Executive Summary

The vehicle fire occurred on June 10, 2006, 1706 hours, at the Wilson Wildland Fire Use (WFU), Gila National Forest. Two crew members from the Zion National Park Fire Use Module Crew were conducting weather observations and fire behavior on FS Road 49. The crew truck they used was a 2002 Ford F-450 Super Duty with an S&S Fire Rescue Support package. Fire behavior at the time the crew drove the truck to be parked in the burn location (last parked location) was moderate with a flanking fire along FS Road 49 and residual smoke heaviest at the fire flanks. An hour later the fire behavior noted by the two crew members at the parked vehicle included light residual smoke, no active fire behavior other than minimal stumps burning, light upslope winds with changing wind direction due to canyon and topography effects. Two and a half hours later the vehicle fire was reported by a Reserve Ranger District employee delivering supplies to the fire crew. There were no injuries associated with the vehicle fire. The crew truck was a total loss.

Narrative

Tuesday June 06, 2006

June 06, 2006, the Wilson Wildland Fire Use (WFU) was detected in a location approximately 12 miles northwest of Reserve, New Mexico, on the Reserve Ranger District of the Gila National Forest. The fire was lightning caused and approximately 10 acres in size upon detection and burning in pinon-juniper and ponderosa pine fuel types. Line construction was done around the southeast corner to protect Torriette private property and a burn out operation conducted to protect a historic cabin and corral. The fire movement at that time was to the south-southeast with 20 personnel on scene.

Thursday June 08, 2006

June 08, 2006, at 0730, the Zion NPS Fire Use Module Crew left Cedar City, Utah, for Reserve, New Mexico. Their daily vehicle check found that the instrument panel lights (dashboard lights) on the 2002 Ford F-450 Super Duty crew truck were still not working. These lights were noted inoperable a week before. At 0815 another Zion NPS Crew Member traveling behind the crew truck noticed that the rear running/parking lights on the crew truck were not working. Between 0830 and 0900, the fire use module crew arrived in Zion, Utah. One of the crew members (Crew Member A) inspected the fuses of the F-450, but found nothing unusual. At 0930 the crew departed Zion and then at 1200 they arrived in Page, Arizona. They then departed Page and stopped to fuel the trucks every couple of hours. They arrived in Alpine, Arizona around 1730. While in Alpine, Crew Member A “rigged” wiring for the air conditioning unit using electrical tape. At 1930 the crew arrived in Reserve, New Mexico and at 2130 they parked for the night.

Friday June 09, 2006

On June 09, 2006, the Wilson WFU was approximately 75 acres in size and still burning in pinon-juniper and ponderosa pine with sparse surface fuels. Line construction had been completed from the Torriette private land to Dillon Mountain. Hand line had also been constructed to protect private land on the east and north side of the fire. Firing operations to protect the historic cabin and corral were completed, but due to unpredicted fire behavior, firefighters had to leave the area for safety concerns. The cabin and corral were checked at a later time to ensure that resource objectives had been met. Fire movement on June 08, 2006, was northwest, northeast, south, and southwest. Fire behavior on June 09 was showing flame lengths from 4 inches to 4 feet. Some short range spotting did occur and the fire moved across Forest Service Road 49. Due to the movement across the road, a road closure became effective north on FS Road 49 from FS Road 49A junction to the junction of FS Road 3020 south of Torroette Lake. Fire progression included burning across FS Road 49 during the late evening of June 08 or early morning of June 09 and the area that the Zion Fire Use Module crew truck would later be parked. At the fire there were 40 assigned fire personnel from the Sacramento Hotshots, the Mammoth Fire Use Module, the Zion Fire Use Module, and the Reserve Ranger District.

The Zion Fire Use Module Crew left their hotel at 0645. The instrument panel lights, the rear running lights, and the air conditioning were still not working. At 0700 the Zion Crew was briefed and they waited for the Mammoth Module Crew prior to the main brief. The primary Incident Action Plan (IAP) objectives included: plan and implement a strategy that fully provides for firefighter and public safety; protect private lands and associated structures; permit the fire to play, to extent possible, its natural role; manage the fire to provide resource benefits by reducing hazardous fuel loads and by reducing live woody vegetation densities while limiting stand replacing crown fires in ponderosa pine 20 – 40% throughout the total project area; minimize damage to yellow pines; increase potential for aspen regeneration; minimize impacts to natural, cultural, and historic resources and fences, water developments, livestock facilities, and roads; and manage the incident in a cost effective and efficient manner. The objectives for the Zion Fire Use Module were: map Wilson WFU fire perimeter and record weather and fire behavior observations. Personnel on the fire were also cautioned to stay out of the path of the fire between 1400 – 1800 hours or when erratic fire behavior was expected based on temperatures above 80 degrees, relative humidity below 10%, or with sustained winds greater than 15 miles per hour. Fire personnel were instructed to pull back more than a quarter of a mile from the perimeter and continue to monitor the fire activity from other locations. Weather observations were taken hourly and communicated to all personnel on the fire, and Daily Spot Weather forecasts were obtained from the National Weather Service.

At 0920 the Zion Crew fueled the vehicles and departed for the fire. At 1300 they left camp for fire "proper" by the corrals in Largo Canyon. The vehicles remained at the corrals, and the crew ran the engines periodically to charge the crew's computers. The crew moved north down the road at 2100 to allow for the burnout of the corrals. They arrived back at camp at 2120 and continued working on their computers until 2145 when they shut down the engines.

Saturday June 10, 2006

On June 10, 2006, there were 48 personnel assigned to the fire, and the Wilson WFU was approximately 9 miles northwest of Reserve, New Mexico, and approximately 92 acres in size. The fire continued to burn in pinon-juniper and ponderosa pine. The burn-out operations from the previous day around the cabin were holding, and the road closure was still effective for FS Road 49. The primary objectives for June 10 included monitoring, completing the hand line construction, and scouting the fire for possible holding on the southwest side from Dillon Mountain to Devils Tank.

At 0700 the Zion Fire Use Module Crew attended the briefing and then departed for the fire at 0800. The objectives for the Incident Action Plan remained the same with the assignments for the Zion Crew unchanged from the previous day.

It was noted by the Zion Crew that between 0900 – 1100 the fire activity was increasing. Weather observations continued to be taken by the Zion Crew on both the top of the ridge and in Largo Canyon. At 1130 one of the crew members (Crew Member A) noticed a burning snag near the crew truck he parked earlier. The crew truck was a Ford 2002 F-450 Super Duty (4 door/6 passenger) with an S&S Fire Rescue Support package. Crew Member A and another crew member (Crew Member B) moved the crew truck down the canyon road about ¼ of a mile. These two crew members met with the Fire Use Module Leader at this new site. While they were having lunch at this site the Fire Use Module Leader and the crew members noticed that the flank of the Wilson Fire would reach their current site earlier than expected. The Fire Use Module Leader asked Crew Member A to move the crew truck to FS Road 49 near the parked utility truck. The two crew members finished the hourly weather observation and by 1330 drove to the area described by the Fire Use Module Leader. Fire behavior at the time was moderate with a flanking fire along FS Road 49 and residual smoke heaviest at the fire flanks. Crew Member A parked the crew truck facing east about 50 feet north of the utility truck in an area black and clear of downed logs and brush (N 33° 50.814′ W 108°44.278′). The crew truck was parked just off of FS Road 49. Crew Member A chocked the right tire with a rock and felt the ground for signs of heat. Satisfied that this area was safe to park the two crew members hiked south on FS Road 49. Another hourly weather observation was conducted at 1400 in an unburned area ¼ mile from the crew truck. Also at 1400 hours the fire was noted to be moving at approximately 10-20 chains per hour (1 chain = 66 feet) with 15-20

foot flames lengths resulting in some independent torching of trees and upslope winds. Primary fire activity was noted to be a minimum of ¼ mile away from the crew truck.

Crew Member A conducted a fire behavior observation and once Crew Member B finished reading the weather over the radio, they hiked back down FS Road 49 to the west side of the fire. While hiking north they passed the crew truck at 1430 and the truck looked fine. Fire behavior at the parked truck included residual light smoke, no active fire behavior other than minimal stumps burning, light upslope winds with changing wind direction due to canyon and topography effects. Approximately 1500 hours the fire activity on the west flank was 1-3 chains per hour with 1-3 foot flame lengths and 3-5 foot flame lengths at the head of the fire. There was some active fire behavior north of the truck including individual tree torching and fire whirls indicating active fire behavior runs upslope. This fire activity resulted in a spot fire across FS Road 49 approximately 4 chains north of the parked truck. By 1530 hours, spotting continued across FS Road 49 north of the truck resulting in some crown fire runs to the top of the ridge. The two crew members stayed in the area where their day began until 1700.

At 1706 they heard over the radio that one of their trucks had caught fire. The fire was reported by a Reserve Ranger District employee delivering ice to crews. This employee noticed that the fire was located in the right rear (passenger side), underside and moved along the right side of the truck. He called in the fire and then moved away from the seen.

The Fire Use Module Leader after hearing the radio report hiked up to FS Road 49 and met one crew member (Crew Member C) on foot and another crew member (Crew Member D) in a vehicle. They drove south on FS Road 49 in Crew Member D's vehicle and found that the utility truck was safe. The crew truck was approximately 50 – 100 yards north of where the utility truck was parked and it was on the same side of the road (eastside). They saw the back end of the crew truck was on fire including the wheel wells and tires. Crew Member C set up a road block on the north end of FS 49. A few minutes later the crew truck started to explode and the Fire Use Module Leader advised Crew Member C to pull back. The Fire Use Module Leader had Crew Member D move the parked utility truck north from the burning crew truck.

The Fire Chief from the Rancho Grande Volunteer Fire Department arrived on scene at 1755. A minute later a Catron County Deputy Sheriff also arrived at the vehicle fire and assisted the Fire Chief to determine if the master cut off switch on the driver's side was in the off position (during the SAIT investigation it was determined that the switch was in the off position). At 1830 the Fire Chief called for another tanker. The tanker arrived at 1930, and at 2054 the volunteer fire department left the scene.

Investigation Process

On June 13, 2006, a serious accident investigation team (SAIT) was appointed by the Deputy Regional Forester of the US Forest Service Region 3. The SAIT members are: Forest Service Team Leader, National Park Service Representative, Chief Investigator, Safety Officer/Documentation Specialist, and two technical specialists. The technical specialists are: Forest Service Region 3 Fire Safety Occupational Health Officer and Forest Service Region 3 Fleet Manager. On June 13, 2006, the Serious Accident Investigation Team met in Reserve, New Mexico, at the US Forest Service Reserve Ranger District.

