



AFTER ACTION REVIEW

second edition

ORC Strike Team 1400C Structure Protection and Extreme Fire Behavior Event

**Station Fire
Big Tujunga Canyon, Angeles National Forest
August 29, 2009**



View of approaching fire from the safety zone.

SYNOPSIS

On Saturday, August 29, 2009, Orange County, CA Fire Authority (OCFA) strike team 1400C (ORC ST-1400C) was committed to the Station Fire on the Angeles National Forest in Southern California's Los Angeles County. The team included five type 3 engines, including a paramedic unit, a Strike Team Leader and his trainee. They were assigned to the Vogel Flats area of Big Tujunga Canyon to protect residential structures and a U.S. Forest Service station there. The following After-Action-Review documents the experiences and lessons learned by ST-1400C members during an extreme fire behavior event which led to the loss of around 35 residential structures and numerous outbuildings, and the burn injury of three civilians in the strike team's area of responsibility. The strike team was initially forced to retreat to a safety zone during this event. The Station Fire burned 160,577 acres in the largest fire in the history of the Angeles National Forest (est. 1892). Over 80 structures were lost. Tragically, two Los Angeles County firefighters lost their lives on August 30.

ST1400C at the STATION INCIDENT

Pre-events

The Station Fire started on August 26, 2009 in steep terrain and heavy brush north of the Forest Service's Angeles Crest Station along Angeles Crest Highway, four miles north of the community of La Canada-Flintridge. ST-1400C was dispatched to the fire the morning of August 27 and on arrival the fire was 300-400 acres in mostly inaccessible terrain. The strike team was staged, and later that afternoon assigned to structure protection of the Angeles Crest Station. The station was approached several times from different directions by heavy fire and the strike team worked that night and half of the day shift Friday (August 27) protecting it. Following this action, ST-1400C was rested until the morning of August 29.

Event Day

The morning of August 29, ST-1400C was one of the resources assigned to the Big Tujunga Structure Protection Group. Three type 3 engine strike teams were assigned to Big Tujunga Canyon including OCFA's, a strike team from Ventura County FD (VNC 1588C), and a mixed agency team from Santa Barbara County (XSB 1521C). The three strike teams were assigned various portions of the canyon over a dozen mile stretch. ST-1400C was assigned to the community of Vogel Flats, a group of about 45 generally rustic homes and the Forest Service's Big Tujunga Station. Many of the area homes were of 1930-40's era construction (similar to Silverado Canyon in Orange County). Angeles NF Engine 13 was also assigned to structure protection of the Big Tujunga Forest Service station. Much of the community had poor brush clearance and lacked defensible space and many of its residents were present.

ST-1400C dispersed throughout the community beginning around 0930 on August 29, contacting every resident and provided advice and assistance in fire preparation. The residents were also advised that they should evacuate. This effort was assisted by Los Angeles County Sheriff's Deputies who announced the evacuation was changing from an advisory to mandatory status. This status however, would not require homeowners to leave their homes. Many residents heeded the advice and departed the community, although a significant number decided to stay. Many cited a previous experience where a fire had skirted the community and "L.A. County had an engine in every driveway". OCFA firefighters stressed the aggressive nature of the fire and it's potential. The effort to contact and prepare the community was greatly aided by preplans and information provided by the local Forest Service crew.

The fire became very active above the community around 1045 hours, moving aggressively with a major run to the north, crossing the highway about a mile and a half above the community. This run blocked Big Tujunga Canyon Road and later prevented the Ventura County strike team from reinforcing units in the southern portion of the canyon.

ST-1400C had positioned itself among various locations that were originally thought to be defensible throughout Vogel Flats. A safety zone was designated in the parking lot of the Vogel Flats Picnic Grounds should fire behavior threaten crew safety. At this time fire was beginning to be visible at the top of canyons above Vogel Flats, high up on the shoulder of Mt. Lukens. Firefighters felt that the fire would likely continue to spread through "roll out" of flaming debris down the steep mountainside, and affect the community from either a flanking action or by spot fires. The Structure Protection Group Supervisor moved the Santa Barbara County strike team in to assist ST-1400C, and the two strike teams worked to prepare structures.

