CDF Green Sheet

California Department of Forestry and Fire Protection

FIRE ENGINE AIR CLEANER FIRES

February 10, 2002

GAVILAN FIRE

CA-MVU-1024
CDF – SAN DIEGO UNIT

SIERRA/SOUTH REGION

Lookouts Communications Escape Routes Safety Zones

A Board of Review has not approved this Summary Report. It is intended as a safety and training tool, an aid to preventing future occurrences, and to inform interested parties. Because it is published on a short time frame, the information contained herein is subject to revision as further investigation is conducted and additional information is developed.

Report: February 12, 2002

SUMMARY

On February 10, 2002, at approximately 1330 hours, a local government fire engine, with three assigned personnel, was severely damaged by fire while evacuating public and protecting structures on the Gavilan Fire in Fallbrook, San Diego County. The engine was NOT overrun by fire, but rather caught fire from blowing embers entering the air intake system and igniting the air cleaner. There was NO wildfire flame impingement on the engine, all the damage was a result of the vehicle itself catching fire and burning the engine compartment and cab. The three-person crew was not injured. The event occurred near the north end of Santa Margarita Road in the community of Fallbrook, within the boundaries of the North County Fire District.

A second local government engine experienced a similar air cleaner fire caused by blowing embers, but the damage was confined to the air cleaner housing and turbocharger. There was NO wildfire flame impingement on the engine, the damage was a result of the vehicle itself catching fire and burning in the engine compartment. This event occurred on the Naval Weapons Center adjacent to the community of Fallbrook.

CONDITIONS:

The first accident site was located near the dead end of Santa Margarita Road, one mile north of the community of Fallbrook, San Diego County. Santa Margarita Rd. is a paved, relatively level, residential road. Average road width is 25 feet. The road traverses north-south along a ridge that runs between two deep drainages. The majority of homes on Santa Margarita Rd. are located along the ridge, on one/half acre to one acre parcels.

Engine 1111 was positioned in the northbound lane, facing south. To access this part of Santa Margarita Road, Engine 1111 had backed down the road to maximize the ability to leave the area quickly. (Turnarounds on Santa Margarita Rd. are limited to "three point" turns.) The left side of Engine 1111 faced east, positioned above a 40% slope covered by an avocado orchard. The right side of the engine faced a landscaped slope, below the residence at 2138

Santa Margarita Rd. The avocado orchard located below the engine had burned prior to its arrival in the neighborhood; therefore, Engine 1111 received no direct wildfire flame impingement.

The second accident site was the on Naval Weapons Center portion of Camp Pendleton. More detailed information on this site was not available.

VEHICLE DESCRIPTIONS:

Engine 1111 (Type 1) of the North County Fire Protection District was a 2001 HME / Central States Fire Apparatus engine, Model 1871 MFD Penetrator. The fire destroyed the cab and power plant. The air intake for the power plant was located on the left side of the cab, just aft of the driver's door. The intake was covered with a metal screen consisting of ¼ inch hexagon holes. This screen comprised the ember protection system for the air filter.

Engine 5 (Type 1) of the Oceanside Fire Department is a 2001 Pierce Quantum. Fire damage was limited to the air cleaner and turbocharger. The air intake for the power plant is located in the front left wheel well. The intake was covered with a metal woven wire screen consisting of ¼ inch holes.

Both engines used paper air filter elements. Both engines were certified NFPA 1901 compliant.

FIRE BEHAVIOR:

Fire behavior was extreme. Rapid rates of spread with large sheets of flame could be observed from the origin until late in the evening on the 10th. 50' flames and 500' per minute spread rates were encountered. Smoke dispersion was confined to a shallow layer near the ground due to strong winds preventing convection column formation. Firebrand production in chaparral is always present, but with strong surface winds, firebrands were large and numerous due to strong transport winds.

