine Strike Team Leader and Strike Team Leader trainee (who are driving up French Creek Road towards DP-2). DIVS Z (T) responds saying that he had been trying to contact the ENGB to advise them to withdraw from their position because of increasing fire behavior, but was unable due to the high level of radio traffic. Radio traffic on Division Tac only pauses briefly and then resumes to being almost continuous.

> "I went into survival mode."
> –Engine 1 ENOP

The Engine 1 ENGB and the crew begin to rapidly withdraw back up the slope towards the engine as the fire closes around them. The ground is wet and slippery with foam from the initial suppression efforts and the slope is about 30 percent. The ENGB considers escaping downhill and rejects this option because it would mean leaving the ENOP in a hazardous position. As the crew moves uphill towards the engine, fire downhill of them continues to close, compromising a downhill escape route.

The ENOP considers cutting the hoselay and escaping in the engine and rejects this option because it would mean cutting off the water supply to the crew's hoselay, leaving them without protection. The ENOP continues defensive engine protection.

> "I went into robot mode, then lockdown mode."
> –Engine 1 ENOP

The fire makes another run up from Pelletreau Creek and the fire to the east of the B spur closes to block the escape route of the Engine 1 crew while the crew is about 30 feet from the road, creating an entrapment. Visiting the site after the incident, a member of the crew stated, "I thought that I was going to die, right here." After a moment, the fire ahead of the entrapped crew burns through the trunk line on the hoselay spraying water on the fire and creating an opening for the crew to escape back to the engine.

> "30 feet from the road, our path to the road was blocked by heat and flame."
> –Engine 1 ENGB

As the crew reaches the B spur, there is a large pine torching next to Engine 1 and the front left tire is burning along with vegetation next to it, making their position at the engine untenable. The ENGB transmits over Division Tac that the channel be cleared for emergency traffic, and then calls DIVS Z (T) on Division Tac requesting additional resources and states Engine 1 is on fire and that he is abandoning the engine. All five crewmembers from Engine 1 walk north up the B spur about 150 or 200 feet until they reach cooler air and less smoke. DIVS Z (T) calls the Engine 1 ENGB and confirms that the Engine 1 crew is accounted for and there are no injuries. Three crew members from Engine 1 then move west to the black and onto the dozer line. Hearing the declaration of "emergency traffic" from Engine 1, DIVS Z returns to the engine, which is still running but is abandoned. At this point, the fire behavior has moderated dramatically. He backs the engine off the burning vegetation into the road and then continues to DP-2. The IHC Superintendent drives down from DP-2 and sees the ENGB and ENOP on the B spur. He takes the ENOP back to the engine (and the ENGB follows on foot) and together they extinguish the burning tire with a fire extinguisher from Engine 1 and the pump on the superintendent's vehicle, check the engine for additional fire and damage, and then move the engine onto the dozer line. The five Engine 1 crewmembers re-gather at Engine 1 and then go to DP-2. At 1655, DIVS Z (T) takes the remaining units (Engine 2, Division Safety, and the IHC Squad) to gather at DP-2.

Entrapment

An entrapment is a situation where personnel are unexpectedly caught in a fire behavior related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. Entrapment may or may not include deployment of a fire shelter for its intended purpose. Entrapment may result in a serious wildland fire accident, a wildland fire accident, or a near-miss. *NFES 2724, Interagency Standards for Fire and Fire Aviation Operations 2012.*

At 1710, DIVS Z requests that two medics move to DP-2 to evaluate the Engine 1 crew. The crew has no apparent injuries and decline further medical treatment. The Engine 1 crew is transported back to ICP where they are debriefed by the IMT Safety Officer and again offered medical treatment and critical incident stress management, which they decline. Engine 1 remains in place on the dozer line until late the next day when it was transported to a repair facility by lo-boy trailer due to the unknown condition of critical safety systems on the engine. The incident management team follows their incident within an incident protocol and makes the proper notifications. A review of this incident is recommended and the FLA Team is mobilized by the Regional Office.

