



Chalk Fire – Engine 56 Rollover Accident Prevention Analysis Report

Chalk Fire

Los Padres National Forest

October 3, 2008



Pacific Southwest Region

October 12, 2008

Amended November 3, 2009 to reflect the July 10, 2006
Region 5 Engine Module Configuration Requirements

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EXECUTIVE SUMMARY

The Chalk Fire started on the evening of Sept. 27, 2008 on the Los Padres National Forest (LPF). After the initial attack, the Forest transitioned to Central Coast Incident Management Team 7 (CIMT7) on Monday, Sept. 29 at 0800 hours. The Incident Command Post (ICP) was established at Fort Hunter Leggett Military Base, utilizing the same location as the Indians Fire in June/July 2008 and the Basin Fire in August 2008. A number of the resources assigned to the Chalk Fire had also been assigned to either the Indians or Basin fires and were familiar with the area and roads. Although the actual location of the fire was different from these other two incidents, some of the same roads were used for crew access to and from the ICP and fire.

The concern about both the paved and unpaved access roads being very narrow and dangerous was well known and communicated within Central Coast Incident Management Team 7 (CIMT7) and the assigned resources. In response to these concerns, Team 7 was in the process of preparing to implement a “one-way” traffic pattern to reduce the amount of two-way traffic on some of the roads when, on Oct. 3, 2008, a rash of accidents occurred within a four-hour period: Two crew haul vehicles struck and broke mirrors, a California Conservation Corps (CCC) crew transport ran off a road into a ditch, a Santa Barbara Fire Department pickup truck was “T-boned” at an intersection, and, lastly, the San Bernardino National Forest (BDF) Engine 56 (E56) rolled over.

At approximately 1940 hours, Engine 56 with five crew members aboard, along with the rest of Strike Team 6609C, was traveling a narrow, two-lane paved road to their night shift assignment when the passenger right rear wheel drifted off the pavement and dropped approximately six inches to the shoulder. The driver attempted to correct the situation by turning the wheel to the left and letting off the gas. This action led to the auto-engagement of the retarder mechanism¹. The engine then slid at a 45 degree angle across the two-lane road, struck and then rolled up an embankment on the opposite side of the road. The driver turned the wheel to the right in an attempt to bring the engine back onto the roadway. At this point, the engine tipped to the right and dropped off the embankment finally landing on the passenger side. The five crew members assisted each other in escaping the engine. They were treated at the scene by other firefighters in the Strike Team and emergency response personnel from the CIMT7, as well as Fort Hunter Leggett Fire Department. They were transported to Mee Memorial Hospital in King City, Calif., where they were treated and released with minor injuries.

On Oct. 4, 2008, at the request of the Strike Team Leader, Strike Team 6609C demobilized from the Chalk incident and returned to their home units. An Accident Prevention Analysis (APA) team was assigned by the Pacific Southwest Regional Forester to review the events and circumstances surrounding the incident. The APA team reported to the Chalk ICP on Oct. 5, 2008. Interviews with those involved in the incident produced much information which allowed the team to assemble the chronology of the events and present the circumstances of the accident. The team also gathered and reviewed photos, reports, and records as part of this review process.

¹ A retarder is a device used to augment or replace some of the functions of primary friction-based braking systems of heavy vehicles. A vehicle's retarder system has a hydraulic retarder and a slipping friction brake that operates in concert to retard a vehicle's forward motion. The hydraulic retarder is an output driven device which is operable to absorb increasing energy as the vehicle's speed increases.

We need to treat accidents and near misses as precious learning opportunities and exploit their full value for enhancing system reliability.

I. INTRODUCTION

On Oct. 3, 2008, San Bernardino Engine 56 was involved in a rollover accident while assigned to the Chalk Fire on the Los Padres National Forest. The accident occurred at approximately 1940 hours when the engine was enroute, as part of Strike Team 6609C, to a night shift assignment. The accident, of which Engine 56 was the only vehicle involved, occurred on a paved, dry and clear, narrow, two-lane road within the Fort Hunter Leggett Military Base. The five crew members aboard the engine were treated at the scene and transported to a local hospital where they were treated and released with minor injuries.

On Oct. 4, 2008 the Pacific Southwest Regional Forester initiated a systematic analysis of the circumstances related to this accident following the Accident Prevention Analysis (APA) process.

An Analysis Team was formed and reported to the Chalk Fire Incident Command Post on Oct. 5, 2008. The Team consisted of a Line Officer/Team Leader, a Fleet Specialist, a Safety Officer, a peer Subject Matter Expert/Engine Captain, Writer/Editor who also served as peer Subject Matter Expert/Hand Crew Captain, and an APA process coach.

The Chalk Fire APA was conducted in the spirit of the “Foundational Doctrine” for fire suppression activities. A foundational principle of high-reliability organizing is the commitment to continuous learning. Learning from success is essential and learning from failure is critical. We need to treat accidents and near misses as precious learning opportunities and exploit their full value for enhancing system reliability. The APA is based on the principles of “Just Culture” and addresses human factors in the accident analysis.

The APA team sought to understand the situation in which the Engine 56 crew found themselves on Oct. 3, 2008. The APA team looked at the actions of the Incident Management Team, Los Padres Forest Management direction to the team, and individuals of the Engine 56 module. The APA team based its analysis on the philosophy that *“employees are expected and empowered to be creative and decisive, to exercise initiative and accept responsibility and to use their training, experience and judgment in decision-making to carry out the leader’s intent.”*

This report will provide the results of the APA review, documenting the events and circumstances, lessons learned, and recommendations.

The objective of this report is to provide an opportunity to learn from this incident. The APA focuses on the organizational and cultural factors that can be identified as causal to this accident. Safety is not an end but a means to the end. The Chalk Fire Engine 56 accident prevention analysis presents an intriguing story with many opportunities for reflection, introspection, and ultimately organizational growth.

II. REVIEW OBJECTIVES

Chalk Fire – Engine 56 Rollover Accident Prevention Analysis Report

Review Objectives

- Develop and complete a peer review (Accident Prevention Analysis/APA) of the California San Bernardino Engine 56 rollover that occurred on the Chalk Fire Incident on Oct. 3, 2008.
- Use the 2005 Accident Investigation Guide to produce an Expanded (72-hour) Briefing of the incident.
- Use the APA guide and process to execute and complete a review of this rollover incident.
- Contact the Regional Forester personally and immediately if acts are identified that the Accident Prevention Analysis Team believes constitutes a reckless and willful disregard for human safety or involve criminal misconduct.
- Provide regular process updates to the Regional Office Health and Safety Manager and Fire Operations Safety Officer.
- Maintain a high level of confidentiality regarding information obtained through interviews.
- Upon completion of the APA report, schedule a presentation with the Regional Forester in compliance with Step 9 of the APA guide.

III. METHODOLOGY

The events and facts presented in this report were determined through a variety of methods. The Accident Prevention Analysis Team conducted more than 30 interviews with firefighters, fire support personnel, and Central Coast Incident Management Team 7 (CIMT7) personnel to develop a factual story and circumstances of the incident based on weight of evidence.

Actual on-the-ground measurements were taken to determine relative distances, dimensions, and orientation of Engine 56, Strike Team 6609 “C”, and the vehicles immediately prior to and during the accident. A key factor in determining the chronological sequence of events was the eye witness statements given by employees of BLM Engine 3636 whose position in that evening’s Strike Team convoy was directly behind Engine 56—just before and during the accident. Where conflicts exist in the chronology of events, they are based on different perspectives from different witnesses.

CIMT 7 communication logs, Los Padres National Forest dispatch tapes, site investigation information, and eyewitness statements were all correlated to determine time and events associated with the incident. There were no images of the actual accident collected by cell phones, videos, or still images to assist in determining the actual time or events. The chronology listed in the report is based on a careful analysis of the various information sources. In most cases, members of Strike Team 6609 “C” were able to corroborate each action in the factual story with two or more sources.

Hand-drawn maps were used to depict roads, direction of travel, and sequence of events. Information from the engine manufacturer, specifications, and maintenance records, were used to understand the fire engine’s physical, mechanical, dynamics, and capabilities.

The next chapter describes the events and actions of the primary participants involved in the accident and people who were working in the area in which the accident occurred. The story is told in the present tense to give the reader a sense of being there at the time.

IV THE STORY

Brief History of San Bernardino National Forest Engine 56

The home of San Bernardino National Forest Engine 56 (a 4x4, 5th Generation B, Model 62, International 7400 Series) is the Keenwild Station on the San Jacinto Ranger District, located in the outskirts of Idyllwild, Calif.