The process of information evidence gathering consisted of:

- Evaluating all human, material, and environmental factors that may have contributed to the vehicle fire.
- Visiting the area where the vehicle fire occurred.
- Gathering written statements of personnel who were connected to the vehicle at some point.
- Interviewing supervisors, coworkers, local law enforcement personnel, and local fire fighter personnel who were involved in the vehicle fire.
- Reviewing operational guidelines, policies, and position descriptions.
- Examining a comparable vehicle
- Gathering outside material evidence such history of vehicle fires associated with this same make and model; documents from past court cases and from victim interviews that had vehicle fires related to the same make and model; and other types of reports concerning vehicle fires.
- Gathering outside information by conducting interviews with vehicle mechanics, fire investigators, fire cache personnel, pyrotechnic vendors, Missoula Technology and Development Center personnel, the builder of the vehicle's fire rescue support package, an investigator from the US Department of Transportation - National Highway Traffic Safety Administration – Office of Defects Investigation, and with the US Consumer Product Safety Commission.

Human, material, and environmental factors were considered in the investigation.

Human Factors:

The Fire Use Module crew had June 3rd and June 4th off prior to departing for the Wilson Fire. These were the normal regular scheduled weekend days off. The module fire crew had adequate rest and days off, pursuant to interagency guidelines, prior to accepting the assignment. Prior to the accident, all personnel had worked within the 2:1 work/rest guidelines. Time on 06/08/06 for the Fire Module crew was 0700 – 2100 with .5 hours for lunch and for dinner. The crew traveled to Reserve, New Mexico, and stayed in a hotel. Time on 06/09/06 for the Fire Module crew was 0600 to 2200, with .5 hour meal

break; this day the crew went on line. On 06/10/06, the crew worked 0600- 2200 with .5 hour break for lunch.

The wildland fire was managed as a wildland fire use incident consistent with existing planning documents on the Gila National Forest. The Commander of the fire is qualified as a Fire Use Manager Type 2 (FUM2). One qualified Division Supervisor was assigned to work directly for the Commander. The Zion National Park Fire Use Module was assigned to work directly for a Task Force Leader (trainee). The Task Force Leader worked under the direction of the Division Supervisor. The span of control for the Division Supervisor was five (5) individuals. There was a written Incident Action Plan for June 10, 2006; members of the Zion National Park Fire Use Module all possessed current and valid "Incident Qualification Cards" (aka Red Cards) for 2006. The Zion Fire Use Module Crew had the following personnel: a module leader, a lead crew member, and 5 crew members.

Environmental Factors:

The crew truck fire occurred on a wildland fire use operation. There appeared to be no active fire in the immediate vicinity of the crew truck at 1430. There was active fire north and south of the truck location at the time of the truck fire which was reported to be 1706. The parked crew truck location had sparse surface fuels and an exposed surface made of dirt.

Material Factors:

The SAIT looked at these material factors: the crew truck itself, fuels, pyrotechnics, batteries, and after-market items installed on the crew truck. These will be discussed in the "Findings" section.

Findings

Finding 01: (Material)

June 08, 2006, at 0730, the Zion NPS Fire Use Module Crew left Cedar City, Utah, for Reserve, New Mexico. Their daily vehicle check found that the instrument panel lights (dashboard lights) on the 2002 Ford F450 Super Duty crew truck were still not working. These lights were noted inoperable a week before.
(RECORDS Tabs B, D, & G)

Finding 02: (Material)

June 08, 2006, at 0815, a Zion NPS crew member who was traveling behind the crew truck had noticed that the rear running/parking lights on the crew truck were not working.
(RECORDS Tabs B, D, & G)

Finding 03: (Material)

June 08, 2006, 0830–0900: the crew arrived in Zion, Utah. One of the crew members (Crew Member A) inspected the fuses of the F450, but found nothing unusual. (RECORDS Tabs D & G)

Finding 04: (Material)

June 08, 2006, at 1730, the crew arrived in Alpine, Arizona. While in Alpine, Crew Member A "rigged" wiring for the air conditioning unit using electrical tape. (RECORDS Tabs D & G)

Finding 05: (Material)

June 09, 2006, at Reserve, New Mexico, the Zion Fire Use Module crew left their hotel at 0645. The instrument panel lights, the rear running lights, and the air conditioning were still not working on the crew truck. (RECORDS Tabs D & G)

Finding 06: (Human)

June 10, 2006, at approximately 1330, Crew Member A parked the crew truck facing east about 50 feet north of the utility truck in an area black and clear of downed logs and brush (N 33° 50.814′ W 108°44.278′). This was the third and last parking spot for the vehicle. Crew Member A chocked the right tire with a rock and felt the ground for signs of heat. Satisfied that this area was safe to park the two crew members hiked south on FS Road 49. (RECORDS Tabs D & G)

Finding 07: (Material)

June 10, 2006, at approximately1430, Crew Member A and Crew Member B hiked north passed the crew truck. The truck looked fine.(RECORDS Tabs D & G)

Finding 08: (Environmental)

June 10, 2006, at approximately 1500, the fire activity on the west flank was 1-3 chains per hour with 1-3 foot flame lengths and 3-5 foot flame lengths at the head of the fire. There was some active fire behavior north of the truck including individual tree torching and fire whirls indicating active fire behavior runs upslope.

Finding 09: (Environmental)

June 10, 2006, at approximately 1530, spotting continued across FS Road 49 north of the truck resulting in some crown fire runs to the top of the ridge.

Finding 10: (Material)

June 10, 2006, 1706, the fire was reported by a Reserve Ranger District employee delivering ice to crews. This employee noticed that the fire was located in the right rear, underside and moved along the right side of the truck.
(RECORDS Tab H)

Finding 11: (Material)

June 10, 2006, sometime after 1706, Fire Use Module Leader, Crew Member C, and Crew Member D saw the back end of the crew truck was on fire including the wheel wells and tires. Crew Member C set up a road block on the north end of FS 49. A few minutes later the crew truck started to explode. (RECORDS Tab G)

Finding 12: (Material)

June 10, 2006, at 1720: The Fire Chief from the Rancho Grande Fire Department received the call about the vehicle fire, and at 1755 arrived on scene. A Catron County Deputy Sheriff also responded to the vehicle fire and assisted the Fire Chief to determine if the master cut off switch on the driver's side was in the off position (during the SAIT investigation it was determined that the switch was in the off position).
(RECORD Tab H)

Finding 13: (Human)

2003 (September?); the Tucson Police Department experienced two separate squad car truck fires, each occurring 15 days apart. The fires were determined to be caused by flares. Police officers were preparing flares in advanced by removing the protective caps from both the igniter tip and the scratch surface. They were pre-loading the flares in anticipation for the need of additional flares. If these flares are not used, they are returned to the truck of the squad car with the caps removed. (RECORDS Tab Q)

Finding 14: (Material)

Tucson, Arizona Flare Experiment: The protective cap that covers the scratch surface was removed from one fusee and the igniter cap was removed from the second fusee, exposing the igniter tip. The exposed igniter tip was softly scraped against the scratch surface. It was observed that a very soft scrape against the scratch surface was sufficient to ignite a fusee. Ignition occurred in approximately 25% of the attempts. The Tucson Police Department observations indicated that the fusee could ignite with relative ease. (RECORDS Tab Q)

Finding 15: (Material)

Tucson, Arizona Flare Experiment: The fusees used in the experiment were several 15 minute red fusees from the National Flare Company, and one fusee was listed 912 Au 3472 44AM, M1-2000-0518, made in China. (RECORDS Tab Q)

Finding 16: (Human)

Tucson, Arizona Flare Experiment: The Tucson Police Department concluded that because of the ease of ignition between the scratch surface and the igniter tip, an improperly stored fusee could pose a safety hazard to Officers, Fireman, and City Personnel. (RECORDS Tab Q)

Finding 17: (Human)

Tucson, Arizona Flare Experiment: a citywide memo was issued: "To minimize the risk of inadvertent flare ignition, which could result in a trunk fire. Flares should never be readied or prepared in advance, anticipating need. Igniter and striker caps must remain intact, on the flare, until the flare is needed. Flares should be kept in their original box or placed in a container, preventing migration and minimizing movement."
(RECORDS Tab Q)

Finding 18: (Material)

The SAIT requested the Fire Cache in Prescott Arizona to send a fusee MSDS. The Prescott Fire Cache sent an MSDS from the Standard Fusee Corporation.
(RECORDS Tab P)

Finding 19: (Material)

The Zion Fire Use Module gave to the SAIT an MSDS from Quoin International, Inc.
(RECORDS Tab P)

Finding 20: (Material)

Underwriters Laboratories Inc has a fusee standard (UL 912).
(RECORDS Tab P)

Finding 21: (Material)

Fusees were stored in the Zion Fire Use Module Crew Truck.
(RECORDS Tab O)

Finding 22: (Material)

According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) no flares were stored in the NPS F450 vehicle.

Finding 23: (Material)

From the Underwriters Laboratories, Inc.(UL) Online Certifications Directory categories of highway signals, which includes the following types:
Fusee – A dry, chemical flare burning with open, red flame.
Liquid-burning Flare – A wick-operated, open flame torch designed for use with liquid fuel having a fire hazard classification not greater than that of kerosene.
(RECORDS Tab P)

Finding 24: (Material)

RECORDS Tab O: Vehicle Inventory (2006) 2002 Ford F-450 Crew Carrier (LN# 1271272): Compartment 4: Ammo Can with Three (3) Grenades, Ammo Can with Tow Chain, Ammo Can with Jumper Cables, Ammo Can with Fusees, Ammo Can with coin (sp) launcher and flares, Hydraulic Jack, Tow Hitch, Bladder Bags (3), Laundry Detergent. (RECORDS Tab O)

Finding 25: (Material)

According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) the grenades are fusees with a wick lit by a match and then thrown.

Finding 26: (Human)

From June 08, 2006 to June 10, 2006, the Zion Fire Use Module Fire Crew did not open the crew truck compartment (passenger side rear). This is the compartment where the fusees were stored. (Initial SAIT interview June 13, 2006)

Finding 27: (Material)

June 13, 2006, SAIT looked at a comparable National Park Service Vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept the SAIT also found oily rags and motor oil. (See RECORDS Tab O photos of S&S Fire Support package- compartment labeled #4).On the other side of the truck in another compartment (#3), the SAIT found the fuels storage. There was evidence of fuel leakage in this compartment. The "pig" mat was soaked with fuel. In addition the SAIT found that this truck was leaking brake fluid onto the pavement from one of the right sided wheel wells.