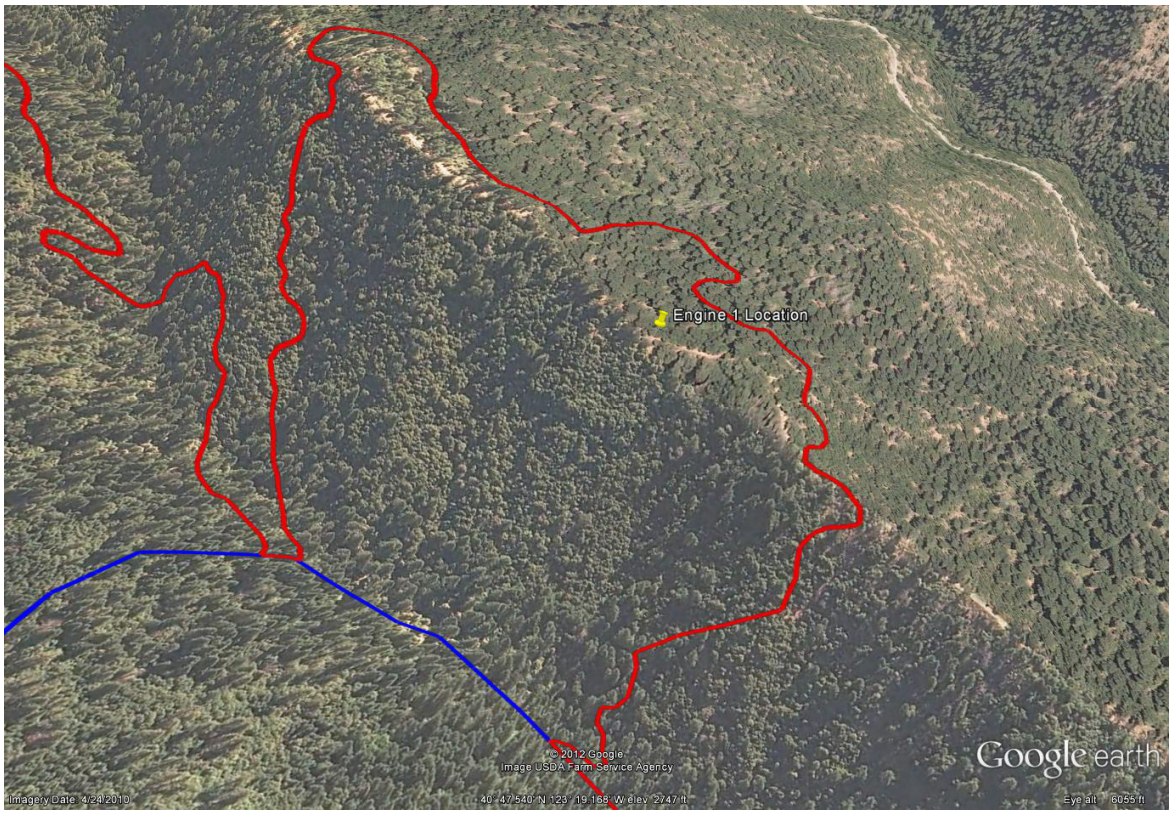

Figure 3. Aerial image with terrain showing location of Engine 1, the fire perimeter (in blue) on July 13, 2012 at the edge of Pelletreau Creek and the fire perimeter (in red) at 2137 on July 14, 2012 after the fire made runs and crossed the B spur on Division Z. For an interactive depiction of the landscape in which this event occurred, with constructed fire lines, fire perimeters, and landmarks, visit the Geospatial Equipment Technology and Applications Group Facilitated Learning Analysis Google Library at http://geta.firenet.gov/training/flag-library/20120714FlatFireEntrapment.kmz.