Extreme Fire Behavior

Shortly before noon the Strike Team Leader for ST-1400c directed members to eat and hydrate expecting firefighting to be likely within the next hour or two. The fire was building aggressively at this time a mile above Vogel Flats near the intersection of Big Tujunga Canyon Road and the Angeles Forest Highway. The Strike Team Leader and his trainee drove to a high point where most of the canyon could be viewed and prepared to eat lunch. They noted the ominous development of a large convection column with "blow-up" conditions. The fire was moving rapidly on the flanks of Mt. Lukens above the community. A pre-designated geographic trigger had already been reached causing the Strike Team Leader to order initiation of foaming operations around the Forest Service station. It was clear the fire was moving much faster than originally forecast. Within minutes, the intense convection column showed signs of collapse

including severe and turbulent winds. The front of the fire turned with the new winds and formed a mile wide front, running down-canyon towards Vogel Flats. Extreme fire behavior developed including long range spotting, fire whirls, and a strong in-draft wind which picked up suddenly at the lookout position. Fire was noted running hard on both canyon walls and along the canyon bottom towards where the homes were located. Flame lengths were observed in the 60-100 foot range in heavy old-age class chaparral.

The Strike Team Leader communicated this condition to ST-1400C and the Santa Barbara strike team and ordered them to retreat to the safety zone. One OCFA and a Forest Service engine were designated to stay and protect the Forest Service station due to its defensible space. As firefighters repositioned to the safety zone several residents began to flee. One engine had a near miss with a rapidly fleeing vehicle being driven by a resident.

Shortly after ST-1400C gathered with the Santa Barbara County units in the safety zone the fire began to pass their location with intense energy output. Structures near the safety zone were seen to rapidly ignite as fire sheeted through both native fuels and structures. The Strike Team Leader ordered crews to prepare to enter their engines and deploy fire shelters if directed. The leader also initiated accountability and safety equipment checks and requested "emergency traffic only" on the tactical radio until the event had passed. A request for the standby of paramedics and ambulances was also made in anticipation of civilian injuries. Crews readied protection hose lines for their apparatus. The fire had moved over a mile and a half in 15 minutes.

Since the strike team had contacted residents prior to the fire's assault, the location of remaining civilians was generally known. A search and rescue plan was rapidly configured for use immediately following the fire's passage. The Santa Barbara County strike team made plans to exit Vogel Flats immediately following the fire's passage to try to reach and protect structures to the west from the new movement of the fire. ST-1400C would continue work in Vogel Flats. At the Forest Service station, the two crews there were forced to briefly retreat inside the station as the fire passed.

Search & Rescue and Firefighting

Immediately following the fire's passage, the Strike Team Leader and his trainee began a recon on the community while initially holding other units in the safety zone. They headed for the general location of civilians known to still be in the area. They encountered a large number of heavily involved one and two-story structures, heavy vegetation fire, and penned and heat stressed horses in a stable area. The Strike Team Leader judged the area too hot for work and retreated again to the safety zone. Ten minutes later they again initiated reconnaissance. This time opportunity existed for attack on several structures

and protection of several which were still uninvolved to which engines were committed. As the Strike Team Leader and the trainee reached the area where civilians were expected, heavy structural and vegetation fire was noted. As they pushed their search for the civilians, a residential propane tank vented adjacent to their position requiring immediate retreat. A number of propane tank BLEVE explosions followed, preventing access to the area for some time.

One missing resident from the area of greatest concern found his way to the Forest Service station. This individual, a retired Pasadena fire battalion chief, advised that he had been forced to retreat from his home by the fire and that at least two additional civilians were still in the area. Later it would be determined that this chief had lost his home. The strike team was heavily engaged in search and firefighting. One crew's vehicle access was blocked by fire and downed trees forcing them to walk into an isolated group of homes to search for civilians. They were able to report that all civilian vehicles previously there had left, leading them to believe all had evacuated at the last minute. All but one structure was burning in this area.

The Strike Team Leader and his trainee initiated a third attempt to reach the homes on the south side of Vogel Flats where two civilians were still reported missing. This time they were accompanied by a Forest Service crew in a pickup truck. Firefighters had to move burning trees and other debris out of the road to make access. As the leader's vehicle passed a burning residence, two civilians popped up from a jacuzzi flagging down the accompanying Forest Service truck. These two civilians were the primary subject of the search; both were badly burned and were transported to the Forest Service station for treatment.

The burn victims were individuals who had earlier been urged by firefighters to evacuate. They had stayed with their home until it caught fire, retreating at first inside. As the fire consumed the home they were forced to flee outside. They suffered severe burns as they ran across a flaming wood footbridge to reach a jacuzzi inside a neighbor's patio structure. This structure burned down around the jacuzzi as they lay in the water.