Finding 28: (Material)

According to the Missoula Technology and Development Center (SAIT phone conversation August 17, 2006) there has only been one reported instance of a problem with fusees. A fusee in a plastic container carried in a back pack ignited. Also according to MTDC the Quoin launcher has a transfer bar. If the launcher is loaded with a flare, this bar prevents the launcher from igniting a flare from any action/movement other than pulling the trigger on the pistol with or without the hammer cocked back.

Finding 29: (Environmental)

According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006) there were signs of stumps burning across FS Road 49 from where the National Park Service crew truck was parked. There were signs of burning stumps approximately 50 – 100 feet from the truck on the side of the road where the truck was parked. The area was in the black.

Finding 30: (Material)

According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006) and according to the Catron County Deputy Sheriff (SAIT phone conversation August 22, 2006); the appearance of the burn pattern on the burnt crew truck indicates that the hottest spot is the right (passenger side) rear.

Finding 31: (Environmental)

On the night of June 12, 2006, three of the SAIT arrived in Reserve, New Mexico. On the morning of June 13, 2006, the other three members arrived. On June 14, 2006, the SAIT visited the vehicle loss area. At the site the SAIT noted that the vehicle loss area was in the black. The area in the vicinity of the burned vehicle showed there was minimal fire behavior (on June 8-9, 2006) with very sparse surface fuels of grass and litter that were burned and quite a bit of dirt, which would have prohibited the fire from moving quickly and thoroughly through the burned area. The crowns of the trees in the area showed no crown fire effects other than the vegetation immediately adjacent to the burned vehicle, which was a direct result of the immense radiant heat occurring from the burning vehicle. Scorch height on the trees in the immediate area supported the fire behavior of 3-4 foot flame lengths with low to moderate intensity.

Finding 32: (Environmental)

According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); he arrived at 1755 on June 10, 2006. The wind was blowing from the east to the west. While he was fighting the vehicle fire he was worried that the Rancho Grande Fire truck might be harmed. The wind did change direction (west to east). He could not tell the speed of the wind. There was quite a bit of smoke at this site coming from the vehicle fire as well as from the Wilson Fire itself.

Finding 33: (Human)

According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); while he was driving on FS Road 49 to the vehicle fire there was a Wilson Fire WFU fire fighter stationed at the road to prevent unauthorized access into the area.

Finding 34: (Material)

On June 14, 2006, the SAIT found that the S&S installed primary power switch located next to the driver's seat on the National Park Service F-450 was in the "off" position.

Finding 35: (Material)

According to an employee at S&S (SAIT phone conversation August 18, 2006); once the primary power switch is turned to the "off" position, it disconnects power to everything in the vehicle except for: two fuses that are kept open to power the computer of the vehicle and the clock in the factory installed dash radio; the starter – wired directly to the battery; the alternator – wired directly to the battery; and the glow plugs, which indicate if the vehicle is ready to be started. He also mentioned that any after-market items might not be disconnected by the primary power switch when in the off position.

Finding 36: (Material)

According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) these are the after-market items added to the crew truck: Bendix King radio (wired through the primary power switch); an added radio/CD (wired to the battery); a power inverter, for the use of their Dell and their IBM laptop computers, (wired to the battery).

Finding 37: (Material)

In the SAIT phone conversation August 19, 2006, with the Zion Fire Use Module Leader, it was said that there was a suspension upgrade to the truck on 06/01/06; during the trip down to Reserve New Mexico the parking lights, the dashboard lights, and the air conditioning were not working; fuses were removed and inspected during a stop while on the way to Reserve; there have been no brake problems; no brake light warning indicated problems; no break fluid leakage; no low brake pedal problems; prior damage to the vehicle – doors replaced from a backing accident; no difficulty shifting out of PARK (the vehicle is a manual); and no problems with the glow plugs. The problem with the air conditioning has been a problem for quite some time. The Zion Crew brought the truck in three times in the past for this problem. Once the mechanic said it needed a new wiring harness (one was installed) and once the mechanic said the A/C was over charged. (RECORDS Tab K)

Finding 38: (Material)

Wires to the air conditioning needed to be "rigged' by duct tape. It seems that taping the wires in a certain position would cause the air conditioning to operate.
(RECORDS Tabs B&G)

Finding 39: (Material)

On June 13, 2006, the SAIT looked at a comparable National Park Service Vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept - the SAIT also found that a wire bundle went through a hole in the compartment (#4). This wire bundle was not protected by any rubber tubing. The compartment bulkhead is made of fiberglass. SAIT noticed that there is an element of play or slack in the wire bundle. The wire bundle then leads to the rear of the S&S Support package. There is a possibility the wire bundle is hooked into the rear lights.

Finding 40: (Material)

According to a local Tucson, Arizona vehicle mechanic (SAIT phone conversation August 14, 2006) a short in a wire even with low amps could cause a fire. This is also true even if the vehicle were shut off. Electrical current runs to different parts of the vehicle even when the vehicle's engine is shut off. For example with the engine shut off a person can step on the brake pedal and the rear brake lights will light. If the battery is totally isolated/disconnected from the shorted wires, the possibility of a fire is impossible because there is no current to heat up the wires.

Finding 41: (Material)

On November 19, 2004, the U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), Office of Defects Investigation (ODI), opened an investigation on speed control deactivation switch (SCDS) failures and related engine compartment fires that were occurring in model year 2000 F-150's, Expeditions and Lincoln Navigators. In January 2005, Ford announced it was recalling certain 2000 F150 Expedition, Lincoln Navigators and certain 2001 F150 Super Crew trucks due to an extremely high SCDS failure/fire rate when compared with other vehicles using the same switch. (RECORDS Tab V)

Finding 42: (Material)

On August 02, 2006, ODI closed the investigation of the speed control deactivation switch. The Texas Instruments speed control deactivation switch can develop an internal short circuit resulting in an engine compartment fire while the vehicle is parked with the ignition in the "off" position. The brake systems generate a vacuum that can potentially cause the SCDS to fail, and in certain switch installation orientations, catch fire. (RECORDS Tab W)

Finding 43: (Material)

Ford's July 27, 2006, recall for vehicles that have the defective SCDS includes 2002 Ford F450s. However, the recall is only for gasoline or natural gas engines. NHTSA's Office of Defects Investigation believes that the vehicles recalled by Ford correlate well with observed SCDS failure rates on these vehicles by model and model year. (RECORDS Tabs X, Y, Z, & 1)

Finding 44: (Material)

The National Park Service Ford 2002 F450 Super Duty crew truck involved in the incident on June 10, 2006, had a diesel engine. The VIN number of the National Park Service's vehicle is not included in the Ford recall.

Finding 45: (Material)

According to the NHTSA's Office of Defects Investigation (SAIT phone conversation on August 14, 2006) the diesel engines do not have an electric current running to the SCDS when the engine is turned off. Only the gasoline engines have the current to the SCDS when the engine is turned off.

Finding 46: (Material)

July 27, 2006 Ford's Supplement to Ford Recall No. 05S28: Ford is supplementing an earlier voluntary safety recall to also include certain model year 1994-2002 F-250 through F-550 Super Duty trucks, 2000-2002 Excursions, 1994-1996 Econolines, 1996-2002 E-450 vans equipped with gasoline or natural gas engines, and 1998 Explorers and Mountaineers. A speed control system interaction can occur that may cause the speed control deactivation switch to overheat and lead to an under hood fire. In rare cases, brake fluid may leak through the speed control deactivation switch into the speed control system electrical components, potentially corroding them. This corrosion in the electrical components can lead to increasing resistance and higher electrical current flow through the system. Together, these conditions could lead to overheating and, possibly, a fire at the switch. This system interaction is the result of several contributing factors including the specific orientation of the switch on the brake master cylinder and repeated high vacuum events that may occur at the switch due to typical brake system operation in the vehicles included in this action. Over time, these vacuum events may cause some speed control deactivation switches to be susceptible to brake fluid leaks and corrosion, which may result in the switch overheating. Ford estimates that there are approximately 1.2 million additional affected vehicles currently registered in the U.S.. Owners will be instructed to return their vehicles to dealers for installation of a fused wiring harness. As of April 2006, Ford has identified approximately 250 incidents that appear to allege a fire or smoke incident related to the speed control deactivation switch on the affected vehicles. In September 2004, Ford began investigating reports of under hood fires related to a speed control deactivation switch. Also according to Ford, investigation of under hood fires is complex because fires can occur for a variety of reasons, including improper vehicle modification (such as aftermarket accessories), arson, prior accident damage, lack of maintenance, or a faulty repair. (RECORDS Tab 2)

Finding 47: Material)

Various items from the NHTSA's Office of Defects Investigation Engineering Analysis Closing Report August 6, 2006:

(a) ODI developed an extensive testing and analysis program during this investigation to understand the root cause of the SCDS failures and understand why certain Ford model / model year vehicles had very high rates of key off engine compartment fire, while other models using the same part number SCDS had very low rates of fire. Understanding the failure mode would enable ODI and Ford to identify what additional vehicles should be recalled and remedied.

(b) ODI was aware of 218 key off fires in parked subject vehicles.

(c) On the subject vehicles, the SCDS receives uninterrupted voltage from the battery so that it is Powered All the Time (PAT).

(d) There are two significant stages in a failure associated with the alleged defect. The first stage involves the development of a leak path from the hydraulic side of the switch

to the electrical side of the switch. The second stage involves the corrosion of the switch contacts and the development of a resistive short to ground that generates heat in the switch cavity, which can result in melting of the plastic base and, in some cases, fire.

(e) SCDS failure is sometimes detected by evidence of brake fluid leakage (e.g. brake fluid on the pavement, brake fluid observed dripping from the switch, low brake fluid level in the reservoir, low brake pedal).

(f) The short circuit condition within the SCDS may also cause the fuse protecting the circuit to open and provide additional symptoms of switch failure. These include: 1) difficulty shifting the vehicle out of PARK; 2) inoperative brake lamps; and 3) brake warning light illumination on the dash. If the fuse opens, the subject switch and the stop lamp switch are isolated from battery voltage and the speed control, stop lamps, and brake transmission shift interlock become inoperative. The operator will not be able to shift out of PARK. A switch fire cannot occur after the fuse has opened, unless the fuse is replaced without diagnosing the problem and replacing the SCDS.