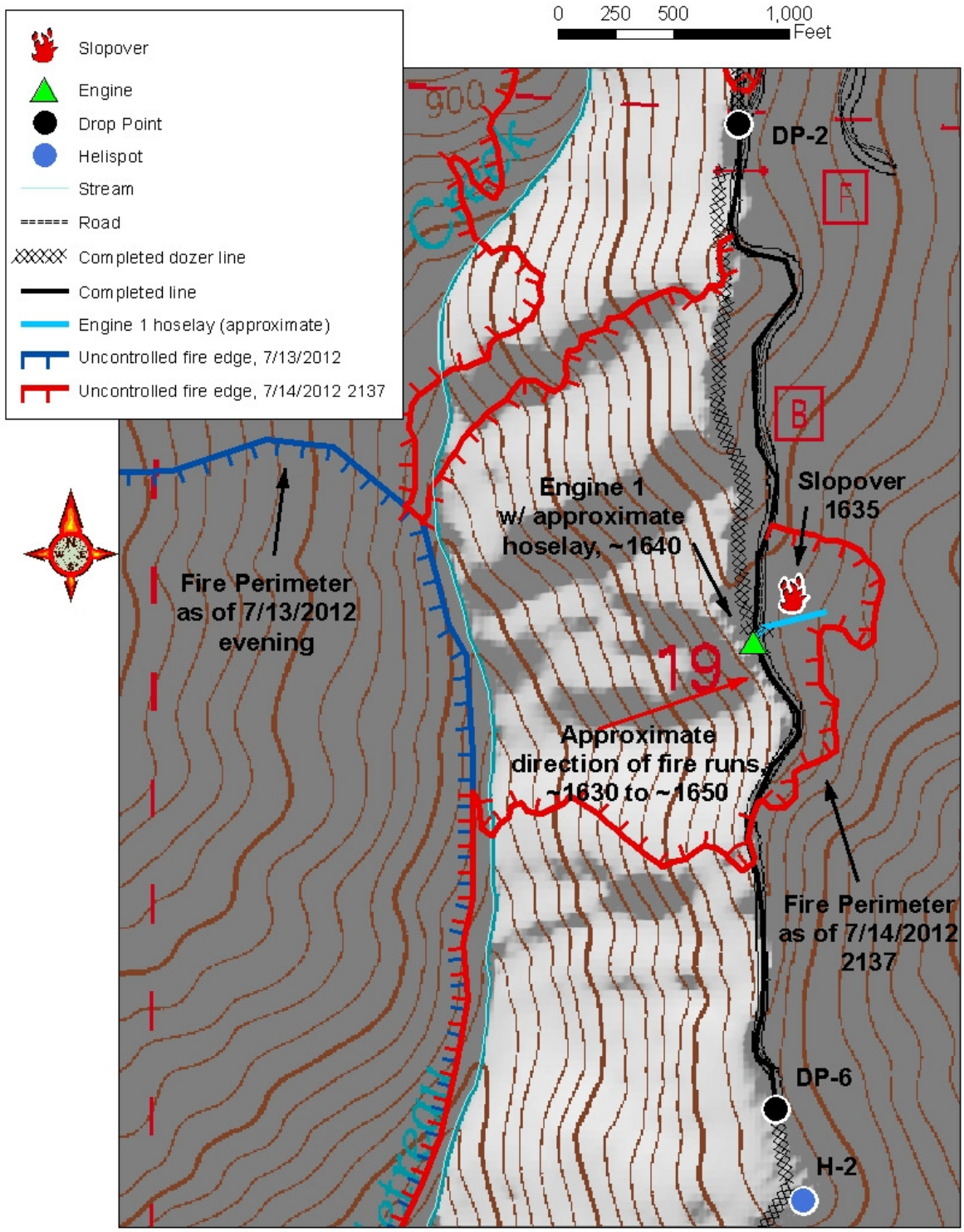

Figure 4. Area map showing constructed firelines around the incident, the fire perimeter as of July 13, 2013 (in blue) along the west side of Pelletreau Creek, and the fire perimeter as of 2137 hours on July 14, 2012 (in red) after the fire made runs and crossed the B spur on Division Z. Contours are 20 meter intervals (3.28 feet per meter).

Human Performance

The following is taken from the Human Organization Potential (HŌP), Define Every-day Work and Margin of Maneuver briefing papers introduced by Ivan Pupulidy, US Forest Service Human Performance Specialist.

Every-day Work: Many organizations believe that accidents and incidents are windows into normal operations. In actuality accidents and incidents represent anomalies. Over 98% of the time our operations or missions are completed without incident or accident. It is therefore critically important to determine or define what every-day work is. We understand that our workforce conducts operations in dynamic and complex environments that defy prediction. The remarkable success rate of workers points to their ability to adapt in the face of the constantly changing environment of wildland fire.