With the exception of the Captain and one of the crew members involved in the accident, all other personnel are new to the crew. The Captain, with 19 years

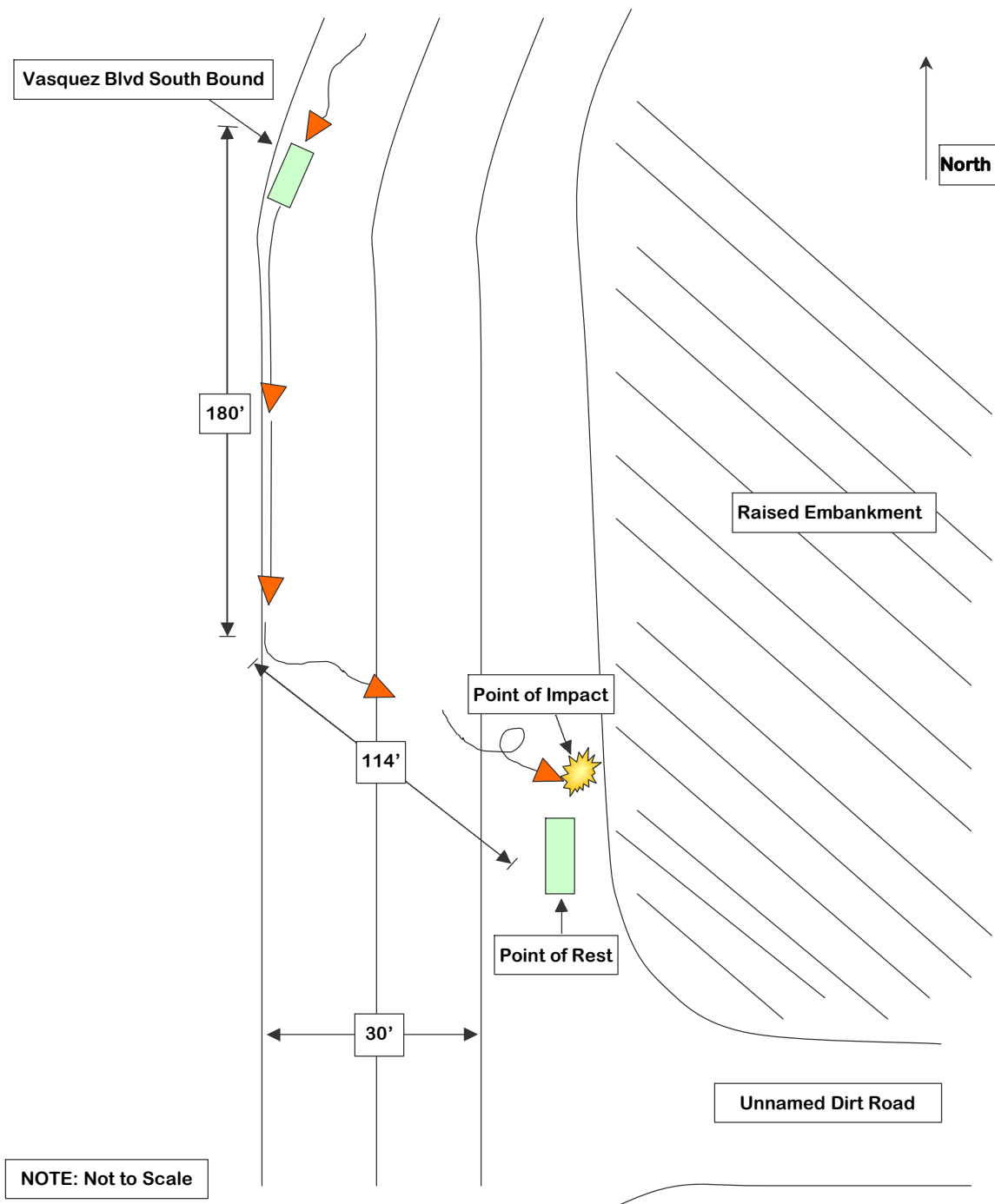
experience and who was not on this assignment with Engine 56, is a Division Group Supervisor and Ground Support Unit Leader Trainee with Southern California Incident Management Team One (1).

He has been deployed five times with that team this fire season (2008). The Fire Engine Operator (FEO), who has been Acting Captain on the majority of assignments for Engine 56, joined the Engine Company in December 2007. The Assistant Fire Engine Operator (AFEO), who was driving at the time of the accident, joined the module after taking advantage of the recent “Developmental Series” job announcement put forth at the Regional level in early 2008. Firefighter #1, who sits behind the driver, is a recently selected apprentice with one previous season of fire experience. Firefighters #2 and #3, who sit in the middle seat behind the Captain respectively, are both first-year temporary Forest Service employees with no previous wildland fire experience.



Fig1 – Position of firefighters, from right to left: Firefighter #1, Firefighter #2, and Firefighter #3.

Accident Site Sketch Map from Military Police Report



Chronology of Events

The Chalk Fire starts the evening of Sept. 27, 2008 on the Monterey Ranger District of the Los Padres National Forest, 22 miles southwest of King City, Calif. The fire is burning actively in Oak woodlands and chaparral with a large volume of dead to live ratio, and pockets of timber. Within the first 24 hours, the fire grows rapidly to more than 1,000-acres. At the time of the Engine 56 accident, the fire is being managed by Central Coast Incident Management Team 7 (CIMT7). Notably, the site chosen for the incident command post and base camp, the Fort Hunter Liggett Military Base, has been utilized on two other occasions in 2008. In fact, several of the resources involved in the accident, including the driver of Engine 56, had traveled many of the routes utilized during the Chalk incident while previously assigned to either the Indians or the Basin Fires.

The San Bernardino National Forest receives an order for a strike team of Type III Engines on Sunday, Sept. 28, 2008. Strike Team 6609C is assembled and travels to the Chalk Incident on Monday, Sept. 29, led by a qualified Strike Team Leader (STEN) as well as a Strike Team Leader Trainee (STEN(t)). The module is comprised of like-typed engines from the Forest Service and Bureau of Land Management (BLM) and includes San Bernardino National Forest Engines: 56, 15, 37, and 34, as well as BLM Engine 3636 from the Black Rock Canyon area.

Upon arrival at the incident at approximately 1300 hours, S/T 6609C checks in and receives a standard in-briefing. At this time, they are instructed to attend the night operational briefing at 1800 hours. In the interim, radios are cloned and programmed and supplies are gathered. Following the 1800 hours briefing, strike team leadership reports to the Operations Section Chief Type 2 (OSC2) as an unassigned resource. They are instructed to bed down for the night and report to the 0600 hours briefing the following morning. After the morning briefing—and not appearing on the day shift Incident Action Plan (IAP)—they again report to the OSC2 as unassigned. They are now informed that the Strike Team will be utilized during the night operational period and to attend the 1800 hours briefing.

Engine companies of S/T 6609C were well rested and attended the Sept. 30, 1800 hours operational briefing.

Each of the Incident Action Plans and operational briefings received on Sept. 30 and Oct. 1-3 emphasizes elements such as current and expected behavior of the fire, predicted weather, operational assignments, communications², and general safety. Also emphasized are safety issues related specifically to this locale, narrow and dangerous roads, and the importance of traveling at safe speeds.

During the three shifts prior to the night of Oct. 3, S/T 6609C crew members and leadership discuss the difficulty and danger involved in two-way traffic on access roads to the fire. Drivers talk about the difficulty in navigating the large fire apparatus on the roadways, and the general uneasy feeling they had in passing vehicles traveling from the opposite direction. Furthermore,

² Discrepancies in frequencies between the Incident Radio Communications Plan and those programmed into the radios had been noted by S/T 6609C members prior to Oct. 3, each time verified and corrected by strike team leadership, allowing for proper and effective communications.

they recounted a particularly frustrating shift that took more than five hours for the night shift/day shift transition to occur due to the volume of traffic attempting to safely travel the narrow roadways.

When CIMT7 took command of the fire, there was no mention of specific travel hazards at their transition in-briefing with the Los Padres National Forest. After assuming command of the incident, they were made aware of the travel concerns with situations being reported to Safety Officers and various other operational functions. Based on these concerns, the team began discussion for a change in the travel plan on Sunday Sept. 28. On Tuesday, Sept. 30, the decision to utilize the traffic plan from the Indians Incident (that occurred three months prior) was made with no set date for implementation. This execution was delayed until proper signage, maps, and adjustments to the IAP could be completed. Ultimately, the travel and traffic plan was not put into effect until 1800 hours Monday, Oct. 6—following the Engine 56 accident.



Fig 2 – The replaced outside rear dual on Engine 56. Findings revealed a difference greater than one-inch diameter between the two tires.

On Thursday, Oct. 2, while preparing for their shift, the driver of Engine 56 drives over the wheel chock block causing a blow-out on the outside left-rear dual. They take the engine to the Ground Support Unit to have the tire changed. It is replaced with a mismatched tread-pattern and circumference size tire because the vendor states that they do not have any tires of the same style/size. The Engine 56 Acting Captain questions the Ground Support Unit Leader about whether or not the engine would later be able to pass the Demob inspection with this new, mismatched, tire. A Ground Support Equipment Inspector checks tread depth on the left front tire and assures the Acting Captain that the vehicle will pass Demob inspection, even though there is a difference. After driving with this replacement, the driver does not notice any vehicle handling differences.

Friday night, October 3, is the fourth operational nightshift to which S/T 6609 C is assigned to the structure protection group. The strike team members have slept adequately (8 hours [+/-]) during the day. They awake at approximately 1700 hours to eat, attend briefing, and prepare for their shift. At the 1800 hours briefing, CIMT7 emphasizes items such as driving speed and the poor access roads that apparatus were required to travel to fireline drop points. It is remarked that

posted speed limits are to be enforced by Federal and local police units. Any driver observed exceeding these limits will be cited.

Furthermore, it is stated that Federal penalties were heightened to triple the standard monetary fine as well as double the standard point reduction. Personnel are informed that three other accidents had occurred that day:

1) A reported mirror strike; 2) A T-bone type collision; and 3) A crew hauler had gone off the road into a ditch.



Fig 3 – Asphalt thickness and road edge where Engine 56's rear dual tires went off Vasquez Road.

At approximately 1830 hours, the Strike Team Leader and Strike Team Leader Trainee return from the operational briefing along with the individual Engine Captains. They brief the strike team members prior to traveling to their assignment location. They further discuss the importance of careful and cognizant driving before traveling. At approximately 1905 hours, when this briefing concludes, each engine company loads into its apparatus and—in no assigned order—follows the Strike Team Leaders out of camp.

The strike team drives its designated route, heading southeast along Del Venturi Road and a right turn onto Vasquez Road. At approximately 1940 hours, now traveling south, the strike team leaders, followed by Engine 56, Engine 3636, Engine 15, and Engine 37 (in this order) continue on Vasquez Road. Engine 34 is slightly delayed at the ICP while facilitating a crew member's demobilization.