FUEL: The brush fuels, from the origin to the incident site, were coastal sage scrub and heavy mixed chaparral, characterized by fuel model 6 and 4 respectively. Significant leaf litter existed in the understory of the natural fuels. The fuels were 50 plus years old and had a high dead to live fuel ratio. Fuels consumed in the fire prior to the fire front arrival on Santa Margarita Road also included a large avocado grove with significant down leaf litter component. Some crown consumption had occurred in the avocado trees. Live fuel moistures were 55% in chamise fuels as measured at the Santa Rosa Plateau sampling area, ten miles to the north. Last sample taken in January 2002.

TOPOGRAPHY: The fire took place in some of the most dissected terrain in southern California. The Santa Margarita River drains most of southwest Riverside and northern San Diego counties. It cuts a 500-1000' deep channel in the land, and the fire started on one side and spread to the other easily, due to wind. In the area of the incident it is significant that there are several minor and major drainages off the main Santa Margarita channel oriented with the wind direction prevalent during the offshore winds.

WEATHER: The significant weather factors involved in the incident included a very strong offshore wind and single digit humidity readings. Beginning at 1000 hours on Feb. 9, (24 hours before the fire) the relative humidity was below 9%. The measurement was taken from a remote automatic weather station (RAWS) 2.5 miles down-stream from the incident site. During the structure protection effort on Santa Margarita Road, relative humidity was between 2 and 5%. The air temperature was in the mid 70's. The result was a fine dead fuel moisture reading of 4% and an ignition probability over 70%. **The largest single weather element was the wind velocity**. At the RAWS station winds were 24-32 mph at 20'. A 1052 millibar high in southern Utah caused extremely strong offshore pressure gradients and hence strong winds in many areas. Terrain channeling exacerbated these conditions.

Temperature: 86-90 F

Relative Humidity: 9-18 %

Wind: East-Northeast 10-12

FINDINGS / RECOMMENDATIONS:

Extreme winds during the fire created intense smoke and ember conditions. Ember protection systems (screens) installed on Engine 1111 and Engine 5 failed to prevent embers from entering the air filter systems and igniting the paper filter elements. The screens in place on Engine 1111 and Engine 5 had ¼ inch holes. Once an air filter catches on fire, the engine will stall and probably not restart.

CDF Engines 3360 and 3377 were working in the same area and fire conditions as Engine 1111. The air intake system on Engine 3360 (Model 14) was protected by the metallic "window screen" sized air filter modification. The air intake system on Engine 3377 (Model 9) was protected by the metallic "kitchen hood screen" air filter modification. Though conditions were so extreme that embers burned holes in several air lines on Engine 3377, the screen modifications on both engines protected both air filters from any ember intakes.

NFPA 1901, Section 10-2.4.1.1 specifies, "...The air inlet shall be protected so as to prevent water and burning embers from entering the air intake system..."

Fire agencies should insure that their fire apparatus have adequate ember protection systems. Consideration must be given to existing ember protection systems and whether or not these systems will adequately protect the apparatus from blowing embers.

SEQUENCE OF EVENTS:

At 1222 hours Engine 1111 was staffed by a call back crew and instructed to respond to protect structures from a rapidly spreading fire driven by strong winds. At approximately 1330 hours, while backing into a dead end road along a ridge top, Engine 1111 stalled and would not restart. Heavy smoke and flying embers made it very difficult to breathe. The crew had to abandon the engine. A CDF engine company working in the area transported them. Five to ten minutes later they observed that the engine compartment and cab were on fire. They were unable to return to the engine to extinguish it. The aluminum cab was completely destroyed and melted.

At 1545 hours a second event occurred involving Engine 5. While the crew was preparing to fire out a road, the engine stalled and would not restart. The Strike Team Leader recognized an air cleaner fire might have caused the engine to stall. Subsequently, the crew detected and suppressed a fire in the air cleaner housing. The damage was minor and restricted to the air cleaner housing and turbocharger.

Injuries:

There were no injuries. Personal Protective Equipment (PPE) was in use and appeared to work effectively.

Safety Issues for Review

- 10 Standard Orders were followed
- 18 Situations that Shout Watch Out were addressed by engine company personnel
- LCES was planned and practiced