We want to understand how the circumstances or conditions influenced the actions of the crew of Engine 1. What did they perceive to be true that resulted in the way(s) they adapted to the conditions? The engine crew was asked when did they perceive changes in the work environment, how did it change, how that change was recognized and how the plan of action (which had been in place) was adapted (or changed) to meet the demands of the situation.

Margin of Maneuver (MOM): The idea is that, in hindsight, crews can discuss the conditions they observed during an operation in order to take advantage of hindsight or the knowledge of what actually transpired. This is done by asking, "What did the conditions do to change our strategy or tactics; where could we have been more aggressive or where should we have taken a tactical pause?" The idea is to enhance learning from the event by activating retrospection (hindsight) as a positive tool. The post mission analytical framework is considered to be one way to actively discuss the changes in the environment and to collectively build experience rapidly.

Margin of Maneuver is designed to be an open and generative process, designed to accelerate learning from the event through dialogue. High Reliability Organizing (HRO) principles are reflected throughout MOM, these include *Resisting Oversimplification*, *Sensitivity to Operations*, increasing the *Capability of Resilience*, Tracking Small Failures (and successes) and taking advantage of *Shifting Locations of Expertise*.

In complex work environments, like wildland firefighting there is often no "right" answer and judging decisions as "good or bad" is often determined by the outcome of the event. Understanding how the conditions influenced the crew offers insight into judgment, decision-making and sense-making, and results in enhanced learning. The key to prevention of adverse outcomes and strengthening successes of every-day work understands how and why people perform the way that they do. We believe that crews already minimize risk and maximize margins as part of normal work.

Normal work is what we do every day

- Moving overhead to support fire suppression operations and employee development is normal work within the capability of the module when adequate depth is present. For this fire assignment, the Captain of Engine 1 was assigned as the Strike Team Leader. This resulted in the FEO becoming the Engine Boss (ENGB) and the AFEO became the Engine Operator (ENOP). All employees were qualified for the positions they were assigned. This is a common occurrence within the standard module configuration. This is an important part of our system, to facilitate career development and meet Interagency Fire Program Management (IFPM) requirements for fireline leaders. In order to meet agency imposed training requirements, we routinely move employees into the next higher position for career development opportunities. This is considered "Every-day work".
- Four engines from the Strike Team arrived on the incident prior to Engine 1 and received a briefing and an assignment from the Planning Operations Chief. Engine 1 had a mechanical problem that was resolved in Redding, which caused them to arrive at the ICP at approximately 1400. Engine 1 received a briefing from the Planning Operation Chief. Engine 1 was assigned to Division B and arrived at DP-2 in time to be reassigned to Division Z to assist in containing a slopover along the B spur. They were instructed to report to DIVS Z (T) for an assignment. When they met DIVS Z (T) they were given a briefing and went to work. In hindsight, the ENGB stated, "next time I will take the time to evaluate the situation more thoroughly and take the time to develop situational awareness". Engine 1 was the last engine in the Strike Team to arrive on the incident. Time of day is also a consideration. 1600 hours is a critical time during the burning period in this part of the country. This incident was coming into alignment with time of day, slope and wind to produce the increased fire behavior that occurred.
- Engine 1 arrived at the slopover, and received instructions from DIVS Z (T). The ENGB sized up the situation, briefed the crew, established LCES and they went to work. This was viewed as a simply normal operation. There was minimal smoke in the area and fire behavior was described as minimal as well. Flame lengths were less than one foot in the entire area of the slopover. It didn't take long for this to change. Within minutes the fire environment changed drastically as embers from torching trees above the crew began to land in the area where they were working. As embers landed they immediately ignited ground fuels. The ENGB stated "it was like embers landing in gasoline". The ENGB recognized the changing conditions immediately and told the crew to return to the engine. The ENGB considered withdrawing to the east, downhill to the French Creek Road. This idea was quickly abandoned, as he didn't want to leave anyone behind, knowing that the ENOP was on the road, and not knowing what conditions he was facing at the engine. With this in mind the crew continued up the line towards the B spur road and the engine. Once the escape route was compromised the ENGB began to reconsider the alternate plan, to withdraw down slope towards French Creek Road. As the ENGB was making this determination, conditions changed. The trunk line supplying water to the hose lay

ruptured and extinguished the flames blocking the crew's egress to the road allowing the crew to proceed safely to the B spur.