(g) Three primary factors contribute to the alleged defect. These include the vacuum pressure (duration and magnitude) generated by the master cylinder on the brake system when the brake pedal is released, the orientation of the SCDS in the master cylinder, and power being supplied to the SCDS at all times.

(h) The data and burn patterns collected from this series of live burns showed that a defective SCDS could catch fire and the fire could then spread to the reminder of the vehicle.

(i) …ODI and Ford were convinced that the magnitude of the vacuum at the end of the brake pressure cycle could have a significant impact on the life expectancy of the SCDS.

(j) The amount and quality of the evidence varied considerably in the engine compartment fire complaints reported to ODI. Therefore, to better assess which fires had evidence of SCDS involvement, ODI carefully analyzed all of the available information and called consumers to gather additional information when necessary. ODI sought any photographs taken of the vehicle during or after the fire, receipts for any service performed before or after the fire, eyewitness accounts of the fire, cause and origin reports written by a professional fire investigator, physical evidence including the SCDS removed from the vehicle, and the owners testimony as to what events occurred before the fire. ODI often contacted insurance companies, fire investigators, attorneys, and eye witnesses in order to gather the required evidence. ODI attempted to collect this type and quantity of evidence for over 1,400 alleged fires. Once collected, the evidence related to a complainant's fire was used to evaluate if the fire appeared to be caused by a failed SCDS. ODI established the following criteria to determine whether an incident would be counted as a "Yes": 1) the fire originated in the area where the speed control deactivation

switch is located (left-rear corner of the engine compartment, near the master cylinder) and 2) there was evidence of speed control deactivation switch failure prior to the fire

(e.g. inoperable speed control, speed control deactivation switch fuse open – sometimes repeatedly, difficulty shifting out of PARK, evidence of brake fluid leakage from the switch) or 3) evidence of speed control switch failures was discovered during post-fire forensic examination. The complainants could often not be contacted. The owners may have moved or changed contact information. ODI then mailed a certified letter to the last known address to try and contact the owner. If the owner could not be contacted, the complaint was marked as a "No". This "No" did not mean that the fire was not related to the SCDS, but that not enough data could be collected to make a determination. After reviewing all of the fires reported to ODI and Ford during investigations PE04-078 and EA05-005, there were a total of 1,472 engine compartment fire incidents reported on Ford model vehicles equipped with a SCDS that was powered all the time and mounted in the master cylinder and where the key position was either off or unknown. ODI did not request complaint information from Ford on the Excursion or Super Duty models. For this reason Ford did not report the number of engine compartment fire related complaints to ODI on these models.

(k) With the three recalls that Ford has announced, all of the models that were built with a TI SCDS and that exhibit the three factors that can cause the switch to fail resulting in a fire while the ignition is in the off position, will be candidates for a free remedy.

(l) Ford stopped manufacturing vehicles equipped with a Texas Instruments SCDS in model year 2002.
(RECORDS Tab 3)

Finding 48: (Material)

Excerpts from Insurance Report and Interview February 01, 2000:
Location of vehicle at time that fire broke out.
Driving down State Route 376.
What was the date and time of the fire?
The date was January 28th and I left for work approximately 20 after 4 a.m. and I got probably five miles up the road and I don't remember, you know, however long it takes to get there. So probably around 4:30 to 20 until 5 something like that.
Had you done any recent repairs or any work on the vehicle?
No. Just changed oil in it.
Where do you normally have the vehicle serviced?
I do it myself. I change my oil every 3,000 miles.
Were there any mechanical defects with the vehicle?
No.
Any electrical defects with the vehicle?
I called Ricart's and set up an appointment to take it in the first, that would be Tuesday the 1st to get it checked. I had trouble when you got in it in the morning or when it set like over night your inside lights didn't work and your power windows didn't work, your door

locks didn't work and your power mirrors didn't work. And I had it scheduled to go in today to get it checked.

Can you think of any reason that would have caused the vehicle to catch fire?
I would say it had to be in the electrical system. That's where it you know. Because when I opened the door the wires that goes through in from the door in to the fender well. That's where the fire was coming out of that hole where the tube goes through.
(RECORD Tab 4)

Finding 49: (Material)

Excerpt from Insurance Report January 10, 2005:
We have completed our investigation of the above loss. Our findings indicate that this fire that damaged our insured's vehicle was due to failure of the brake pressure switch.
(RECORD Tab 5)

Finding 50: (Material)

Excerpt from Insurance Report March 29, 2005:
Customer said: Cust had a veh F150/1995 which was caught on fire and burned her house to the ground. She heard on the news NHTSA is conducting research on veh from 1995 to 1999 for veh engine fire issue. There are other veh catching on fire. Ford is liable for this… (RECORD Tab 6)

Finding 51: (Material)

Excerpt from Investigation Report July 24, 2002:
From the interview with___ was learned that he discovered the fire shortly after he was awoke to go to the bathroom at about 2:30 AM. He heard the horn blowing on the 1997 Ford F150 pickup parked in the garage addition on the rear of the house. He went to the garage to investigate the noise; when he opened the door from the rear house addition halfway to the garage, he saw that the truck hood was on fire. __-said the truck was burning at the front of the engine compartment on the passenger side. _also noticed that the 1996 Lincoln Town car was parked next to the 1997 F150 truck was not involved in the initial fire….both the 1997 Ford F150 and the 1996 Town Car were totally consumed. Also, the garage burned and collapsed onto the vehicles. The odometer reading at the time of the fire was estimated to be around 60,000 miles. The vehicle had been driven to Paducah on the day prior to the fire, but it had been parked since 9:30 PM. The truck was running normally prior to the fire. Everything was in good working condition, and nothing unusual was noted. _did note that the cruise control was not working on the truck. The dealer had diagnosed the cruise control problem as part of a service request in the Fall of 2001, and a new control module was recommended. Because of the expense of the electronic module, _ elected not to repair the cruise control. ..it is this engineer's opinion that the probable cause of the fire was an electrical system malfunction involving the 1997 Ford F150 truck. (RECORDS Tab 7)

Finding 52: (Material)

Excerpt from Insurance Report September 01, 1999:
He parked the truck for the night in front of his room at approximately 5:00 PM. He retrieved some paper work from the cab at about 6:00 PM and received a pizza at his door at 7:00 PM. He then proceeded to do some paper work with the curtains open until 8:30 PM., then took a shower. Upon getting out of the shower, he heard a "deep boom", opened his door and observed flames coming from the engine compartment near the fire wall. He said the vehicle was a 1997 Ford F-150 with approximately 60,000 miles on the odometer. He mentioned that it had never required any repairs and he was not aware of any recalls. (RECORDS Tab 8)

Finding 53: (Material)

Excerpt from Insurance report August 08, 2003:
Findings were that the fire started under hood. Veh had not been turned on at all that day it was parked and veh went up in flames.
Odometer: 65,000 MI (RECORDS Tab 9)

Finding 54: (Material)

Excerpt from Investigation Report February 15, 2005:
It is suspected that the fire was caused by a defective cruise control deactivation switch that had been attached to the top of the master cylinder. The burn patterns indicated that when the vehicle burned there was a slight breeze which had pushed the fire from the engine compartment to the passenger's side. The burn damage to the rear cargo area indicated that the fire had traveled under the roof from the front of the vehicle. As aforementioned, the burn patterns around the windshield suggested that the fire's travel was controlled by ventilation.
(RECORDS Tab 10)

Finding 55: (Material)

Excerpt from Insurance Report and Interview July 12, 1999:
Okay, um, and what was the purpose of your trip at the time of the accident?
I was ..I was taking it to be dropped off at Lincoln Mercury for an appointment on Monday morning to .. because the electric windows stopped working.
Okay, um, had you had any other problems with the vehicle at the time it.. it caught fire?
No, nothing.
Okay.
It was running fine, everything was going good.
Do you know what the mileage was approximately on the.. on the vehicle?
I..I.. I would .. I'm just gonna' guess, I want to say it was around 30 somewhat thou..33,000, 34,000 miles.
Okay, were you aware of any.. any mechanical problems with the vehicle at all?

Just I was taking it up to have the windows fixed.
Okay, so it was.. it was the win.. you had a problem with the window?

With the electric windows, right.
And what.. what were the electric windows, what were the problem with that you were having with them?
Well, there was a .. there was a short in them 'cause you.. it kept blowing the fuse and we brought it to our service station and uh, they put a new fuse in it, then it worked for a minute, then it blew the fuse again. So I went back and they uh, with my uh, daughter in-law and they put another fuse in and then they said uh, there's no sense putting anymore fuses in it because you have a short somewhere, you need to bring it to the.. your.. where it's under warranty, just bring it back to Ford.
Oh.
So that's ..we immediately called Concord Lincoln Mercury and uh, they said the.. they gave us an appointment for Monday, which this happened on a Sunday night, I.. I know it happened on a Sunday night 'cause we were bringing it there on Monday.
(RECORDS Tab 11)

Finding 56: (Material)

Excerpt from Investigation Report November 24, 2003:
There was approximately 65K miles on the vehicle when the fire occurred. __ stated that he had experienced problems with the air conditioner compressor prior to the fire.
(RECORDS Tab 12)

Finding 57: (Material)

Excerpt from District Court Baltimore City December 30, 2003:
On August 16, 2003, __- used the 1998 Ford Expedition to run a short errand and then returned home, parking the vehicle in the driveway next to her house in order to unload it, and removed the key from the ignition. Approximately 25 to 30 minutes later, after __ returned from a neighbor's house, she heard the vehicle alarm from the 998 Ford Expedition sounding. As a result of the fire __ suffered a complete loss of the vehicle, as well as significant damage to her house and a loss of numerous personal items in the vehicle, which had been packed with items for a vacation. Ford Motor Company was negligent in its design or construction of Ford Triton 5.4-liter, V-8 engine installed in the 1998 Ford Expedition owned by ___. (RECORDS Tab 13)

Finding 58: (Material)

Excerpt from Insurance Report April 04, 2001:
The origin of the fire was the top front driver's side area of the engine. The probable causes of the fire are power steering fluid, gasoline, engine oil, or brake fluid leaking onto the driver's side exhaust manifold. Yes, the engine was running. Yes, the keys were in the ignition. The purchase date was December 24, 2000, the miles at the time of purchase was, according to the owner, less than 500 miles. (RECORDS Tab 14)

Finding 59: (Material)