As ST-1400C's paramedics initiated treatment of the burned victims, plans were implemented to move the injured from the canyon. The team was joined by the Angeles NF Safety Officer who provided valuable local knowledge. Moving the patients was problematic since heavy smoke and high winds in the canyon initially prevented aerial extraction. Large power lines had also fallen across Big Tujunga Canyon Road; this and numerous small landslides blocked access from the west, and heavy fire above Vogel Flats blocked access to the north and east. A proposal to pass the patients across the downed power lines was rejected. Finally, a Los Angeles County Sheriff's rescue helicopter secured by an Angeles NF Assistant Chief was able to access the area. The copter made a difficult

landing after several attempts in severe turbulence and smoke. The victims were then airlifted to a burn center almost 90 minutes after their rescue had begun.

This same isolation-by-fire prevented the incident from reinforcing resources in the Vogel Flats area. Even as treatment of the burned was being provided other members of ST-1400C continued fire suppression, including interior attack on a 5,000 square foot modern and fire resistive home. Despite a heavily involved attic this home was saved. A third burn victim was also found during fire attack. He was located near a creek bottom behind a burning home. He had burn injuries to his arms and face and was treated and transported to a burn center.

By 1800 hours on August 29, firefighting and rescue activities subsided in the Vogel Flats area, some six hours after they had begun. At 1900 hours ST-1400C was released to base for rest, but was challenged one more time to drive through the fire's flank to leave Big Tujunga Canyon. One of the most active and demanding days in any of the ST-1400C member's memory had ended.

AFTER ACTION REVIEW

ST-1400C personnel gathered on Sept. 3, 2009 in a staging area and conducted an After-Action Review of the Big Tujunga structure protection assignment and extreme fire behavior event on August 29. The following lessons were learned:

Fire Behavior

- a. The fire exhibited "plume dominated" fire behavior which included multiple episodes of extreme fire behavior. This behavior was fed by a heavy accumulation of chaparral, drought, and steep terrain. This type of extreme fire behavior is uncommon in Southern California. The Burn Index for this day was 250.
- b. Convection columns built by the fire (pyrocumulus) would reach altitudes of 20-40,000 feet. The columns would then collapse and push high winds to the surface much like a thunderstorm. Extreme fire behavior including long flame lengths, heavy spotting, firewhirls, rapid rates of spread, and long fire runs would develop, often with unexpected trajectories.
- c. The collapse of the convection column above Vogel Flats caused a reversal of fire trajectory and drove the fire down-canyon into the community.
- d. As the fire front approached, its sound was described as the "roar of a freight train".
- e. The width, speed, and intensity of the fire front posed life threatening conditions to firefighters and civilians in Vogel Flats.

Escape Routes and Safety Zones

- a. The designation of a safety zone was critical to ST-1400C's survival when they were threatened by a rapidly approaching fire front. Most other positions in the canyon were untenable during the fire's passage.
- b. The call to enter the safety zone could not have been delayed. The fire front approached the safety zone shortly after all units were assembled.
- c. Movement to the safety zone was nearly compromised at one time by panicked and fleeing civilians.
- d. A plan was made to place civilians who might arrive in the safety zone inside a masonry restroom for refuge. This was not used.
- e. Another previously proposed safety zone site had been discarded for insufficient size. This was prudent as its use would likely have been unsuccessful.

Local Knowledge

- a. The use of the local knowledge in advance of the fire's assault to identify defensible vs. non defensible positions, identify water sources, inspect structures and bridges, and identify safety zones and helispots was important to the effective deployment of the strike team. This local knowledge was chiefly provided by the Forest Service Big Tujunga station crew and the ANF Safety Officer.

Contact with Residents

- a. Experiences by OCFA firefighters in their own "Ready, Set, Go" hazard area inspections proved valuable. ST-1400C members used this experience to quickly advise and assist residents in preparatory steps. Most residents had two hours lead time before the fire approached. A number stated early-on that they were staying to defend their homes regardless of firefighter's risk assessment.
- b. One resident communicated with the Strike Team Leader after the fire and thanked OCFA firefighters for the pre-fire advice provided, crediting it with the saving of her home. Her home was one of two that survived on a street of 13 homes.
- c. The worst-case fire behavior developed and was much more severe than anticipated. Despite firefighter and sheriff urgings to evacuate, some residents elected to stay with their homes based on their experiences from a prior and much less aggressive fire.