- "The Escape Route is back up the hose lay to the engine and then out to the drop point". This is common practice amongst engine crews. The ENGB felt LCES was in place. However, he did not have an Identified, Dedicated, Empowered, Accountable, Lookout, (IDEAL) Lookout. (See IDEAL Lookout below) The ENOP was assigned as the lookout along with Engine Operator duties, which quickly took precedence as the situation changed for the ENOP. He became focused on protecting the engine. He had a decision to make ("Fight or Flight"). The decision made by the ENOP was to stay and fight to protect the engine. The decision could have been to drive off in the engine however this could have endangered the crew by leaving them without the advantage of the hoselay. The ENOP took aggressive action to protect the engine from a nearby flare-up. As a result of this the rest of the crew was left without a dedicated lookout because the ENOPs attention was focused now on the task at hand; protecting the engine that he had worked on for nine years. It is a common practice to assign lookout duties to an Engine Operator.

Readiness

The 2010 and 2011 fire seasons were relatively slow in the Pacific Southwest Region. This was the first off forest fire assignment for Engine 1 in the 2012 fire season. Engine 1 had two fires in their local response area this year. The ENGB has ten years' experience working for various wildland fire agencies, and was hired into his current position in January of 2012. The crew felt that crew cohesion was a positive factor as they had drilled on entrapment avoidance earlier this year. They felt entrapment avoidance training contributed to their success that day

Recognize your limitations

A fully qualified Division Supervisor arrived on the incident, and prior to being assigned asked if he could be assigned as a trainee. The DIVS asked to be assigned as a trainee because he had never been on a timber fire in Northern California and was unfamiliar with local conditions. He felt the need to spend some time with a skilled DIVS to become familiar with strategy and tactics in this fuel type. This is a rare occurrence. Oftentimes egos won't allow us to recognize our limitations. This DIVS had the wisdom to recognize that he wasn't in a familiar situation and wasn't ashamed to ask for an assignment as a Division Supervisor trainee. This is exemplar behavior. The humility of this action may have had a significant positive effect in the outcome of this incident.

Fear of reprisal

The ENGB said, "I thought someone was going to show up, turn me upside down, shake the change out of my pockets and ruin my career." The ENGB and crew were not sure what was going to happen to them as a result of this incident. They were not familiar with the FLA process and had never been involved in an FLA before. There was fear and uncertainty as to where this

process was going. This is common amongst those who have experienced an unexpected, undesirable outcome. It is normal to fear the unknown; however, this sense of unease can have a deleterious effect on the cohesion of our missions. “Fear of reprisal” is a topic of concern in all literature regarding HRO, System Safety and Resilience Engineering. Significant effort should be undertaken at a national level to address this issue. Locally, it is incumbent on fireline leaders to mentor our employees and explain what may occur in these situations.

Margin of Maneuver (MOM)

As the crew began their assignment their Margin of Maneuver was broad. As fire conditions changed the MOM began to reduce exponentially. As the crew withdrew up the fireline to the road, the MOM was reduced drastically as they encountered a “wall of flames” less than thirty feet from the road. The ENGB did have an alternate plan of escape, by returning back downhill and out to the French Creek Road. This provided resilience to their plan. The ENGB quickly recognized that the fire behavior was escalating and the crew would not be able to control the numerous spot fires. This prompted a rapid withdrawal up the hoselay to the road. Early recognition of the changing conditions contributed to the success of this crew. In past events on wildland fires, it was minutes if not seconds that made the difference in the outcome.

Tactical Channel Chatter

Many incidents are plagued by “too much chatter on the Tactical Net”. In this situation the ENGB reported “Emergency Traffic” on the Tac Net. Radio traffic slowed for a moment then resumed its high tempo. Fireline leaders should continue to mentor employees regarding radio discipline. IMTs may want to consider setting up an alternate Tac channel similar to the “Air Guard” channel in the radio programing scheme to allow for priority traffic to be heard by all. Having an alternate Tac to allow those not involved in the incident the ability to move to an alternate Tac channel and leave those involved on the channel they are operating on. Other options could be explored. We could learn from our cooperators in the municipal fire departments that practice Rapid Intervention Crew/Company (RIC) operations (see Attachment 1).