Excerpts from detnews.com August 4, 2006: The National Highway Traffic Safety Administration said Thursday that it closed a complex investigation into the cause of the fires that spanned nearly two years. NHTSA said it did not expect any additional recalls tied to the defect. About 20 million of the switches in question are used in both Ford and non-Ford vehicles, but Rae Tyson, spokesman for the NHTSA, said similar problems have not been found in non-Ford vehicles. (RECORDS Tab 15)

Finding 60: (Material)

Excerpts from Insurance Report and Interview October 22, 2002:
And approximately how long ago did you purchase it?
Uh, just about exactly three months ago.
Okay, have you had any prior problems with the vehicle since you purchased it?
None whatsoever. Its been perfect.
How many miles did it have on it before the fire?
It had, uh, 3,150 miles.
And when you saw that it was smoking, what, what did you do at that point?
Well [laugh}, I said a few words. But, uh, I uh, uh, I went immediately and got the, uh, hose, which was at the dog pen and, and pulled it back and turned it on. And then about this time I, uh, got back to the car, it was already flaming up so, flaming out. I could see flames under the hood.
Seeing the smoke, any indications like gauges or anything like that?
None whatsoever. All the gauges worked perfect, I was just, you know, amazed how nice everything was, you know, when I came home. And, and there was no indication of anything, no smell of anything.
Were the flames higher at that point?
Uh, I-, they shot out everywhere. They scorched my hair and, um, and the fig tree and my arms and burned all the hair off my arms… (RECORDS Tab 16)

Finding 61: (Material)

Excerpts from Insurance report May 26, 2004:
When questioned regarding any complaints or problems with the vehicle prior to the fire, it was learned that the driver's window would go up and down by itself and the door locks would lock and unlock by themselves when going over a bumpy road. The mileage at the time of the purchase was approximately 60,000 miles and the mileage at the time of the fire loss was approximately 150,000 miles. Since ownership, no recall notices, campaigns or correspondence have been received from the manufacturer. No aftermarket accessories have been added since ownership, and it has not been involved in an accident since ownership. At the time of the fire, the vehicle had been parked for approximately seven hours, and upon hearing noises and looking out the window, smoke and flames were observed, emanating out from the center to rear through the aluminum hood. During the course of the fire, all doors and windows were closed.

…it is the opinion of this Investigator that the fire was accidental in nature. It is further the opinion of this Investigator that the fire originated within the right rear of the engine

compartment, in factory wiring traveling from the solenoid at the bulkhead where there is evidence of electrical faulting sufficient to ignite the wiring insulation and immediate combustibles into open flame, with the fire extending upward and outward from that location, causing the damage present. The fire is deemed to be an accidental fire, electrical in nature. (RECORDS Tab 17)

Finding 62: (Material)

Excerpt from Attorney Report and Interview April 7, 2004:
The fire occurred on January 12, 2004. That morning __ had driven just a short distance to return a weed eater and came back home. She had lunch at her home and also watched a movie in her bedroom. A little after 5:00 p.m. ___ responded to someone pounding on her door only to find that a neighbor was telling her that her truck was on fire in the driveway.
What was the mileage at time of occurrence?
Approximately 59,000 miles. (The exact mileage on July 24, 2003, was 58,413.)
What is the alleged defect?
Electrical failure at the relay/fuse box.
List all after market additions or modifications that were made to the vehicle.
Diesel tank, a tool box, tailgate cover, mat in back, headache rack, rails, floor mats, trailer hitch.
Was the engine running?
No.
(RECORDS Tab 18)

Finding 63: (Material)

Excerpt from a Letter to Insurance Company May 25, 2001:
We returned to Oxbow from Presque Isle and went to our camp. About 3 hours later our neighbor came down to our camp to tell us that our pickup had burned in their yard. The only work done to the truck was front end ball joint replacement, about one month before. Engine was not running. Mileage at the time of purchase was about 63,000. This vehicle was purchased in December, 1999. (RECORDS Tab 19)

Finding 64: (Material)

Excerpt from a "News from CPSC" August 15, 2006 Release #06-231:
The U.S. Consumer Product Safety Commission, in cooperation with the firm named below (Dell), today announced a voluntary recall of the following consumer product. Consumers should stop using recalled products immediately unless otherwise instructed. Name of Product: Dell-branded lithium-ion batteries made with cells manufactured by Sony. Hazard: These lithium-ion batteries can overheat, posing a fire hazard to consumers. Dell has received six reports of batteries overheating, resulting in property

damage to furniture and personal effects. The recalled lithium-ion batteries were sold with or separately to be used with the following Dell notebook computers; Latitude, Inspiron, Dell Precision, and XPS.

Finding 65: (Material)

The Zion Crew had a Dell laptop computer inside the main rear cargo area. (RECORDS Tab O)

Finding 66: (Material)

According to the Missoula Technology and Development Center (SAIT phone conversation August 21, 2006) all fusees must be bought through the GSA contract. As far as MTDC knew, "Standard Fusee Corporation" is the only company that is on the GSA contract. These fusees are periodically tested by GSA to ensure the fusees conform to USDA Forest Service Specification 5100-360E. It is uncertain if the rest of the manufacturers of fusees belong to the one manufacturer - the Standard Fusee Corporation - or if they are all individual manufacturers.

Finding 67: (Material)

According to the Silver City Fire Cache (phone conversation August 21, 2006) they have flares in the Fire Cache. These are purchased from a distributor called "Wildfire". The manufacturer of these flares is Quoin International, Inc

Finding 68: (Material)

According to ODI (SAIT phone conversation August 22, 2006) the main difference between a diesel engine that has the SCDS vs. a gasoline engine that has the SCDS is because the circuitry in a gasoline engine has the power all the time (PAT) to the switch whereas the diesel does not. Yes, there have been failures in the SDCS in diesel engines and, yes, there have been failures in SCDS with gasoline engines that do not have the power all the time to the switch (some gasoline engines are Non-PAT). The classic scenario for a PAT vehicle with a failed SCDS is to have the vehicle parked for a period of time (this varies from minutes to weeks) and then as the electric current runs through the failed switch it catches fire. Those vehicles that were PAT and running at the time - there was obviously someone (the driver) to witness the fire. Likewise for those Non-PAT vehicles (including diesel engines) that caught fire from a failed SCDS someone was there to witness the fire (the driver). According to ODI once the switch catches fire it takes about 15 minutes for the rest of the engine compartment to catch on fire.

Finding 69: **(Material)**

RECORDS Tab O: Vehicle Inventory (2006) 2002 Ford F-450 Crew Carrier (LN# 1271272): Compartment 3: Top shelf: Bar Oil (2- 1 gal. jugs), 2-Cycle Mix, Propane Canisters (6), Power Steering Fluid, and Antifreeze (1 gal.), Motor Oil (1 gal.)
Bottom Shelf: Drip Torches (4), Dolmars (2), Sig Bottles (4)
Compartment 1 Drawer: Saw Chain; 044, 440, 066 Parts Manual; Saw Cleaning Supplies/Tools; Rags used for cleaning
Compartment 2: Stihl 044 Chain Saws (2); Saw Kits (2)
Main Cargo (Zion Crew calls it the Rear Cargo): Compartment 2C: cooking/camping gear; Colemen 3-Burner Stove (1); Fish Cooker Large Stove (1)

Finding 70: **(Environmental)**

On the night of June 12, 2006, three of the SAIT arrived in Reserve, New Mexico. On the morning of June 13, 2006, the other three members arrived. On June 14, 2006, the SAIT visited the vehicle loss area. While driving along FS #49, it was noted by 4 members of the SAIT that the road was very "wash-boardy".

Finding 71: **(Material)**

From the Catron County Deputy Sheriff's State of New Mexico Uniform Crash Report #22055801: "I also spoke with ____ from the Quemado Ranger District and he advised me that when he saw the fire it was along the right side from the rear of the vehicle to the rear of the cab." (Tab H)

Finding 72: **(Material)**

According to ODI (SAIT phone conversation August 22, 2006) the reason the SDCS symptoms were not mentioned in the various insurance reports, fire investigations, and witness statements, was that the interviewers did not know to ask about the specific symptoms. The specific symptoms for a failed SDCS that were later asked by ODI from the owners of the Ford vehicles which caught on fire were: evidence of brake fluid leakage (e.g. brake fluid on the pavement, brake fluid observed dripping from the switch, low brake fluid level in the reservoir, low brake pedal); difficulty shifting the vehicle out of PARK; inoperative brake lamps; and brake warning light illumination on the dash. Once the questions were asked about the specific symptoms then the Ford owners said yes they had these symptoms.

Finding 73: **(Material)**

According to a Dell spokesperson (SAIT phone conversation August 23, 2006) the recalled Dell computer laptop batteries could catch on fire even though the laptop itself is not plugged into a power source. The batteries within the laptop could catch fire even with the laptop not turned on.

Finding 74: **(Material)**

SAIT interview with The Zion Crew on June 13, 2006: At 1300 0n Friday, June 06, 2006, left camp for fire "proper" by corrals in Largo Canyon. Vehicle remains at the corrals periodically running to charge computers. At 2100 we moved north down the road to allow burnout of corrals. At 2120 arrived back at camp. Continued working on computers periodically running vehicle to power up. At 2145 shut down.

Finding 75: **(Material)**

According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006); June 09, 2006, was the last time the crew used the computers inside the F-450 crew truck cab.

Finding 76: **(Environmental)**

Excerpt from the California Department of Forestry and Fire Protection, Fire Engine Air Cleaner Fires, February 10, 2002: 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 (RECORDS Tab 20).

Finding 77: **(Material)**

At the request of the SAIT, the Consumer Product Safety Commission conducted a product safety survey of consumer complaints concerning power inverters. SAIT asked CPSC to survey the complaints starting on January 01, 2001, and ending on August 23, 2006. Here are three excerpts from the survey:

- A man, age 40, was burned while using a power inverter, which connected into a deep cycle RV battery that was in a battery box. A TV & game system was plugged into the inverter when the clamps on the battery fried & a fire started inside the battery box.

- A 1000 watt power inverter was installed in a truck less than a year ago. Owner smelled an electrical fire & noticed the sleeper cab was full of smoke & the inverter was very hot to the touch & was smoking. No injury.

- A power inverter that was being used in a van failed & filled the van with thick black smoke & started a fire. Now both the power sockets in the van do not work. No injury. Fire hazard.