As Engine 56 continues through a slight left bend in Vasquez Road, traveling between 30 to 56 mph³, the driver feels the passenger side rear dual tires of the apparatus slip off the edge between the asphalt and shoulder. (This height was measured post-incident to be between 4 and 8

³ The Accident Prevention Analysis Team found a large discrepancy in possible speed of travel: interviews with employees of Engine 56 and witnesses reported a variety of speeds from 30 to 45 mph; the Equipment Specialist evaluation estimated Engine 56 to be traveling between 50 and 55 mph; and the police report estimated Engine 56 was moving at a minimum speed of 56 mph.



Figure 4 – The skid line where Engine 56 returned to the pavement and headed toward the embankment.

inches, averaging approximately 6 inches through the distance traveled by Engine 56. This is the height between the top of asphalt and final grade road base material measured post-incident.)

Crew members sitting in the back seats feel a noticeable and abrupt tip to the right. The Acting Captain yells “Slow the F--- Down!” as the driver releases his foot from the accelerator and feels the retarder mechanism engage. The driver turns the wheel to the left in an attempt to return the vehicle to the road. The apparatus enters a full, out-of-control, skid across Vasquez Road.

Engine 3636 Captain and driver observe Engine 56 crossing the roadway at an approximate 45 degree angle toward an embankment on the opposite side. The Engine 56 driver attempts to correct by counter-steering and applying the service brake. Neither of these actions—in the driver’s opinion—have any noticeable effect on the trajectory of Engine 56 at the time. Engine 3636 Captain observes Engine 56 make a slight right turn (to the passenger side)—continuing toward the embankment. The apparatus travels up the embankment at an angle from the road on a slight contour to the right. Engine 3636 driver reports that both the front and at least the left rear tires fully climb the slope of the embankment. Finally, as the vehicle slows, it rolls to the right, slamming down on the passenger side, coming to rest on the shoulder, parallel to the northbound lane of Vasquez Road.

At this time, Captain 3636 notifies the STEN via the structure group tactical frequency that an engine has rolled over and they should return to the accident scene at once. The STEN immediately attempts to contact the Chalk Fire Incident Communications Unit via the command frequency with no response. However, the Fulton Hotshot Superintendent, who passed S/T 6609C on Vasquez Road prior to the accident, hears these calls and successfully relays the emergency traffic transmission.

The Communications unit contacts the local 911 center via cell phone and relays the request for a medical response and two ambulance units. Concurrently, Engine 3636 driver positions the engine north of the accident to block traffic and illuminate the scene. Engine 15 proceeds south of the accident to similarly position.

Inside the cab of Engine 56, the Acting Captain verbally checks to make sure his crew is alright. They all respond. The Acting Captain notices that the engine is still running and instructs the driver to shut it off. The driver has his foot caught in the overhead bin. Firefighter #2 also has his left foot caught between the console and driver's seat. Firefighter #3 quickly unbuckles his seat belt, helps to free the leg of Firefighter #2, then climbs up and out through the back driver's side window and jumps to the ground—followed by firefighters #1, and #2.

Acting Captain 56 positions himself on the inside of the passenger door and helps to free the driver's stuck foot. The driver climbs out of the engine; the Acting Captain remains inside. Noticing that the cab has begun to fill with water and foam from the tank overflow, the Acting Captain quickly searches for personal items such as his cell phone and wallet.

Outside, as the STEN arrives, EMTs from both Engine 3636 and Engine 15 offload, grab their trauma kits, backboards and other supplies, and begin facilitating patient care. Soon after, EMTs and First Responders from the other engine companies begin arriving to assist.

The STEN assumes control of the incident and notices Engine 56 crew members up and walking around the scene. He immediately makes the decision that, due to the mechanism of injury, all patients need to have "C" spine precautions taken and be backboard immobilized⁴. The STEN (t) notices the Acting Captain of Engine 56 still in the cab and verbally instructs him to get out immediately.

Shortly after the accident, CIMT7 Night Operations Section Chief arrives and makes contact with the STEN. Comfortable with the STEN running this "incident within an incident" and recognizing the need for a communication relay to overcome the "dead spot" in radio transmission, he moves to a location where he has positive contact with both the STEN and the Communications Unit at ICP.

⁴ It is at this time Engine 34 returns after hearing the emergency radio communications. They also assist with patient care.

At 1950 hours, Communications is notified from the scene that there are a total of five patients, four of which sustained minor injuries and one with moderate injury. A third ambulance is requested and confirmed enroute at 1957 hours.

Recognizing that Engine 56 crew members are going to be transported and removed from the accident and that the scene is safe (engine secure), the STEN decides to allow one individual from the strike team into the engine to retrieve personal belongings. Items recovered include: wallets, keys, cell phones, GPS units, an infrared Fire Finder, agency owned laptop computers, Self-Contained Breathing Apparatus (SCBA) equipment, personal gear bags (Red Bags), and fireline gear.

Shortly after, units from the Ft. Hunter Liggett Fire Department arrive at the scene to provide aid. Upon arrival of the first unit—because the accident has occurred within the Ft. Hunter Liggett jurisdictional boundaries—a transition occurs to Ft. Hunter Liggett as the Incident Commander. This is communicated to the Chalk Fire Communications Unit at 2009 hours. Within five minutes of this transition of command, the Engine 56 driver and Firefighter #3 are loaded into Ambulance Unit 8869 and travel to a staging area where the patients are transferred to an Advanced Life Support (ALS) Unit which takes them to Mee Memorial Hospital in King City, Calif.

While this patient care and transport is being facilitated, the new Engine 56 Rollover Incident Commander notices that Forest Service personnel are in the process of removing equipment from Engine 56. He discusses this with the STEN and to preserve the scene for a potential investigation attempts to ensure that this process happens quickly and only critical equipment is removed.

At 2020 hours, the Acting Captain and Firefighter #1 are loaded into Ambulance Unit 8868 and transported. By 2030 hours, Firefighter #2 has been loaded into the Ambulance Unit AMR Medic 53 and is transported to Mee Memorial Hospital.

After the five injured members of Engine 56 are transported, the remaining members of S/T 6609C load retrieved equipment and personal gear into the STEN's vehicle. Upon release from the accident scene, they board their engines and return to ICP in strike team configuration.

When the strike team arrives back at camp, all members report for a debriefing at the Operational Briefing Tent. They are met by CIMT7 leadership and talk about the circumstances surrounding the accident, the well-being of all S/T 6609C crew members, and the current status of the Engine 56 crew.

Another item of discussion is what could have been done to prevent the accident, such as the invocation of a one-way traffic plan. During this meeting, the Chalk IC trainee receives a call from Mee Memorial Hospital informing him that all Engine 56 crew members are to be released this evening. Only minor injuries were sustained.

That night, the Strike Team Leaders, Engine 34, Engine 37, and one firefighter from Engine 15 travel to Mee Memorial Hospital to bring Engine 56 crew members their retrieved personal gear and provide transportation.

That night, after a brief reuniting with S/T 6609C at the local Denny's Restaurant, Engine 56 crew members check into a local hotel while the rest of the strike team returns to camp to sleep. The following morning, the Communication Unit visits the location of the accident site and determines that there is a true "dead spot" within the line of site.

A formal Critical Incident Stress Debriefing occurs with the entire strike team. At approximately 1500 hours, at the request of the STEN, S/T 6609C is demobilized and released from the Chalk Incident. Upon release from the fire, the STEN takes Engine Companies 3636, 15, 37, and 34 back to the accident site to see the scene again, take photographs, and review what happened the previous night. The crew of Engine 56 is transported separately after being picked up by the San Bernardino National Forest San Jacinto Battalion Chief and the Captain of E56.

Captain 56 is transporting Firefighters #1, #2, and #3. He also allows for a brief site visit before beginning travel home. The San Jacinto Battalion Chief is transporting the Acting Captain and driver of Engine 56. He drives past the accident site without stopping, and begins travel back to the San Bernardino National Forest.

S/T 6609C continues travel home, resting overnight in Pismo Beach, Calif. The following day, resuming travel at 0930 hours, they continue to the San Bernardino National Forest locale. Upon arrival and the disassembly of S/T 6609C, each module returns to their respective duty stations, ending their assignment to the Chalk Fire.

V. LESSONS LEARNED

Lessons Learned by the Firefighters Directly Involved in the Rollover Accident

Every person that appeared to have had a significant role in the Chalk Fire Engine 56 accident was interviewed. At the conclusion of each interview, each person was asked a series of questions regarding what they have learned for themselves from this accident and what they believe the greater wildland fire community needs to learn from the event.

The Accident Prevention Analysis Team focused on and highlights these people's thoughts about the factors contributing to the rollover. Their responses are outlined below, edited to eliminate redundancy, personal references, and to improve clarity.

The Lessons Learned Analysis (LLA) is a display of relevant facts of the accident, an analysis of the firefighters lessons learned and the Accident Prevention Analysis Team's analysis of the cultural and organizational faults, lapses, and weaknesses that contributed—or were causal—to the Engine 56 rollover. The LLA assessed categories and factors germane and pertinent to the accident: a) Key issues, decisions and behaviors; b) Related elements; and c) “Upstream causal and latent factors”⁵.

What Firefighters Said They Learned from this Incident

Training, Qualification and Skills

- Match speed to road conditions.
- Drive slower.
- Be cautious of following distance while driving large equipment.
- The lack of overall experience and knowledge of modules.

Crew Cohesiveness

- Will be less trusting of persons not known to the crew. This trust only occurs after a significant period of working together on the fireline and on project work. This had not occurred during the time the FEO and AFEO/driver and several crewmembers had been on the crew.
- Central Coast California Incident Management Team Incident Commander was very supportive.

⁵ Causal factors are the underlying (latent) organizational and cultural factors (the upstream factors) that enabled human errors to produce an unintended outcome, factors that are failing to manage at-risk behaviors or normalization of deviance at the organizational level. Causal factors do not include omissions or deficiencies such as fatigue, inappropriate actions, failure to comply with the standard firefighting orders, etc.