Lessons Learned

The following lessons learned were compiled from discussions with incident Firefighters, Division Supervisor, Division Supervisor (T), Strike Team Leader, Division Safety Officer, IHC Superintendent and IHC crew members.

Lessons Learned from the Firefighters: These lessons learned were identified by the firefighters involved in the incident and include lessons on things that went really well and things

that could be improved upon. These lessons learned tend to fall in three general themes of Preparation and Training, Situational Awareness, and Communications.

Preparation and Training:

The thorough preparation and training of the crew involved contributed to a positive outcome for this event and these lessons learned include some of those things that went well.

- Crew cohesion training at the beginning of the season and during refresher training can become vital during those intense moments on the fire ground. Quality crew cohesion enables firefighters to work and stay together even during a very stressful fire environment.
- Repetitive scenario based training provides a strong foundation to overcome the stress of an intense fire situation.
- Arduous physical fitness training programs based on real life situations helped firefighters to be physically prepared for unusual fireline moments. The combination of these training exercises helps to create muscle memory of crucial fireline tasks that may otherwise become impossible for an individual to perform while under extreme stress.
- Incident trainees should be in close proximity or in the same vehicle with the trainer to provide closer mentoring opportunities.

Situational Awareness:

- It is very important to establish a Common Operating Picture among all units including fire status, past shift history, local factors, past local fire history and any pertinent information that may affect firefighter operations.
- When arriving on scene, slow down and observe what is happening. Ask questions of people that are already on scene to gain knowledge of fire behavior patterns and operations and to help establish a Common Operating Picture. If you are just arriving on the incident and being placed into service, carefully evaluate the situation.
- Consider assigning a dedicated lookout for the engine operator when working on a hoselay.
- Topographical features such as ravines, draws, and saddles may be obscured by heavy vegetation, hiding potential fire behavior factors.
- The fire environment can change very rapidly in timber fuel models. Group torching can cause fire intensity to change from low to high and then moderate again in a matter of minutes.
- Apparatus or vehicle placement near the fireline should be thoroughly assessed for potential fire impacts to the vehicle.

Common Operating Picture

A common operating picture (COP) is a single identical display of relevant information shared by more than one Command. A COP facilitates collaborative planning and assists all echelons to achieve situational awareness. –Geospatial Equipment and Technology Group (geta.firenet.gov)

Communications:

- Radio traffic can be very congested on command, tactical and air/ground channels, especially during active burning periods.
- While we are trained to hold all communications when we hear "Emergency Traffic" on the radio, in practice, this does not necessarily happen. All units should be aware of the need to hold non-emergency traffic when this is heard.
- Environmental noise including wind, engines, and fire can inhibit all forms of communication including radio, face to face, and hand signals.
- IMTs may consider adding incident within an incident procedures that include moving non affected resources to a separate tactical channel, leaving the Division tactical channel available for the incident within an incident.

FLA Team Lessons Learned: In addition to the lessons learned by the firefighters involved in this incident, the FLA Team identified other items that also follow the broader themes of Preparation and Training, Situational Awareness, and Communications.

Preparation and Training:

- Communicate to people involved what a Facilitated Learning Analysis is and what it isn't and what the FLA team's role is after an incident occurs. This should include training for IMTs, agency administrators, module leaders, and crew members before the fire season begins so that, if an incident occurs, they know what to expect. As one participant noted, he expected that the FLA team was coming to, "show up, turn me upside down, shake the change out of my pockets and ruin my career." instead of help lead a non-punitive learning process. During the period between the time that an incident occurs and the arrival of the FLA team, the role of the FLA team should be emphasized to those people involved in the incident.
- Social Media: Relentless emphasis from the IMT made for leaks from within to social media null:

  > From the Flat Fire Incident Action Plans: "IMT reminds all personal to think before you post those photos and/or videos taken on this incident. Remember that all of our Agencies have policies in place regarding the taking and/or posting of photos or videos on any media site such as Facebook, You Tube, Flicker, etc. Such activities can easily result in serious, unintended consequences.
  >
  > If you have photos or video that you would like to share, please bring them by the PIO desk located at the ICP."