(RECORDS Tab 21)

Cause

The vehicle was a fire use support crew truck consisting of a Ford F-450 chassis with a power stroke diesel engine and a fiberglass body apparatus built and installed by the S&S Fire Apparatus Company. The crew truck was involved in a wildland fire use activity. During the Wilson WFU the crew truck was used to transport two members of a fire use module. The members of the fire use module were monitoring the fire and taking weather observations. During the monitoring, the crew truck was parked off the side of the road in an appropriate fashion. The truck was parked for approximately two and one half hours. Witnesses saw the crew truck sustain complete destruction due to fire.

The root cause is a deficiency that the correction, elimination, or avoidance of would likely have prevented or mitigated the accident. The Serious Accident Investigation Team (SAIT) is tasked with identifying the root cause and all contributing factors of the vehicle fire. After viewing photographs, visiting the vehicle site, discussing the sequence of events leading up to the loss, and reading other outside documents; the SAIT is unable to identify the root cause of the Wilson Wildland Fire Use Vehicle Loss on June 10, 2006.

The SAIT was only able to determine probable factors contributing to the vehicle fire

Contributing Factors

A contributing factor is any behavior, omission, or deficiency that sets the stage for an accident, or increases the severity of injuries or extent of property damage. Contributing factors may be present during an accident but may not have prevented or mitigated the accident if they had not been present..

There are three principle types of evidence: human, material, and environmental. Encompassing these three principles the SAIT selected four probable factors contributing to the fire that consumed the National Park Service crew truck on June 10, 2006. These are: 1) Arson, 2) The Wilson Wildland Use Fire, 3) Combustion Due to Fuels, Pyrotechnics, and Batteries; and 4) The Vehicle itself Due to Malfunction.

Based on the findings the SAIT gave each of the four probable factors a "probability rating". The probability ratings are low, medium, and high.

Probable Factor 1: Arson

According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); while he was driving north on FS Road 49 to the vehicle fire there was a Wilson Fire WFU fire fighter stationed at the road to prevent unauthorized access into the area (Finding 33).

Discussion:
The probability of arson is low due to Finding 33. Only authorized personal were allowed to proceed along Forest Service Road 49. That left only the Wilson Wildland Fire Use team members in this area.

Probable Factor 2: The Wilson Wildland Use Fire

Finding 06: June 10, 2006, at approximately 1330, Crew Member A parked the crew truck facing east about 50 feet north of the utility truck in an area black and clear of downed logs and brush (N 33° 50.814′ W 108°44.278′). This was the third and last parking spot for the vehicle. Crew Member A chocked the right tire with a rock and felt the ground for signs of heat. Satisfied that this area was safe to park the two crew members hiked south on FS Road 49. (RECORDS Tabs D & G)

Finding 07: June 10, 2006, at approximately1430, Crew Member A and Crew Member B hiked north passed the crew truck. The truck looked fine. (RECORDS Tabs D & G)

Finding 08: June 10, 2006, at approximately 1500, the fire activity on the west flank was 1-3 chains per hour with 1-3 foot flame lengths and 3-5 foot flame lengths at the head of the fire. There was some active fire behavior north of the truck including individual tree torching and fire whirls indicating active fire behavior runs upslope.

Finding 09: June 10, 2006, at approximately 1530, spotting continued across FS Road 49 north of the truck resulting in some crown fire runs to the top of the ridge.

Finding 29: According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006) there were signs of stumps burning across FS Road 49 from where the National Park Service crew truck was parked. There were signs of burning stumps approximately 50 – 100 feet from the truck on the side of the road where the truck was parked. The area was in the black.

Finding 31: On the night of June 12, 2006, three of the SAIT arrived in Reserve, New Mexico. On the morning of June 13, 2006, the other three members arrived. On June 14, 2006, the SAIT visited the vehicle loss area. At the site the SAIT noted that the vehicle loss area was in the black. The area in the vicinity of the burned vehicle showed there was minimal fire behavior (on June 8-9, 2006) with very sparse surface fuels of grass and litter that were burned and quite a bit of dirt, which would have prohibited the fire from moving quickly and thoroughly through the burned area. The crowns of the trees in the area showed no crown fire effects other than the vegetation immediately adjacent to the burned vehicle which was a direct result of the immense radiant heat occurring from the burning vehicle. Scorch height on the trees in the immediate area supported the fire behavior of 3-4 foot flame lengths with low to moderate intensity.

Finding 32: According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); he arrived at 1755 on June 10, 2006. The wind was blowing from the east to the west. While he was fighting the vehicle fire he was worried that the Ranch Grande Fire truck might be harmed. The wind did change direction (west to east). He could not tell the speed of the wind. There was quite a bit of smoke at this site coming from the vehicle fire as well as from the Wilson Fire itself.

Discussion:
There were no apparent vegetation hazards (snags, hazard trees) in the area to support any theory of a burning limb falling near or on the vehicle. There was also no indication of burning stump holes including burning roots that could have traveled to the vehicle location resulting in heat and ignition. However, there were indications of burning stumps (not stump holes) in the area (Finding 29). Indications were not conclusive that the possibility of burning vegetation was present and lodged in the dual tires but eye witness accounts discount this theory (Finding 06).

Due to the active fire north and south of the truck crew location at the time of the vehicle fire, upslope winds could have possibly carried embers (Findings 08, 09, and 32). However, fire embers would require a receptive fuel bed (vegetation) in order to cause ignition and allow the fire to burn continuously generating enough heat to ignite the truck (Finding 31). If there was a source such as dripping/leaking fuel enough to saturate the minimal surface fuels under the truck – embers could have easily ignited the fuels. There was quite a bit of dirt and sparse vegetation in this location (Finding 31).

The Wilson Wildland Use Fire as the cause of the truck fire has a low probability.

Probable Factor 3: Combustion Due to Fuels, Pyrotechnics, and Batteries

Finding 06: June 10, 2006, at approximately 1330, Crew Member A parked the crew truck facing east about 50 feet north of the utility truck in an area black and clear of downed logs and brush (N 33° 50.814′ W 108°44.278′). This was the third and last parking spot for the vehicle. Crew Member A chocked the right tire with a rock and felt the ground for signs of heat. Satisfied that this area was safe to park the two crew members hiked south on FS Road 49. (RECORDS Tabs D & G)

Finding 07: June 10, 2006, at approximately 1430, Crew Member A and Crew Member B hiked north passed the crew truck. The truck looked fine.(RECORDS Tabs D & G)

Finding 10: June 10, 2006, 1706, the fire was reported by a Reserve Ranger District employee delivering ice to crews. This employee noticed that the fire was located in the right rear, underside and moved along the right side of the truck.
(RECORDS Tab H)

Finding 11: June 10, 2006, sometime after 1706, Fire Use Module Leader, Crew Member C, and Crew Member D saw the back end of the crew truck was on fire including the wheel wells and tires. Crew Member C set up a road block on the north end of FS 49. A few minutes later the crew truck started to explode. (RECORDS Tab G)

Finding 13: 2003 (September?); the Tucson Police Department experienced two separate squad car truck fires, each occurring 15 days apart. The fires were determined to be caused by flares. Police officers were preparing flares in advanced by removing the protective caps from both the igniter tip and the scratch surface. They were pre-loading the flares in anticipation for the need of additional flares. If these flares are not used, they are returned to the truck of the squad car with the caps removed. (RECORDS Tab Q)

Finding 14: Tucson, Arizona Flare Experiment: The protective cap that covers the scratch surface was removed from one fusee and the igniter cap was removed from the second fusee, exposing the igniter tip. The exposed igniter tip was softly scraped against the scratch surface. It was observed that a very soft scrape against the scratch surface was sufficient to ignite a fusee. Ignition occurred in approximately 25% of the attempts. The Tucson Police Department observations indicated that the fusee could ignite with relative ease. (RECORDS Tab Q)

Finding 15: Tucson, Arizona Flare Experiment: The fusees used in the experiment were several 15 minute red fusees from the National Flare Company, and one fusee was listed 912 Au 3472 44AM, M1-2000-0518, made in China. (RECORDS Tab Q)

Finding 16: Tucson, Arizona Flare Experiment: The Tucson Police Department concluded that because of the ease of ignition between the scratch surface and the igniter tip, an improperly stored fusee could pose a safety hazard to Officers, Fireman, and City Personnel. (RECORDS Tab Q)

Finding 17: Tucson, Arizona Flare Experiment: a citywide memo was issued: "To minimize the risk of inadvertent flare ignition, which could result in a trunk fire. Flares should never be readied or prepared in advance, anticipating need. Igniter and striker caps must remain intact, on the flare, until the flare is needed. Flares should be kept in their original box or placed in a container, preventing migration and minimizing movement." (RECORDS Tab Q)

Finding 18: The SAIT requested the Fire Cache in Prescott Arizona to send a fusee MSDS. The Prescott Fire Cache sent an MSDS from the Standard Fusee Corporation. (RECORDS Tab P)

Finding 19: The Zion Fire Use Module gave to the SAIT an MSDS from Quoin International, Inc. (RECORDS Tab P)

Finding 20: Underwriters Laboratories Inc has a fusee standard (UL 912). (RECORDS Tab P)

Finding 21: Fusees were stored in the Zion Fire Use Module Crew Truck. (RECORDS Tab O)

Finding 22: According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) no flares were stored in the NPS F450 vehicle.

Finding 23: From the Underwriters Laboratories, Inc.(UL) Online Certifications Directory categories of highway signals, which includes the following types:
Fusee – A dry, chemical flare burning with open, red flame.
Liquid-burning Flare – A wick-operated, open flame torch designed for use with liquid fuel having a fire hazard classification not greater than that of kerosene.
(RECORDS Tab P)

Finding 24: RECORDS Tab O: Vehicle Inventory (2006) 2002 Ford F-450 Crew Carrier (LN# 1271272): Compartment 4: Ammo Can with Three (3) Grenades, Ammo Can with Tow Chain, Ammo Can with Jumper Cables, Ammo Can with Fusees, Ammo Can with coin (sp) launcher and flares, Hydraulic Jack, Tow Hitch, Bladder Bags (3), Laundry Detergent. (RECORDS Tab O)

Finding 25: According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) the grenades are fusees with a wick lit by a match and then thrown.