Incident/Forest Management Oversight

- Have a better traffic plan.
- Utilize previous Incident Management Team's traffic plans prior to the Chalk Fire.
- Sixteen-inch wildland antenna are more effective than standard "stubbie" antenna.
- Although the Chalk Fire was on Forest Service land, the accident occurred on Fort Hunter Liggett Military Base, the accident was under unified command...
- Scene management was challenging due to unified command. More firefighters than patients.
- No phone list in the Incident Action Plan.

Post-Accident Management

- Testing for controlled substances must be accomplished within 32 hours of an accident and within eight hours for alcohol testing.
- Have current Critical Incident Stress Debriefing contact phone numbers.

Equipment Operation, Maintenance and Performance

- Know the application of retarders. (*See "retarder" definition in page 2 footnote.*)
- Will be more assertive and speak up to express thoughts or concerns regarding engine maintenance.
- Will not defer to others just because they specialize in a particular area.

Environmental

- Situational Awareness was not as high on the paved roads.
- Width of the road.
- Drive more slowly and stay farther behind the vehicle ahead.

What Firefighters Said The Greater Wildland Fire Community Should Learn from this Incident

Training, Qualification and Skills

- Prior to a mission, provide quality "Driver Training" (such as Emergency Vehicle Operations Course, Engine Academy, On-the-Job Training).
- Driving experience is needed.
- Requirement of successful completion of Engine Academy prior to certification of Engine Operator.
- Meet minimum qualifications for a position.
- Provide one-on-one training with newly licensed drivers prior to driving with a crew.
- Provide Commercial "Class B" Training prior to licensing.
- Have documented hours of driving specialized equipment prior to licensing.
- Understand the difference between training and experience.
- The EMS training (First Responder and EMTs) that the strike team provided did an excellent treatment for the injured.
- Even though an individual meets the qualification for Engine Boss or Engine Operator, they may lack actual experience.

- Specialized training is needed for people who operate vehicles with a high center of gravity. To ensure that they understand how to load and safely operate these types of vehicles, their operators should be provided with situational awareness training, followed by practical experience.

Crew Cohesiveness

- Captain should provide leadership to new crewmembers.
- Training as a team is valuable.

Incident/Forest Management Oversight

- Incident Management Team Safety should scout out roads prior to when engines and strike teams engage.
- Amount of time individuals in leadership positions spend on Incident Management Teams.
- Forest Management Officers are unaware of individuals in leadership positions and their qualifications.

Post-Accident Management

- To promote closure with support from management, allow and encourage accident victims to revisit accident sites.
- The quality of the work assignment versus the length of the assignment should be determined with discretion in granting leave (time off) under work/rest guidelines.
- Information about the accident was disseminated through personal text messages and cell phone calls from employees at the scene.
- To protect the driver, supervisors of employees involved in a vehicle accident should request post-accident drug testing.

Environmental

- Vehicle operators and passengers need to maintain alertness to the variety and changing environmental conditions on fires such as narrow roads, soft shoulders, and roadway edge drop off.
- Even though the posted speed limit is 35 mph on a two-lane road does not ensure it will accommodate commercial vehicles.
- You must adjust your speed, depending on several conditions which include: traction, curves, visibility, traffic, and hills.

Equipment Operation Maintenance and Performance

- Proper use of retarder and training.
- The ingrained repetition and practice of driving specialized equipment will save lives.
- Wearing your seat belt reduces the chance of injuries.
- Module experience should be matched to assignments/missions.
- Know your resources' experience level.
- Are there system issues with retarders?
- Mismatched tires could affect the engine's handling capability.

Accident Prevention Analysis Team Lessons Learned

Information gathering during the Accident Prevention Analysis process resulted in much information surrounding the circumstances that led to the Engine 56 rollover. Information was gathered from interviews with involved participants, from data collected by the Accident Prevention Analysis Team, and from perspectives and analysis by subject matter experts on the Accident Prevention Analysis Team.

In the Accident Prevention Analysis process, the review team continuously engaged in a substitution test. As stated in the Accident Prevention Analysis guide:

“Throughout the investigative process, the team should be performing a “Substitution Test.” This is asking: Could another employee (or supervisor of the activity) meeting the agency’s minimum Level 1 Standards based on the 5109.17 make the same decisions and have the same (or worse) outcome? If the answer to this question is “yes” then it is likely that a similar—or worse—accident will occur again unless the latent causes are identified and mitigated.”

In each of the following “Key Issues, Decisions, and Behaviors” analyzed, the determination of the review team to this substitution test was “YES”.

Consequently, if an employee’s error is due to a lack of experience, the root cause of that error isn’t the employee’s lack of experience; rather the root cause or “causal factor” is that the agency’s standard for experience is either inadequate or standards are not fully managed. Likewise, everyone directly involved appeared to be appropriately motivated and intentioned. The decisions, which in hindsight may seem unreasonable to the reader, seemed reasonable to those involved at the time—based on their understanding of the situation, their experience, and their expectations.

Key Issues, Decisions, and Behaviors

1. Training, Qualifications, and Skills

Both the Driver and Acting Captain had minimal skill or experience necessary to meet the regional mobilization standard for engines of having two (2) qualified drivers of a Type III Model 62 Engine. This resulted in a chain of events that lead to lack of qualification requirements.

(See Appendix C, Training Qualification Report for supporting documentation.)

Related Elements

Engine 56 Driver and Acting Captain were not in compliance with the qualification requirements unique to the following:

- National Wildland Fire Coordinating Group (NWCG) Wildland Fire Qualification Systems Guide (310-1).

- Fire and Aviation Management Qualifications Handbook (FSH 5109.17).
- Forest Service Handbooks (FSH).
- Fire Qualification Review Committee (FQRC) Standard Operating Plan.
- Regional letter of direction set forth in July 10, 2006.
- OF-346, Government Motor Vehicle Operator's Identification Card.
- Position Description

Casual Factors:

- **Task Books**

The Driver of Engine 56 had recently been qualified as an Engine Operator (ENOP) by completing the task book with two one-day local fire assignments, one 14-day off-forest fire assignment—for a total of 17 days as an ENOP(T). There is no standard for appropriate number of evaluation assignments, experience or quantifiable time as an indicator for qualification within the Fire and Aviation Management Qualifications Handbook 5109.17.

During the review of the Incident Qualification Certifying Systems Master Records and Training folders the Driver's ENOP task book was initiated by a Senior Fire Engine Operator (Engine Captain). Position Task Books can only be initiated by either a designated official from the Home Unit/Agency or a Training Specialist on an incident (with approval from the Home Unit/Agency). Supporting documentation of a Forest Qualification Review Committee Certification Standard Operating Plan and identification of the designated official could not be provided by San Bernardino National Forest to the Accident Prevention Analysis Team. Documentation of the recommendation and decision of the ENOP certification was not available in the employee's master record file. It seems there is a commonality among forests not delegating a designated official or implementing the Forest Qualification Review Committee Certification Standard Operating Plan process.

- **Government Licensing Authority**

During the evaluation of the Government Motor Vehicle Operator's Identification Cards (OF-346), the APA team found that neither the Driver nor Acting Captain was certified by an appropriate Government Official stating that they were qualified to operate a 4x4 vehicle. As a result, the Driver did not meet the ENOP appropriate authority and endorsements for the make and model of the engine as stated in the Fire and Aviation Management Qualifications Handbook 5109.17 and the GS-06 Position Description.

Both Driver and Acting Captain were not adhering to the Regional letter of direction set forth in L~~wn~~ 32, 2006 ("...*vj'kpenwf g"cp'Gpi kpg'Dqui" GPI D+y j q" ku'pqvf t kxkpi "j g"gpi kpg"cpf "c"s wcnkkgf 'f t kxgt 'y kj "Class B nicense cpf "appropriate endorsements"*). The Acting Captain's OF-346 had not been issued by the San

Bernardino National Forest, it was issued by the Cleveland National Forest (CNF).

2. Leadership

Lack of effective and consistent leadership has resulted in poor cohesion on the module. This has had a direct effect on the understanding of leader's intent, daily direction, mobilization, and, ultimately, the safety of the crew. The Captain had been absent from the module for all of Engine 56 off-forest assignments during the 2008 season.

Related Elements

- The Fire Engine Operator (Acting Captain) was promoted to Engine 56 as a Fire Engine Operator in December 2007 from the Cleveland National Forest. One of the four firefighters was a returning crewmember from 2007. The remaining three firefighters of Engine 56, who were all involved in the accident, were new and inexperienced to the module in May of 2008. The Assistant Fire Engine Operator (Driver) was the newest to Engine 56, arriving in August 2008. The Chalk Fire was the driver's second off-forest assignment with Engine 56.
- There was a discrepancy in perception of "risk" by the Crew versus the Captain and Forest Fire Management Officers in relation to the Assistant Fire Engine Operator's (Driver's) driving abilities.

Causal Factors

- **Experience of Crew**

The responsibility for leadership and oversight of crew was relegated by the Captain to the new Fire Engine Operator for the majority of the season, with no arrangements for qualified and experienced replacement for the primary Captain.

- **Absence of Leadership**

It appears the responsibility for leadership and oversight of the crew was delegated by the Captain to the new Fire Engine Operator for the majority of the fire season. There was no arrangement for qualified and experienced replacement for key Forest leadership positions including, and not limited to, the Captain, Battalion Chief, Division Chief, Forest Fire Management Officer, and Deputy—all of whom are formally involved with Incident Management Teams. This left Forest leadership gaps during initial attack operations/decisions. Supervisory positions/responsibilities need to be backfilled to prevent reoccurring organizational and leadership gaps.

Forest Management was not aware of the affects of collateral duties of the Engine 56 Captain. The Captain was attending to his commitment with an Incident Management Team and not attending to his primary responsibility as Captain of Engine 56 with a brand new crew. Forest Management viewed the Engine 56

Module as one of the more skilled and veteran crews on the Forest. This was because the Engine Captain was a senior Captain of the Captains across the forest. This module had also demonstrated a history of superior performance in the past. This created an illusion: Because past Engine 56 crews performed well, then this latest crew—even without the Engine Captain—would be trained, skilled, and perform at the same superior level as past crews.