Re-engagement

- a. The Strike Team Leader prioritized search and rescue of likely sites where civilians might be located following passage of the fire front. Firefighting was only authorized after primary search had been completed.
- b. Some members of ST-1400C felt they were retained in the safety zone after the fire front passage for a protracted period. However others

- reported that as they engaged after this period that they still found conditions to be very hot.
- c. The aftermath of the fire's passage included many structure fires, burning and exploding propane tanks, downed power lines, heavy smoke, landslides, and burning trees on the road as well as a still active fire front. This condition prevented reinforcement and access to the area by additional resources or overhead. ST-1400C, ANF E13, and the Santa Barbara strike team were forced to deal with all contingencies with only their available resources for hours. This required continuous prioritization of targets, selection of targets offering the "best results for the effort" and an intense focus on safety.
 - d. Numerous structures were saved by direct action. Had firefighters not been present these structures would likely have been lost.
 - e. An emotional attachment developed among strike team members for one "fire-safe" constructed house in particular. A very taxing and prolonged firefight was necessary to save it. A determination developed that "this house wasn't going to be lost". In retrospect, this may have driven strike team members potentially to the edge of safety and members felt we should guard against that in future commitments.
 - f. Sharp shale rock on the roadway from landslides caused a tire on the Strike Team Leader's vehicle to be damaged and deflate during the transport of burned civilians.

Treatment

- a. The resource requirements for treatment of the burn victims were extensive and caused a redirection of most resources from firefighting. Some additional structures were likely lost during this period.
- b. Fire officers in ST-1400C felt a better organization for the burn victim issue would have been to identify a medical unit with designated resources as a sub-set of the strike team. It was felt some supervision over on-going firefighting was lost as team leadership focused on the burn injuries and their evacuation.
- c. Morphine drug resources were exhausted in the treatment of burn victims. Re-supply was necessary for the safety of strike team personnel. This was handled by the OCFA Medical Director traveling to the incident with re-supplies.
- d. Standard treatment practices were followed, yet the conditions probably should have demanded expedited processes and less personnel commitment.
- e. Patients and care providers were required to be transported significant distances to helispots and ambulances in the exposed back of pickup trucks. This was problematic from a safety point of view.
- f. Three helicopters were involved in the rescue effort. The first attempt by Los Angeles County Fire Dept. Copter 11 (Bell 412) was aborted when the

aircraft encountered a strong “microburst” downdraft from collapsing pyrocumulus. The pilot increased pitch and engine speed, resulting in “over-torqueing” of the engine/transmission to 116% to “avoid contact with the ground”. Copter 11 was required to conduct an emergency landing. A second fire copter refused the mission for excessive risk. Finally, a Los Angeles County Sheriff’s Dept. helicopter (H3 Sea King), “Air-Rescue 5” was able to land after multiple attempts and evacuate the first two burned patients. The County Fire copter which experienced the rotor “over-speed” incurred \$250,000 in damage during the event.

Safety and Performance

- a. Use of full personal protective equipment was essential to individual safety.
- b. Hydration in 100+ degree weather was essential. At times on this day, firefighters had to pause during the 6-hour firefighting operation to re-hydrate and cool down as a medical necessity. A mix of water and Gatorade was preferred.
- c. Crew continuity became a problem as multiple tasks of firefighting, medical treatment, and heli-spot preparations were engaged in simultaneously. Crews were required to be split to handle various functions. This should be avoided whenever possible.
- d. The members of the strike team possessed diverse and exceptional skills which contributed significantly towards the team’s success. Empowerment of these individuals to provide their expertise was important.
- e. Team briefings and direction was cited as being complete, clear and succinct, and of great assistance in preparing for mission engagement.
- f. Flexibility, adaptability, and constant observation were critical to the safety and effectiveness of the strike team.
- g. This was a very hazardous situation demanding aggressive yet defensive actions and conservative judgment to ensure safety.

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*Original report: 10/1/09, Second Edition updated: 11/19/10



High intensity fire moves around the safety zone



Treating burn victims at Big Tujunga Ranger Station



Plume dominated fire behavior. Pyrocumulus convection from the Station Fire (LA Times photo)



Structure fire in Vogel Flats, Big Tujunga Canyon. Orange County Register photo.

All photos provided by OCFA ST1400C except where noted