Finding 26: From June 08, 2006 to June 10, 2006, the Zion Fire Use Module Fire Crew did not open the crew truck compartment (passenger side rear). This is the compartment where the fusees were stored. (Initial SAIT interview June 13, 2006)

Finding 27: June 13, 2006, SAIT looked at a comparable National Park Service Vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept the SAIT also found oily rags and motor oil. (See RECORDS Tab O photos of S&S Fire Support package- compartment labeled #4).On the other side of the truck in another compartment (#3), the SAIT found the fuels storage. There was evidence of fuel leakage in this compartment. The "pig" mat was soaked with fuel. In addition the SAIT found that this truck was leaking brake fluid onto the pavement from one of the right sided wheel wells.

Finding 28: According to the Missoula Technology and Development Center (SAIT phone conversation August 17, 2006) there has only been one reported instance of a problem with fusees. A fusee in a plastic container carried in a back pack ignited. Also according to MTDC the Quoin launcher has a transfer bar. If the launcher is loaded with a flare, this bar prevents the launcher from igniting a flare from any action/movement other than pulling the trigger on the pistol with or without the hammer cocked back.

Finding 30: According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006) and according to the Catron County Deputy Sheriff (SAIT phone conversation August 22, 2006); the appearance of the burn pattern on the burnt crew truck indicates that the hottest spot is the right (passenger side) rear.

Finding 32: According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); he arrived at 1755 on June 10, 2006. The wind was blowing from the east to the west. While he was fighting the vehicle fire he was worried that the Rancho Grande Fire truck might be harmed. The wind did change direction (west to east). He could not tell the speed of the wind. There was quite a bit of smoke at this site coming from the vehicle fire as well as from the Wilson Fire itself.

Finding 64: Excerpt from a "News from CPSC" August 15, 2006 Release #06-231: The U.S. Consumer Product Safety Commission, in cooperation with the firm named below (Dell), today announced a voluntary recall of the following consumer product. Consumers should stop using recalled products immediately unless otherwise instructed. Name of Product: Dell-branded lithium-ion batteries made with cells manufactured by Sony. Hazard: These lithium-ion batteries can overheat, posing a fire hazard to consumers. Dell has received six reports of batteries overheating, resulting in property damage to furniture and personal effects. The recalled lithium-ion batteries were sold with or separately to be used with the following Dell notebook computers; Latitude, Inspiron, Dell Precision, and XPS.

Finding 65: The Zion Crew had a Dell laptop computer inside the main rear cargo area. (RECORDS Tab O)

Finding 66: According to the Missoula Technology and Development Center (SAIT phone conversation August 21, 2006) all fusees must be bought through the GSA contract. As far as MTDC knew, "Standard Fusee Corporation" is the only company that is on the GSA contract. These fusees are periodically tested by GSA to ensure the fusees conform to USDA Forest Service Specification 5100-360E. It is uncertain if the rest of the manufacturers of fusees belongs to the one manufacturer - the Standard Fusee Corporation - or if they are all individual manufacturers.

Finding 67: According to the Silver City Fire Cache (phone conversation August 21, 2006); they have flares in the Fire Cache. These are purchased from a distributor called "Wildfire". The manufacturer of these flares is Quoin International, Inc.

Finding 68: According to ODI (SAIT phone conversation August 22, 2006) the main difference between a diesel engine that has the SCDS vs. a gasoline engine that has the SCDS is because the circuitry in a gasoline engine has the power all the time (PAT) to the switch whereas the diesel does not. Yes, there have been failures in the SDCS in diesel engines and, yes, there have been failures in SCDS with gasoline engines that do not have the power all the time to the switch (some gasoline engines are Non-PAT). The classic scenario for a PAT vehicle with a failed SCDS is to have the vehicle parked for a period of time (this varies from minutes to weeks) and then as the electric current runs through the failed switch it catches fire. Those vehicles that were PAT and running at the time - there was obviously someone (the driver) to witness the fire. Likewise for those Non-PAT vehicles (including diesel engines) that caught fire from a failed SCDS someone was there to witness the fire (the driver). According to ODI once the switch catches fire it takes about 15 minutes for the rest of the engine compartment catch on fire.

Finding 69: RECORDS Tab O: Vehicle Inventory (2006) 2002 Ford F-450 Crew Carrier (LN# 1271272): Compartment 3: Top shelf: Bar Oil (2- 1 gal. jugs), 2-Cycle Mix, Propane Canisters (6), Power Steering Fluid, and Antifreeze (1 gal.), Motor Oil (1 gal.)
Bottom Shelf: Drip Torches (4), Dolmars (2), Sig Bottles (4)
Compartment 1 Drawer: Saw Chain; 044, 440, 066 Parts Manual; Saw Cleaning Supplies/Tools; Rags used for cleaning
Compartment 2: Stihl 044 Chain Saws (2); Saw Kits (2)
Main Cargo (Zion Crew calls it the Rear Cargo): Compartment 2C: cooking/camping gear; Colemen 3-Burner Stove (1); Fish Cooker Large Stove (1)

Finding 70: On the night of June 12, 2006, three of the SAIT arrived in Reserve, New Mexico. On the morning of June 13, 2006, the other three members arrived. On June 14, 2006, the SAIT visited the vehicle loss area. While driving along FS #49, it was noted by 4 members of the SAIT that the road was very "wash-boardy".

Finding 71: From the Catron County Deputy Sheriff's State of New Mexico Uniform Crash Report #22055801: "I also spoke with ____ from the Quemado Ranger District and he advised me that when he saw the fire it was along the right side from the rear of the vehicle to the rear of the cab." (Tab H)

Finding 73: According to a Dell spokesperson (SAIT phone conversation August 23, 2006) the recalled Dell computer laptop batteries could catch on fire even though the laptop itself is not plugged into a power source. The batteries within the laptop could catch fire even with the laptop not turned on.

Finding 74: SAIT interview with The Zion Crew on June 13, 2006: At 1300 on Friday, June 06, 2006, left camp for fire "proper" by corrals in Largo Canyon. Vehicle remains at the corrals periodically running to charge computers. At 2100 we moved north down the road to allow burnout of corrals. At 2120 arrived back at camp. Continued working on computers periodically running vehicle to power up. At 2145 shut down.

Finding 75: According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006); June 09, 2006, was the last time the crew used the computers inside the F-450 crew truck cab.

Discussion:

The Tucson Police Department experienced a couple of squad car fires in 2003. It was determined that the officers were pre-loading the fusees in anticipation of responding to various traffic accidents. The officers would remove the strike cap from the fusee and store the strike cap along with the rest of the fusse inside the squad car truck. The Tucson Police Department conducted an experiment and found that it did not take much striking force to ignite the fusee. It was believed that the normal movement of the squad car on the road was enough to cause the two pieces of the fusee to come together and cause a fire. Some of their fusees were bought from the National Flare Company (Findings 13, 14, 15, 16, and 17).

Fusees were stored in the Zion Crew truck (Finding 21). It is uncertain as to what *exactly* was stored in compartment 4 since the Zion Crew had not looked in this compartment before they went out on this assignment (Finding 26). We do have an inventory list of what should be in compartment 4 (Finding 24). The SAIT looked at a compatible crew truck and found items that should not be stored with the fusees (Finding 27). According to MTDC there has only been one reported case of a fusee spontaneously combusting (Finding 28). The SAIT asked the Prescott Fire Cache for a fusee MSDS and they sent one from the Standard Fusee Company (Finding 18). The Zion Crew when asked for an MSDS gave the SAIT an MSDS from Quoin International, Inc (Finding 19). According to MTDC, fusees that are bought must go through the GSA contract. As far as MTDC knew, the "Standard Fusee Company" is the only manufacturer that has this contract for fusees (Finding 66).

However, the Quoin International, Inc. also manufactures flares (Finding 19). The Silver City Fire Cache has the Quoin International, Inc. flares in their system (Finding 67). These flares are launched from a pistol or, in one type of flare; it is lit by a match and thrown. "Wildfire" is the name of a company that distributes the Quoin International, Inc. flares. Wildfire does not have a GSA contract. It is unknown if Quoin International, Inc. has a GSA contract. The Fire Cache can purchase these flares through the distributor

"Wildfire". The Quoin International, Inc. flares were stored in the Zion crew truck in compartment 4 (Finding 19, 24, and 25).

The Quoin flare launchers are also bought from Quoin International, Inc. with "Wildfire" as the distributor (Findings 19 and 67). According to MTDC the Quoin launcher has a transfer bar. If the launcher is loaded with a flare, this bar prevents the launcher from igniting a flare from any action/movement other than pulling the trigger on the pistol with or without the hammer cocked back (Finding 28).

From speaking with the Zion Crew, the Silver City Fire Cache, MTDC, and the Distributor "Wildfire" the term "fusee" is a type of flare that ignites by removing the cap of the fusee and then striking the cap to the fusee. The term "flare" is an open flame torch that can either be launched from a pistol or lit by a match (Finding 23).

The Forest Service may not have a standard for flares as they do for fusees. It is unknown if these flares are tested to ensure the safety of the product.

Dell has recalled some of their laptop computers due to faulty batteries. These lithium-ion batteries can overheat, posing a fire hazard to consumers. Dell has received six reports of batteries overheating, resulting in property damage to furniture and personal effects. The recalled lithium-ion batteries were sold with or separately to be used with the following Dell notebook computers: Latitude, Inspiron, Dell Precision, and XPS (Finding 64). The Zion Crew had a Dell laptop in the inside of the main rear cargo, floor, right side (Finding 65).

The evaporation of a flammable or combustible liquid when exposed to air forms a vapor. There is a flammable range below which the vapor air mixture is too lean to burn; likewise, there is a flammable range above which the vapor air mixture is too rich to burn. When the vapor air mixture is near the lower flammable limit or near the upper flammable limit, burning will occur. If the vapor air mixture is nearer the midrange, there is an explosion. The flash point of a liquid is the lowest temperature at which the vapor of the liquid will produce an ignitable mixture. Proper ventilation is necessary to prevent the accumulation of these flammable vapors. There is always the possibility of breaks or leaks in a container. Storing flammable liquids in a proper leak proof type of a closed container and minimizing the exposure to air is extremely important in controlling a fire hazard during storage. Once the liquid escapes the container and is exposed to air the liquid becomes a vapor. Spills from flammable and combustible fuels that are not wiped up and not properly ventilated can cause the vapors to build up and reach the flammable limit.

The Zion Crew stored flammable liquids in the crew truck (Finding 69). The comparable crew truck had spilled flammable liquids. There was evidence of fuel leakage in compartment #3. The "pig" mat was soaked with fuel. In addition the SAIT found that this truck was leaking brake fluid onto the pavement from one of the right sided wheel wells (Finding 27).