During the 2008 fire season, there was a prolonged absence and lack of supervisory oversight by Captain 56 due to his trainee assignments as a Division Group Supervisor and Ground Support Leader with Southern California Incident Management Team One.

It appeared there was a breakdown in communication regarding the Driver's performance and qualifications of the crewmembers between the Engineer and Captain of performances and qualifications of crewmembers of Engine 56.

Throughout the chain of command—starting with the Captain—the Battalion Chief, Division Chief, Forest Fire Management Officer, and Deputy were unaware of lack of qualifications or deficiencies and allowed Engine 56 to be available for assignments.

Filling Incident Management Team positions with field crew supervisors (Engine Module Supervisors, Handcrew Supervisors, Battalion Chiefs, Division Chiefs) has become a standard versus an exception. This is a compromise that Agency Administrators and Line Officers have been struggling with for some time. Balancing the need to maintain Incident Management Team Rosters and support large fire nationwide versus maintaining skilled, experienced, and qualified first line supervisors for initial attack has been a challenge. This has periodically resulted in less-experienced fireline supervisors to manage and mitigate risks during high hazard fire conditions.

3. Incident/Forest Management Oversight

While traffic concerns and hazards on the Chalk Fire access roads were recognized, they were not mitigated upon recognition. This delay may have contributed to the Engine 56 rollover incident.

Related Elements

- It was recognized by Central Coast California Incident Management Team 7 that there was a need to adopt the (three months prior) Indians Fire traffic plan. Lack of action or understanding of the risks resulted in less than timely adoption and implementation of a one-way traffic plan. Three days after near misses, vehicles accidents, and the Engine 56 rollover, a one-way traffic plan was implemented.
- A “Unified Command” decision was made to enforce posted speed limit regulations within the base by doubling the fines and tripling the point deduction for drivers cited by Federal Police Officers.

- Individual fatigue management was considered. There had been three large fires on the Los Padres National Forest within a four-month period.

Causal Factors

- Central Coast California Incident Management Team 7 was a local team familiar with the hazards of area roads within the Fort Hunter Liggett Military Base. In fact, this team had been the initial Incident Management Team for the Indians Fire earlier in the summer and had developed an incident traffic plan for that incident. During the Chalk Fire, near misses had been formally and informally reported. Documented and recorded incidents included a mirror clip between two “buggies” directly related to extremely narrow two-way roads. A T-Bone collision occurred at a highly used insertion, and a California Conservation Corp crew hauler veered into a roadside ditch. There were several “strong signals” days before as well as the very day of the Engine 56 rollover that risks were high and small accidents were occurring—possibly leading up to a significant accident. It appeared there was a performance lapse between the IMT and Forest Management by putting the focus, problem, or solution on drivers and their vehicles and *not* implementing a traffic plan until the time was right and all the logistical resources were available to implement (signs, maps, etc). Three days after the Engine 56 rollover, the Indians Fire one-way travel plan was implemented. This resulted in a major and formal change in the traffic management process on the Chalk Fire.
- The driver of Engine 56 had previous experience driving several similar roads on Fort Hunter Liggett Military Base while assigned Driver, Engine Operator on another module earlier in the 2008 fire season. It was perceived that the driver of Engine 56 took extra risks in driving at excess speed, was complacent, and had casualness due to experience driving the roads.
- On several occasions, drivers among S/T 6609C discussed driving hazards present on access roads to the Chalk Fire. These concerns were expressed to the Strike Team Leader/Strike Team Leader Trainee and voiced up the chain of command to Operations Section Chief, Logistics Section Chief, and the Incident Commander.
- Transition briefing elements between LPF and CIMT7 did not address road hazard issues.
- The Incident Management Team normalized the driving risks associated with the roads even after recognition of the driving risks and hazards. Some people interviewed felt it was complacency on the part of the IMT due to the presumed understanding that the team and crews were familiar with the roads and hazards because this was the third time in the 2008 fire season that the identical ICP site had been utilized.

4. Equipment Operation Maintenance and Performance

Several key issues, at risk decisions and behaviors relative to engine operations, maintenance, and equipment and operator performance that enabled and/or contributed to human error which precipitated the unintended outcome were identified. These issues, decisions and behaviors were divided into three sections:

- A. Speed of travel of the engine was determined to be between 45 to 56 mph in a 35 mile an hour zone. This was determined by witness statements, a police report, equipment specialist, and the equipment analysis.
- B. A damaged rear tire on the engine during the fire assignment (another signal of driver's inattentiveness or skill level) resulted in the tire being replaced by Ground Support with a mismatched tire with different tread pattern, height and width of the tire. Engine 56 crew leadership accepted this mismatch.
- C. The continuous use of the retarder mechanism as it was continuously left in the "on" position and used by the driver as part of the regular braking system.

Related Elements:

- The driver did not have the skills, experience, or knowledge to react to a situation requiring these attributes.
- Prior to Engine 56 being mobilized to the Chalk Fire, visual checks were performed by the Captain and Fire Engine Operator revealing that all four rear dual tires were nearly worn to the point of replacement. At this time, it was decided that the tire replacement would be scheduled once the engine returned from the fire assignment. There was no supporting documentation on the preventive maintenance (PM) check.
- Due to the left rear dual tire damage, the tire was replaced at the Incident Command Post by Ground Support. However, during the post-accident demobilization inspection, all six tires were at—or near—tread wear bar limits. In addition, a difference in diameter in the rear dual tire was noted. The difference of one inch in diameter between the two left rear dual tires as revealed in the post-accident findings may have been a contributing factor in the handling of the apparatus during the accident. The November 2002 International Operator's Manual states: *"Dual tires should be matched using tires of equivalent size. Tires that differ more than ¼ inches in diameter or ¾ inch in circumference should not be mounted on the same dual wheel assembly."*
- The Driver and Acting Captain questioned the Ground Support Mechanic about whether or not the mismatch tires would affect the release of the apparatus during the demobilization process versus the effect of the performance of the engine. The mechanic replied that there would be no issue with demobilization of Engine 56.
- Review of manuals and engine documentation reveals the use of the retarder mechanism contributed to the loss of control during attempted corrective maneuvers

during the accident. Engine 56 retarder mechanism was in the “on” position and functioning at the time of the accident.

Causal Factors

- **Driving Skills and Performance**

All hard evidence suggests that Engine 56 was traveling in excess of 35 mph, impacting the driver’s ability to control the vehicle once the rear dual dropped off the pavement. The driver had demonstrated a penchant for driving too fast in the past, as well as inattentiveness. He was also prone to distractions. Previous driving skills and performance indicates a deficiency of maturity or experience as a driver of a Type III Model 62 Fire Engine which resulted in at-risk behaviors.

Prior to the rollover, Engine 56 crewmembers had their issues and concerns about this driver’s abilities. However, there appeared to be a hesitancy to voice these concerns to supervisors. (Crewmembers did not speak up to the Engine Operator, Captain, Battalion Chief, or Division Chief at their ranger district.)

There seems to be a cultural hesitancy to question or voice an opinion to experienced authority. The academic literature discusses these problems of “upward voice”—people not raising issues of concern with those above them in the hierarchy.

This rollover experience highlights how we need to be concerned with what is known as “lateral voice”—inter-crew communication. Each person has the responsibility to think of themselves as a safety officer or a lookout for the entire crew. Someone might see something from their unique perspective that others are not seeing. We therefore need to cultivate a mindset of collective “sense-making” and realize that developing good situational awareness is a crew responsibility.

- **Retarder**

It appears to be a common practice for drivers to keep the retarder in the “on” position and rely on this as a primary device to slow the apparatus during daily driving operations. Retarders aid in a secondary braking device. To prevent the service brakes from excessively wearing, drivers are constantly reminded to use the retarder mechanisms as much as possible. Very little documented training in proper use of the retarder mechanism had occurred. This particular driver of Engine 56 had not attended a Geographical Engine Academy. The Pacific Southwest Region’s Engine Academies allow drivers to demonstrate and show competency during hands-on training in driving-related physics and physiology, and the use of instruments and equipment appropriate to driving Type III Engines.

- **Tires**

People refer to and look for recommendations from the “experts” when seeking direction. The finding by the experts is often taken as the last and final word when possible disagreement may arise. While replacing the damaged tire, when the

Acting Engine Captain and driver questioned the mismatched size and tread of the tire, they were told that there would be no issue during demobilization from Ground Support. There was no concern or question that the mismatched tires may affect safe handling of the engine. The goal by Ground Support, the Driver and Acting Engine Captain was to repair the engine, become serviceable, and return to the fireline.

5. Post-Accident Incident Management

Neither the San Bernardino National Forest or Los Padres National Forest Incident Management Team or the Pacific Southwest Region adhered to established regulations and policies regarding post-accident drug testing.

There was limited contingency planning between CIMT7 and Fort Hunter Liggett regarding roles and responsibilities for handling “an incident within an incident” regarding a variety of contingencies and possibilities. Fort Hunter Liggett was part of the Unified Command System and attended briefings. Forest Service Law Enforcement did not play an active role in the Unified Command of the Chalk Fire. Part of Fort Hunter Liggett’s Law Enforcement response to the traffic issues was to triple points and double the fine, which did not address the traffic flows risks and hazards, but only enforced current regulations.

The Strike Team Leader asked for administrative leave from several different San Bernardino Fire Management Officers to provide the engine modules (Forest Service and Bureau of Land Management) with two paid days off upon return to their home units from the Chalk Fire. This request was made due to the mental stress the Strike Team had experienced from the accident. The administrative leave was denied or not considered from the Forest Fire Management Officer because the Strike Team had not met the 14-day assignment length requirement.