Situational Awareness:

- The Operational Environment: "No resource or facility is worth the loss of human life, however the wildland fire suppression environment is complex and possesses inherent hazards that can—even with reasonable mitigation—result in harm to firefighters engaged in fire suppression operations. In recognition of this fact, we are committed to the aggressive management of risk." *Foundational Doctrine-Guiding Fire Suppression in the U.S. Forest Service*

Communications:

- Incident Notification: The IMT Incident Commander followed the Incident within an Incident protocols and made the proper notification per the IMT Standard Operating Plan.
- Upward reporting was timely and according to protocol, which takes prior planning and organizational discipline.
- During the FLA process, how and when to communicate new findings that may have considerable impact to the Agency Administrator needs to be carefully considered.

Other:

- If at all possible visit the site of the incident with the people directly involved to conduct the facilitated dialogue. Information will be gained that makes the development of the story and lessons learned possible.

Discussion points

These discussion points may or may not be relevant to the Flat Incident you the reader can discuss and decide.

- Identified-Dedicated-Empowered-Accountable-Lookout (See below).
- Downhill fire suppression.
- Situational Awareness.
- Use of priority setting on the Bendix King radio.
- Local pocket card thresholds (See Figure 1).
- What is the IMT's, Agency Administrator's, and other involved party's role in FLA process.
- LCES: What lookouts, communications, escape routes, and safety zones are established and how do these change over the course of an incident?
- Crew cohesion and experience together with limited fire assignments.

IDEAL Lookout

Every Firefighter is entitled to an IDEAL Fire Assignment.
One foot in the black or a lookout assigned and planned escape routes to a safety zone.
When you have unburned fuel between you and the fire you do not have an IDEAL assignment.
When you cannot see the entire fire perimeter, you do not have an IDEAL assignment.
How do we mitigate this?
By keeping one foot in the black or by assigning a Lookout.

Lookouts must be: IDEAL

1. Identified
2. Dedicated/Competent
3. Empowered
4. Accountable
5. Lookout

Facilitated Learning Analysis Team Members

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Attachment 1: "Emergency Traffic"

From: FIRESCOPE FIREFIGHTER INCIDENT SAFETY AND ACCOUNTABILITY GUIDELINES ICS-910

In compliance with NFPA, Incident Commanders shall acknowledge the person in trouble declaring "EMERGENCY TRAFFIC" to clear radio traffic. Clear text shall be used to identify the **situation** of emergency: "OFFICER SHOT," "RESPONDER ELECTROCUTED," "RESPONDER DOWN," "RESPONDER MISSING," or "RESPONDER TRAPPED," to notify all on-scene personnel. Also, the "location" needs to be communicated and could be as simple as "second floor rear of building," along with the "identification" such as "F/F Smith." This is especially important when multi-agencies or multi-jurisdictions are operating on the same incident, thus, appropriate action can be initiated in "Clear Text". When Firefighters or response personnel are faced with life threatening emergencies, they may call for help using a variety of terms that may include the use of "Mayday," help," or "responder down." The acronym "Mayday" is used by some fire agencies as a distress signal (hailing call) indicating a firefighter is in trouble. The use of the hailing signal "Mayday" does not describe the "location," "identification," or "situation". Any Emergency Service Organization (ESO) that allows the use of the hailing call "Mayday" for responders needs to have a system in place to immediately address this call for assistance and use "clear text" for the "location", "identification," and "situation" of the "Mayday" emergency. The use of "clear text" is very important in determining the actual situation. This is especially critical when multi-agencies or multi-jurisdictions are operating on the same incident, thus, appropriate action can be initiated in "clear text." The term "Mayday" should not be used by an ESO that routinely responds to maritime or wildland incidents, in that, this distress signal could cause confusion at these types of incidents. Remember that if an Emergency Service Organization (ESO) allows the use of this hailing signal by their response personnel, they need to have a procedure in place to immediately address this call for assistance using "clear text."

Other NFPA 1500 guidelines for "EMERGENCY TRAFFIC" include the Dispatch Center transmitting a distinctive "EMERGENCY TRAFFIC" tone on designated channel(s) followed by clear text verbal message that identifies the emergency situation, i.e., "OFFICER SHOT," "RESPONDER ELECTROCUTED," "RESPONDER DOWN," "RESPONDER MISSING," or "RESPONDER TRAPPED." In addition the "identification" and "location" needs to be provided. At the conclusion of the emergency situation, an "all clear" should be broadcast on the radio channels.