Related Elements

The driver was not post-accident drug tested. This standard procedure was not considered at the Supervisor, Incident Management Team, Forest, or Regional level. California Incident Management Team 7 Staff, San Bernardino National Forest, and Los Padres National Forest all maintain that they had no knowledge of post-accident drug testing requirements. Strike Team Leader 6609C was peripherally aware of post-accident drug testing policy but was preoccupied with medical care of Engine 56 employees involved in the accident.

At the time of the accident, the San Bernardino National Forest did not have the position filled that could track or facilitate drug testing initiation. The Regional Fire Safety Officer had forgotten about the drug testing requirements. The final decision as to whether to test or not to drug test an employee post-accident lies with the centralized Human Resources Director at the National level.

Each National Forest within the Forest Service manages their Critical Incident Stress Debriefings and a provider locally, as the program is decentralized.

Causal Factors

There is no clarification or direction of process and procedure for post-accident testing requirements, training, and implementation from the Washington Office.

Agency Administrators and many Incident Management Teams use the template “Agency Administrator’s Briefing to IMT’s” from the Interagency Standards for Fire and Aviation Operations “Red Book” Appendix D-1. This template contains no discussion points for roles and responsibilities or agency-specific directions for managing accidents (vehicle accidents – drug testing, Critical Incident Stress Debriefing [CISD] provider phone numbers, etc.) nor accident scene management and coordination with cooperators. It is therefore dependent upon Agency Administrators and IMTs to discuss these types of questions during the inbriefing. Many times, team members feel inhibited to ask questions at the inbriefing or they decide there will be the appropriate time once the team gets settled to ask these questions of agency subject matter experts.

Some teams will ask the Agency Administrator for an extended Agency Administrator in-briefing dialogue after the initial in-briefing. The Incident Commander (IC) plus several members of the Command and General Staff will spend several hours with the Agency Administrator to assure a comprehensive dialogue while other members of the team will begin management of the incident.

Many IMTs practice execution of their incident within an incident protocols at their spring meetings in an atmosphere free of fireline distractions. It has been demonstrated that those teams who regularly practice their incident within an incident protocols on real incidents are better prepared to manage the “real thing”. Also, those teams who have several dry runs preseason—and then train during each incident—are better prepared than those teams who solely dialogue at their spring meeting about roles and responsibilities for team members.

The granting of administrative leave is a discretionary decision and the work/rest guidelines are just that, *guidelines*. There is concern that allowing for an exception to a written guideline could potentially set a precedent that would require future adherence (Administrative Leave).

VI RECOMMENDATIONS

1. The Pacific Southwest Region fleet works with the National Engine Operators Steering Committee and International Harvester Corporation to develop, establish, and implement standards and scenarios in which retarders may or may not be beneficial—as well as properly train permitted and newly licensed commercial drivers to a predetermined level of experience. *(The creation of a Type III ENOP PTB that mandates and documents specific time and complexity increments capturing “quantity and quality” of driver training experience.)*
2. The Pacific Southwest Region will develop a written Training, Qualifications, and Requirement standard that compiles and aligns: current standard position descriptions, 5109.17 qualifications, letters of direction (LWA 32, 2006 Tgi kqp 7 Gpi kpg O qf wrg "Eqphki wtcvkqp Tgs wktgo gpw), and Interagency Standards for Fire and Aviation Operations specific to the Engine Captain and Engine Operator positions on Type III Engine Modules. This action should develop consistent and clearly understood direction describing the function and qualification of each position, region-wide.

Currently:

- a. **Position Description:** GS-0462-7, Forestry Technician, Engine Operator. *“In the absence of SFEO, serves as Initial Attack Incident Commander on wildland fires and wildland urban-interface/intermix situations occurring on the unit.”* This is unclear as to Incident Commander Type 4 or Type 5.
 - b. **5109.17:** There is no Incident Commander requirement in the current 5109.17 for either Engine Boss or Engine Operator qualification.
 - c. **Regional Letter of Direction:** Vj g'f ckn "eqphki wtcvkqp hqt 702 uchw hpi "eqpvkwgu" "*****vq kpenwf g'cp Gpi kpg Dqu *GP I D+y j q ku'pqvf tkxkpi 'yj g'gpi kpg'cpf 'c's wcnhkf " "*****f tkxgt 'y kj "Ercau'D'hegpug'cpf "cr r tqr tkvg'gpf qtugo gpw"r gt LWA 32. 4228 rgwgt +0
 - d. **Interagency Standards for Fire and Aviation Operations:** No Minimum Staffing Requirement, Fire Training and Qualification Standard, or Driver Training and Qualification Requirements.
3. In situations where an individual is in a designated leadership position (such as Engine Captain, Division Chief, Battalion Chief) in collateral duties (such as long-term commitment to an Incident Management Team), management assesses the effects, consequences, and functionality of the unit with the missing leadership position. If operational, leadership, or safety deficiencies are identified, action will be taken by the unit Line Officer to fill this temporary void in leadership.
 4. The Los Padres National Forest, as well as other units, should access and integrate previously developed travel plans during future incidents that occur within the Ft. Hunter Liggett Military Base. The road conditions (such as narrow, no shoulder) need to be highlighted during the Agency Administrators and Incident Management Teams transitional in-briefing process.

5. The Pacific Southwest Region's fleet works with contracted vendors, CAL FIRE, California Wildfire Coordinating Group (CWCG), and Firescope, referring to vehicle operators manuals for direction when replacing tires—ensuring not to install mismatched size tires on vehicles.
6. Any modifications to standard configuration of the manufacturer's truck or pump design will occur only after appropriate authorization, in concert with existing regional policies.
7. The Washington Office needs to provide clarification, direction, and procedure for post-accident drug testing requirements, training, and implementation.
8. The Pacific Southwest Region provides a directive that clarifies the proper procedure for releasing sensitive and confidential accident information via text messaging and cell phones.
9. Forests, Line Officers, and Incident Management Teams review and discuss the Agency Administrator's Guide to Critical Incident Management (July 2008) several times a year.

This Accident Prevention Analysis provided an opportunity to formalize a process that will help reduce future errors by correcting or reinforcing behaviors and providing a foundational basis for accelerating fire management organizational learning.

VII SUMMARY

The Accident Prevention Analysis process utilized for this incident was a viable method that facilitated accomplishment of all desired objectives. It provided an opportunity to evaluate individual decisions, actions, behaviors, issues, and causal factors. The outcome of this process imparted much less stress and anxiety to the firefighters who were interviewed. This resulted in more open and candid discussions of the event. It also provided an opportunity to formalize a process that will help reduce future errors by correcting or reinforcing behaviors and providing a foundational basis for accelerating fire management organizational learning.

In an effective learning culture, mistakes, near misses, and accidents are framed, publicized, and exploited as opportunities to learn. Consequently, the focus of this analysis was not to document where employees went wrong, but, instead, to understand and display why what they did made sense to them at the time. Importantly, given similar circumstances, if their at-risk decisions made sense to them at the time, the same risky decisions will make sense again to other firefighters.

The related elements that were uncovered through this analysis display a number of at-risk behaviors that were ignored—if not condoned—by the agency and the culture. For example: driver qualifications, history and performance, and maintenance and operation of large complex fire engines.

The following is an excerpt from the “Human Factors” section in the Indians Fire Accident Prevention Analysis Report:

“The intention of learning must be at the forefront. At the heart of learning is to challenge assumptions and expectations. If, after you read this report, your thought is, ‘Did they ever screw up—I would never do that,’ then we on the APA Team have failed in our responsibilities as storytellers. And you have failed in your responsibility as a listener to take advantage of this learning opportunity. By taking such a stance, you would in effect be enacting a defensive routine to protect your ego. You, as a reader, have a responsibility to learn. That can only happen by trying to put yourself in the place of the participants and see the world from their perspective—and try as best you can to avoid hindsight bias, which is pervasive and unavoidable. We need to become students of practical drift, and study why it occurs, so that we can respond appropriately.”

VIII. COMMENDATIONS

California Incident Management Team #7

The Accident Prevention Analysis Team would like to acknowledge how the California Incident Management Team #7 was identified by crew members as being responsive to their needs—both during and after the rollover accident.

Special mention goes to John Alford, PIO 2, California Incident Management Team #7 for recognizing a need and providing support to the San Bernardino National Forest Engine 56 crew after their accident. Noteworthy was his ability to have concern and compassion for the well-being of the firefighters and his willingness to assist them.

John met the five Engine 56 crew members at the hospital, transported them to a local motel, and provided them dinner. The next morning, John provided them breakfast and drove the crew members back to base camp. His contribution is commendable and made a positive difference in this difficult situation.

San Bernardino National Forest Supervisor's Office Staff

The Accident Prevention Analysis Team would like to recognize the management of the San Bernardino Forest Supervisor's office for providing staff assistance, accommodations, and coordination to the team.

A special note of thanks goes to Daniel Snow, Chief 3, San Bernardino Forest Supervisor's Office. Daniel spent countless hours accommodating the Accident Prevention Analysis Team arranging office space, providing conference rooms, copy machines, and—most importantly—the scheduling of four San Bernardino Forest engine crew interviews, plus one BLM engine crew and other San Bernardino Forest employee interviews. The help from Daniel allowed the Accident Prevention Analysis Team to focus time on the analysis process.

IX. APPENDICES

APPENDIX A: CHRONOLOGY OF EVENTS

DATE 2008	TIME (all times approximate)	IDENTIFIER	EVENTS
Friday Oct 3	1800		<ul style="list-style-type: none"> Night Operation – Incident Operation Briefing
Friday Oct 3	1940	Safety	<ul style="list-style-type: none"> CA-BDF-E56, traveling safely west bound on Vasquez Road.
Friday Oct 3	1940	Fulton IHC	<ul style="list-style-type: none"> Reports to communication: “Emergency Traffic from Strike Team 6609 “C”
Friday Oct 3	1941	Communications Unit	<ul style="list-style-type: none"> “An engine from Strike Team 6609 “C”, assigned to Structure Group rolled on Vasquez Road.”
Friday Oct 3	1945	Communications Unit	<ul style="list-style-type: none"> Notified 911 via cell phone; requesting for medical response with two (2) ambulances to Vasquez Road, one (1) mile south of Del Venturi Road. All hard phone lines are down at the time due to overload. The ambulance that was available at the Incident Command Post was committed to the CCC vehicle accident. Safety Officer Type II (SOF2) and SOF2 (T) responded to the incident.
Friday Oct 3	1948	Communications Unit	<ul style="list-style-type: none"> Cal Star Air Ambulance en route, via land line from Salinas, CA.
Friday Oct 3	1950		<ul style="list-style-type: none"> Notification from accident scene of a total of five (5) patient four(4) minor injuries, one (1) moderate injury. Requesting one (1) additional ambulance. (Comm Unit)
Friday Oct 3	1952	Fort Hunter Liggett Fire and Emergency Services (F&ES)	<ul style="list-style-type: none"> A phone call received at the fire station from Fire Com stating that there was a “fire engine” rollover with five (5) patients one mile from Del Venture Road on Vasquez Road. Fire Com stated that there was two (2) Advanced Life Support (ALS) ambulances enroute and wanted to inform Fort Hunter Liggett F&ES of the incident.
Friday Oct 3	1953	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> Respond to the scene.
Friday Oct 3	1955	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> Fort Hunter Liggett units arrive at scene.
Friday Oct 3	1955	Fort Hunter Liggett Chief 8802	<ul style="list-style-type: none"> Incident Command Post was established by Chief 8802 where multiple engines were found at scene with one (1) resting the passenger side along with multiple fire personnel treating five (5) patients.
Friday	1955	Fort Hunter	<ul style="list-style-type: none"> Ambulance 8869 was assigned patient care.

Oct 3		Liggett Chief 8802	<ul style="list-style-type: none"> • Engine 8812 was assigned with patient care and secure E56. • Engine 8811 was assigned to get other vehicles off the road in order to get the patients to the ambulance. • Law enforcement agencies assisted with traffic control.
Friday Oct 3	1957	Communications Unit	<ul style="list-style-type: none"> • Confirmation of third ambulance in route. (Comm Unit)
Friday Oct 3	2001	Communications Unit	<ul style="list-style-type: none"> • CHP Helicopter-70, in route. (Comm Unit)
Friday Oct 3	2004	Fort Hunter Liggett Chief 8802	<ul style="list-style-type: none"> • Reports came in that there were two (2) major and three (3) minor patients. • Air ambulance requested. • <i>All five (5) patients conditions were later down graded.</i>
Friday Oct 3	2009	Communications Unit	<ul style="list-style-type: none"> • Transition to local control for incident. • Operation Section Chief on scene.
Friday Oct 3	2010	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> • Engine 8811 was advised to establish a landing zone for the CalStar Medical Helicopter at the clinic with an estimated Time of arrival (ETA) of 2051 hours .
Friday Oct 3	2013	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> • Ambulance 8868 loads Patient #1, and Patient #2.
Friday Oct 3	2015	Night Operations	<ul style="list-style-type: none"> • Asked if the remaining engines of Strike Team 6609”C” will be on the line for the rest of the work period.
Friday Oct 3	2020	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> • CalStar reported they were unable to arrive. • Ambulance 8869 transferred care (2 patients) to American Medical Response Ambulance • AMR Ambulance enroute to Mee Memorial Hospital, King City, CA, with Patient #3 and Patient #4.
Friday Oct 3	2021	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> • Ambulance 8868 enroute to Mee Memorial Hospital, King City, CA, with Patient #1 and Patient #2.
Friday Oct 3	2027	Fort Hunter Liggett	<ul style="list-style-type: none"> • American Medical Response Ambulance arrived on post.
Friday Oct 3	2030	Communications Unit	<ul style="list-style-type: none"> • Third ambulance on scene, loading Patient #5.
Friday Oct 3	2040	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> • Medic 53 arrived at scene. • Medic 53 transporting last patient to Mee Memorial Hospital, King City, CA.
Friday Oct 3	2043	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> • Landing Zone terminated and all possible aircraft and ambulances that might have been en route were cancelled.
Friday Oct 3	2055	Communications Unit	<ul style="list-style-type: none"> • Night Operations reports there is need for battery exchange on the repeater, radio communications are difficult. • All five (5) patients have been transported to

			Mee Memorial Hospital for further evaluation.
Friday Oct 3	2056	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> Fort Hunter Liggett 8811, available, off scene. Fort Hunter Liggett 8802 and 8812, remained on scene to clean up and wait until tow truck arrived.
Friday Oct 3	2100	Communications Unit	<ul style="list-style-type: none"> BDF E56 will be towed to Helibase across from USFS Mission Creek Fire Station.
Friday Oct 3	2155	Communications Unit	<ul style="list-style-type: none"> All five (5) patients will be released and in hotel for the night
Friday Oct 3	2130		<ul style="list-style-type: none"> After action discussion with Strike Team Leader and Trainee, Human Resources, Safety, Incident Commander. Critical Incident Stress Debriefing offer was made.
Friday Oct 3	2303	Fort Hunter Liggett F&ES	<ul style="list-style-type: none"> All Fort Hunter Liggett units back in quarters.
Saturday Oct 4	1230		<ul style="list-style-type: none"> Critical Incident Stress Debriefing
Saturday Oct 4	1330		<ul style="list-style-type: none"> After Action Review at Fort Hunter Liggett
Saturday Oct 4			<ul style="list-style-type: none"> Demobilization of Strike Team 6609”C”
Saturday Oct 4			<ul style="list-style-type: none"> Communication Unit visits accident site to review radio signal strength.
Sunday Oct 5	1400		<ul style="list-style-type: none"> Incident Demobilization Vehicle Safety Inspection on E56.
Sunday Oct 5	1500		<ul style="list-style-type: none"> In Briefing with Coastal Incident Management Team 7 and the Accident Prevention Team.

Patient #1: Acting Captain

Patient #2: Fire Fighter #1

Patient #3: Driver

Patient #4: Fire Fighter #3

Patient #5: Fire Fighter #2

APPENDIX B: EQUIPMENT SPECIALIST SUMMARY

October 2nd 2008 approx. 1700 hours – Engine 56 drives over its wheel chalk block causing a blow out on the outside left rear dual tire in the chalk fire camp. The crew takes the engine to the ground support unit to have the tire changed.

October 3rd 2008 at 1940 hours - F.S. 6029 BDF Engine 56 a 2004 international 7400 model 62 4x4 Fire Engine is involved in a rollover accident on Vasquez Rd. and is laying on its right side parallel to the northbound lane of Vasquez Rd.

October 3rd 2008 approx. 2100 hours - Always Towing, a local towing company, is on the accident scene to begin recovery operations for Engine 56 and gets the fire apparatus up right on all four wheels. The tow truck operator is directed to tow Engine 56 to a vacant lot across from the Hunter Liggett Fire Dept.

October 3rd 2008 approx. 2200 hours - CIMT7 is providing security watch for Engine 56 and its contents at the vacant lot across from Hunter Liggett Fire Dept. and continues providing security until October 6th at 1200 hours .

October 6th 2008 1000 hours - The Regional APA team is in place at Fort Hunter Liggett Base Camp and takes possession of Engine 56.

October 6th 2008 1000 hours - The Regional APA team members, Captain 64 and the fleet specialist from Southern California remove all loose fire equipment, medical devices, extra fire hose, tools, SCBA bottles, and personal effects from Engine 56 and load them into a contracted ground support stake bed truck.

October 6th 2008 1030 hours - The contracted stake bed truck returns to the ground support unit with the contents of Engine 56 and waits for the APA team's instructions for returning the items to Engine crew 56 on the San Bernardino National Forest.

October 6th 2008 1100 hours - City Motors Towing is contracted by the APA team to load Engine 56 on a low bed trailer and take it to Gibbs International in Nipomo, Ca. for a preliminary damage assessment and complete mechanical inspection.

October 6th 2008 1400 hours - Engine 56 arrives at Gibbs International truck Dealer in Nipomo, CA. by way of City Motors Towing.

October 13th 2008 1500 - hours APA team members receive an E-mail from Gibbs International that reveals pictures and tire tread depth readings from Engine 56. They also indicate that they are unable to communicate with the Engine's computer due to damage to the electrical system.

October 15th 2008 1930 hours - Engine 56 damage estimates are completed by service writer Allan Fraser. The total body damage estimated is \$58,855.84 and the estimate for mechanical repairs for Engine 56 is \$34,365.00.

October 20th 2008 1100 hours - Gibbs International finishes its 83 point inspection of Engine 56 and includes the brake lining percentages of the truck at the time of the accident. The brake shoes had only 25% wear at the time of the accident and had a

full 75% lining left of their original thickness, it is determined that the frame of the truck is not distorted or bent.

October 20th 2008 1500 hours Engine 56 awaits a decision to be repaired or transported to a local Forest Service Yard for storage.

November 7th 2008 1600 hours Engine 56 arrives at Golden Hands Auto Body in Pasadena, Ca. from Gibbs international in Nipomo Ca. by way of Forest Service transport 1 from San Bernardino N.F. crew. Engine 56 begins repair process that was decided by Fleet Mgt., San Bernardino Forest Supervisor, Deputy Forest Supervisor, San Bernardino fire management officers, along with the concurrence of the regional fleet manager. Golden Hands Auto Body won the contract bid to repair Engine 56 at \$85,000.

Equipment Summary Facts

- The Allison transmission hydraulic retarder master control switch was on, energized and the retarder itself was working at the time of the Engine 56 rollover accident.
- The left rear outside dual tire was mismatched to the left rear inside dual tire in circumference as well as tread design. The front steer tires were smooth at the tire wear bar indicators and worn beyond limits.
- Engine 56 was modified prior to the accident at the chalk incident by having its hard line hose reel complete unit removed and compartment space completely filled with hose packs.
- Engine 56 sustained severe impact damage to the main crew cabin and disintegrating of the front hood of the truck. Also Engine 56 sustained complete right side damage and misalignment of the rear fire apparatus unit, along with extensive mechanical damage.

Equipment Conclusion

1. After several test drives in similar and sister model 62 4x4 brush trucks engaging the retarder at different speeds between 35mph and 55 mph, along with discussions with Allison transmission manufactures and rebuilders, there would be minimal and hardly any lunging action with the retarder energized and engaged at 35mph breaking impact. At 55 miles per hour, engaging the retarder and releasing the throttle and, or applying the service brakes, would cause a significant lunging action back onto the road surface from the dirt shoulder with the right rear dual tires locking up causing a loss of control, and or skidding. Due to the right rear dual tires being in the dirt, the retarder would read this action as an open differential spin or a slippery road condition. This would probably result in an injury accident or mechanical damage.
2. After inspection of all six (6) tires on Engine 56 it has been determined by the Equipment Specialist and numerous tire management personnel from Goodyear commercial tire systems that were consulted that Engine 56 could have had much better handling capabilities and control of the vehicle if it would have had its six tires replaced and properly matched before the accident occurred.
3. The issues regarding Hose reel hardline removal and modification were discussed with the fire engine manufacture in Boise, Idaho. It was determined that the weight difference with the hose packs in place of the hose reel unit probably would not cause any significant problems.
4. After numerous commercial truck repair facilities inspections of Engine 56 and the severe damage impact to the body and front end mechanical damage sustained, along with the Hunter Leggitt police report and accident site investigations this strongly suggests that Engine 56 was traveling between 50 and 55 miles per hour at the time of the accident.

APPENDIX C: TRAINING QUALIFICATION REPORT

Minimum skill and quality experience is an issue of concern to the firefighters involved in any incident, as well as, a major focus of the APA review team. During this analysis the review team did have access to the agency's Incident Qualification Certifying Systems Master Records of individuals involved in the accident. Qualifications were reviewed as opportunities presented themselves, but the team relied mainly on high confidence in the various levels of checks and balances embedded in the IQCS System, Fire and Aviation Management Handbook 5109.17, Forest Service Manual 5100 Fire Management Chapter 5120 – Preparedness, Chapter 5130 – Wildland Fire Suppression, Forest Service Handbook 7109.19 – Fleet Equipment Management Handbook.

Everyone directly involved appeared to be appropriately motivated and intentioned. The decisions seemed reasonable to those involved at the time based upon their understanding of the situation, their experience and their expectations.

An issue was identified by the APA team regarding mobilization of E56 without two (2) qualified drivers on the Type III Engine. During the analysis process of the CA-BDF-E56 Rollover, both the Acting Captain and Assistant Fire Engine Operator did not meet the training qualifications set forth by the Position Descriptions, Fire and Aviation Management Handbook (5109.17), Forest Service Handbook (7109.19), Forest Service Manual (5100), and the Regional letter of direction dated July 10, 2006.

QUALIFICATIONS

DRIVER	ACTING CAPTAIN
ENOP, Engine Operator	ENGB, Engine Boss
FFTI, Firefighter I	ENOP, Engine Operator
FFT2, Firefighter II	FFT1, Firefighter I
RXCM, Prescribed Fire Crew Member	FFT2, Firefighter II
EDRC, Expanded Dispatch Recorder	CRWB(T), Crew Boss
N9022, Defensive Driving	RXB3, Prescribed Fire Burn Boss 3
	STAM, Staging Area Manager
	Region 5, South Zone Engine Academy

E56 Driver and Acting Captain were not in compliance with the qualification requirements unique to the following:

- **National Wildland Fire Coordinating Group (NWCG) Wildland Fire Qualification Systems Guide (310-1).**
- **Fire and Aviation Management Qualifications Handbook (FSH 5109.17).**

ENGINE OPERATOR (ENOP), Driver

Required Training

IS-700, National Incident Management System (NIMS), An Introduction
Completed: May 18, 2007

RT-130, Annual Fireline Safety Refresher
Completed: May 12, 2008

Required License

Appropriate license and endorsements for make and model of engine.

Class B Commercial License *Issued: April 29, 2008*

U.S. Government Motor Vehicle Operators Identification Card

Issued by San Bernardino National Forest: October 24, 2006

Sedans/Pickups <15,000 GVW *Certified*

Model 61, 62 26,000> GVW *Certified*

Red Lights & Sirens *Certified*

4 x 4 **Non Compliant**

Required Experience

Firefighter Type I (FFTI), *Certified: August 6, 2007*

AND

Satisfactory performance as an Engine Operator, *Certified: August 5, 2008*

Physical Fitness

Arduos, *Completed: April 28, 2008*

Other Position Assignments that will Maintain Currency

Single Resource Boss Engine (ENGB), *Not Qualified*

Strike Team Leader Engine (STEN), *Not Qualified*

Other Training Which Supports Development of Knowledge and Skills

Geographic Area Engine Academy, *Not Completed*

ENGINE BOSS (ENGB), Acting Captain

310-1 Required Training

S-290, Intermediate Wildland Fire Behavior, *Completed: January 21, 2005*

S-230, Crew Boss (Single Resource), *Completed: December, 8, 2004*

RT-130, Annual Fireline Safety Refresher, *Completed: April 28, 2008*

Forest Service Additional Required Training

I-200, Basic Incident Command System, *Completed: December 8, 2006*

IS-700, National Incident Management System (NIMS), An Introduction
Completed: December 4, 2008

L-280, Followership to Leadership, *Completed: March 26, 2004*

S-215, Fire Operations in the Urban Interface, *April 28, 2005*

S-231, Engine Boss or *Geographic Area Engine Academy:*
Completed: April 26, 2006

S-234, Ignition Operations, *Completed: January 14, 2005*

S-260, Interagency Incident Business Management,
Completed: May 18, 2004

S-270, Basic Air Operations, *Completed: January 26, 2005*

310-1 Required Experience

Satisfactory performance as a Fire Fighter Type I (FFTI),
Qualified: October 25, 2004, May 4, 2007

AND

Successful position performance as an Engine Boss, Single Resource (ENGB) on a
Wildland fire incident, *Qualified: June 14, 2007*

310-1 Physical Fitness Level

Arduous, *Completed: May 7, 2008*

310-1 Other Position Assignments that will Maintain Currency

Any single resource boss (CRWB, DOZB, FIRB, FELB, TRPB, HELB,)

Not qualified in any position.

Incident Commander Type 4 (ICT4), ***Not Qualified***

Any higher position for which this position is a prerequisite.

Required License (No requirement for ENGB)

Appropriate license and endorsements for make and model of engine.

Class B Commercial License, *Issued: March 29, 2006*

U.S. Government Motor Vehicle Operators Identification Card

Issued by Cleveland National Forest: March 22, 2007

Sedans/Pickups <15,000 GVW *Certified*

Model 61, 62 26,000> GVW *Certified*

Red Lights & Sirens *Certified*

4 x 4 ***Non Compliant***

- **Forest Service Handbooks (FSH).**
- **Fire Qualification Review Committee (FQRC) Standard Operating Plan.**

No supporting documentation was provided to the APA Team verifying a Fire Qualification Review Committee (FQRC) Standard Operating Plan was in place.

No supporting documentation of a FQRC Committee consisting at a minimum of the Fire Management Staff Officer, a line officer representative, Incident Qualifications and Certification System (IQCS) Administrator, and a representative from the National Federation of Federal Employees (NFFE) or other appropriate Forest Service union official, as well as representatives knowledgeable of the unit's personnel.

- **Regional Letter of Direction set forth in *in*, 2006.**

The daily configuration for 5.0 staffing continues to include an Engine Boss (ENGB) who is not driving the engine and a qualified driver with Class B license and appropriate endorsements.

- **OF-346, Government Motor Vehicle Operator's Identification Card.**

No supporting documentation provided for issuing OF, 346.

ENGINE OPERATOR (ENOP), Driver: Required Endorsement

Appropriate license and endorsements for make and model of engine.

Class B Commercial License *Issued: April 29, 2008*
U.S. Government Motor Vehicle Operators Identification Card
Issued by San Bernardino National Forest: October 24, 2006
Sedans/Pickups <15,000 GVW *Certified*
Model 61, 62 26,000> GVW *Certified*
Red Lights & Sirens *Certified*
4 x 4 **Non Compliant**

Required License

Appropriate license and endorsements for make and model of engine.

Class B Commercial License, *Issued: March 29, 2006*
U.S. Government Motor Vehicle Operators Identification Card
Issued by Cleveland National Forest: March 22, 2007
Sedans/Pickups <15,000 GVW *Certified*
Model 61, 62 26,000> GVW *Certified*
Red Lights & Sirens *Certified*
4 x 4 **Non Compliant**

- **Position Description**

DRIVER, Forestry Technician, GS-0462-05

“Ability to operate four wheel drive pickups and may require ability to operate a fire engine.”

ACTING CAPTAIN, Forestry Technician, GS-0462-07

“In absence of SFEO, serves as initial incident Commander on Wildland fires and Wildland urban/intermix situations occurring on the unit.”

APPENDIX D: ACCIDENT PREVENTION ANALYSIS TEAM MEMBERS

Jody Noiron, Team Leader, Forest Supervisor, Angeles National Forest

Ted Moore, Accident Prevention Analysis Process Coach, Fire Safety and Training Branch Chief, Rocky Mountain Region

Julie Buel, Writer/Editor, Subject Matter Expert - Engine Captain, Training Specialist, Eldorado National Forest

Ron Ashdale, Safety Officer, Forest Safety Officer, Angeles National Forest

Myron Hoffman, Subject Matter Expert - Equipment Specialist, Fleet Maintenance Manager, Southern California Province

Arin Doyle, Subject Matter Expert, Hand Crew Squad Leader, Six Rivers National Forest