Sigg type bottles if overfilled may cause extreme pressure as the temperature rises. The MSR Sigg type bottle has a cap seal with an O-ring that allows the O-rind seal to fail before the bottle bursts. This allows only a small amount of fuel leakage instead of allowing the entire contents of the bottle to escape.

A common liquefied flammable gas is propane. If a liquefied flammable gas, such as propane, escapes or leaks from its container, the gas mixes with air. When the flammable limit is reached, the gas and air mixture is ignitable and will burn. A gas fire burns rapidly and produces heat rapidly. Materials in the area of a gas fire will absorb heat and expand. Air will double its volume for every 459° F it is heated. If the heated air cannot escape, the pressure will rise. If the structure is not strong enough to withstand the increasing pressure from the heated air, an explosion will be the result.

The Zion Crew truck contained propane bottles (Finding 69).

Fusees, Flares, Batteries, Flammable Liquids, Flammable Gases: These all could start a fire; some more easily than others. The fusee could start a fire if it was struck by the striking cap of the fusee itself. It is doubtful that the Zion Crew pre-loaded the fusees. Fusees have been around in the Fire Community for some time. GSA ensures the quality of these fusees as long as the fusees are bought from a GSA contract. Most fusees are brought from the "Standard Fusee Company". They have a GSA contract. It is quite possible that fusees are bought outside the GSA contract. If this is the case the quality/safety of the fusee may not meet the specifications outlined in 5100-306E.

Flares are not regulated by GSA and do not have any specifications as to their quality/safety. The Underwriters Laboratory does have fusee/flare standards (UL 912) and the flares that are distributed to our fire community may or may not meet these UL standards. What is interesting about the Tucson Police Department squad car fires is not so much the result of the officers pre-loading the fusees/flares but the finding of the Tucson PD investigator as to where some of the fusees/flares were manufactured. Some flares were manufactured in China. It is unknown if these flares would be manufactured to the UL 912 standard.

According to a Dell spokesperson (SAIT phone conversation August 23, 2006) the recalled Dell computer laptop batteries could catch on fire even though the laptop itself is not plugged into a power source. The batteries within the laptop could catch fire even with the laptop not turned on (Finding 73).

SAIT interview with the Zion Crew on June 13, 2006: At 1300 on Friday, June 06, 2006, left camp for fire "proper" by corrals in Largo Canyon. Vehicle remains at the corrals periodically running to charge computers. At 2100 we moved north down the road to allow burnout of corrals. At 2120 arrived back at camp. Continued working on computers periodically running vehicle to power up. At 2145 shut down (Find 74). According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006); June 09, 2006, was the last time the crew used the computers inside the F-450 crew truck cab

(Finding 75). The Zion Crew used a power inverter that was wired directly to the battery as a power source for their computers (Finding 36).

Flammable liquid leaks and improper storage are a problem. It is possible that a container of a flammable liquid leaked from its container; was exposed to air and formed into a vapor. The vapor may have been trapped inside the compartment due to lack of ventilation. The air vent may have been blocked from other items in the compartment due to the jostling of the contents while the truck was moved for the third and last time (Finding 70). This vapor could have reached its flammable limit and caused a fire.

A propane bottle could have been jostled around in compartment #3 and developed a small puncture which caused the flammable gas to escape. The gas then could have mixed with the air and this gas air mixture could have reached its flammable limit and caused a fire (Finding 70).

It is unknown if a fire crew member (Crew Member A) could have detected a flammable liquid leak or a flammable gas leak within the cargo area, unless the liquid leak or gas leak was strong enough to detect by smell. It is possible for Crew Member A to detect a flammable liquid leak that was dripping outside the compartment. He did place a chock (rock) under the right tire and then felt the ground for heat (Finding 06). However, most of the flammable liquids were stored on the other side of the truck (Finding 69). At the June 14, 2006, view of the comparable NPS crew truck, the SAIT did note the leaking fluid problems within compartment #3 and also the leaking brake fluid on the ground (Finding 27). It may be possible that leaking fluid is a common problem and would not be greatly noticed by a crew member.

For the truck fire itself, there is a factor of time when the fire started and a factor of location where the fire started.

The crew truck was parked for the last and final time at 1330 (Finding 06). Crew Member A and Crew Member B hiked south down FS 49 and after taking weather observations hiked north on FS 49 passing the crew truck. The crew truck was parked just off the road. As they passed the truck everything looked OK (Finding 07). At 1706 the truck fire was reported by a Reserve District Employee delivering ice to the fire crew. This employee noticed that the fire was located in the right rear underside and moved along the right side of the truck (Finding 10). It is difficult to tell when exactly the truck fire started. The truck was parked at 1330. The crew members walked right by it at 1430. The fire was reported at 1706. For at least one hour the truck was OK.

It is difficult to tell exactly where in the truck the fire started. If the fire started earlier than 1706, the fire could have started in one part of the truck and moved to another part by traveling along wires and the combustibles within the truck itself. According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); he arrived at 1755 on June 10, 2006. The wind was blowing from the east to the west. While he was fighting the vehicle fire he was worried that the Rancho Grande Fire truck might be

harmed. The wind did change direction (west to east). He could not tell the speed of the wind. There was quite a bit of smoke at this site coming from the vehicle fire as well as from the Wilson Fire itself (Finding 32). The wind direction from 1430 to 1755 could have pushed the fire from front to back, back to front, left to right, or from right to left. From the Catron County Deputy Sheriff's State of New Mexico Uniform Crash Report #22055801: "I also spoke with ____ from the Quemado Ranger District and he advised me that when he saw the fire it was along the right side from the rear of the vehicle to the rear of the cab" (Finding 71). The truck fire was seen by two witnesses who said they saw the fire on the right side (Finding 11). A fire can spread rapidly from one side to another especially in a windy condition and when the wind can change direction due to an upslope. It is worth noting that both the fire chief and the deputy sheriff noticed that the right rear of the truck burned the hottest (Finding 30).

If the truck's liquid flammable contents were jostled and spilled from the ride down FS #49 to the last parking space or if the contents were jostled and spilled from parking the vehicle itself (Finding 70), there is a time factor for the flammable liquid to evaporate into a vapor and then reach the flammable limit. There is a factor of the fire location. If the fire started in the compartment where most of the flammable liquids where kept, the fire could have easily moved from that location to another location due to wind and to the fire consuming materials on and in the truck (Finding 32).

If the Dell laptop computer battery caught fire, it could catch fire at any time as long as the battery is inserted into the laptop (Finding 73). Both the IBM laptop and the Dell laptop were kept in the main rear cargo area, floor, right side (Finding 65).

The question of flare standards; the common problem of improper storage of flammable liquids and gases; the time it takes to reach flammability; and the recall of the defective Dell laptop computer batteries that can catch on fire without the computer turned on - rates the factor "Combustion Due to Fuels, Pyrotechnics, and Batteries" as a high probability.

<u>Probable Factor 4:</u> The Vehicle Itself Due to Malfunction

Finding 01: June 08, 2006, at 0730, the Zion NPS Fire Use Module Crew left Cedar City, Utah, for Reserve, New Mexico. Their daily vehicle check found that the instrument panel lights (dashboard lights) on the 2002 Ford F450 Super Duty crew truck were still not working. These lights were noted inoperable a week before.
(RECORDS Tabs B, D, & G)

Finding 02: June 08, 2006, at 0815, a Zion NPS crew member who was traveling behind the crew truck had noticed that the rear running/parking lights on the crew truck were not working. (RECORDS Tabs B, D, & G)

Finding 03: June 08, 2006, 0830–0900: the crew arrived in Zion, Utah. One of the crew members (Crew Member A) inspected the fuses of the F450, but found nothing unusual. (RECORDS Tabs D & G)

Finding 04: June 08, 2006, at 1730, the crew arrived in Alpine, Arizona. While in Alpine, Crew Member A "rigged" wiring for the air conditioning unit using electrical tape. (RECORDS Tabs D & G)

Finding 05: June 09, 2006, at Reserve, New Mexico, the Zion Fire Use Module Crew left their hotel at 0645. The instrument panel lights, the rear running lights, and the air conditioning were still not working on the crew truck. (RECORDS Tabs D & G)

Finding 06: June 10, 2006, at approximately 1330, Crew Member A parked the crew truck facing east about 50 feet north of the utility truck in an area black and clear of downed logs and brush (N 33° 50.814′ W 108°44.278′). This was the third and last parking spot for the vehicle. Crew Member A chocked the right tire with a rock and felt the ground for signs of heat. Satisfied that this area was safe to park the two crew members hiked south on FS Road 49. (RECORDS Tabs D & G)

Finding 07: June 10, 2006, at approximately1430, Crew Member A and Crew Member B hiked north passed the crew truck. The truck looked fine.(RECORDS Tabs D & G)

Finding 10: June 10, 2006, 1706, the fire was reported by a Reserve Ranger District employee delivering ice to crews. This employee noticed that the fire was located in the right rear, underside and moved along the right side of the truck.
(RECORDS Tab H)

Finding 11: June 10, 2006, sometime after 1706, Fire Use Module Leader, Crew Member C, and Crew Member D saw the back end of the crew truck was on fire including the wheel wells and tires. Crew Member C set up a road block on the north end of FS 49. A few minutes later the crew truck started to explode. (RECORDS Tab G)

Finding 12: June 10, 2006, at 1720: The Fire Chief from the Rancho Grande Fire Department received the call about the vehicle fire, and at 1755 arrived on scene. A Catron County Deputy Sheriff also responded to the vehicle fire and assisted the Fire Chief to determine if the master cut off switch on the driver's side was in the off position (during the SAIT investigation it was determined that the switch was in the off position). (RECORD Tab H)

Finding 26: From June 08, 2006 to June 10, 2006, the Zion Fire Use Module Fire Crew did not open the crew truck compartment (passenger side rear). This is the compartment where the fusees were stored. (Initial SAIT interview June 13, 2006)

Finding 27: June 13, 2006, SAIT looked at a comparable National Park Service Vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept the SAIT also found oily rags and motor oil. (See RECORDS Tab O photos of S&S Fire Support package- compartment labeled #4).On the other side of the truck in another compartment (#3), the SAIT found the fuels storage. There was evidence of fuel leakage in this compartment. The "pig" mat was soaked with fuel. In addition the SAIT found that this truck was leaking brake fluid onto the pavement from one of the right sided wheel wells.

Finding 32: According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); he arrived at 1755 on June 10, 2006. The wind was blowing from the east to the west. While he was fighting the vehicle fire he was worried that the Rancho Grande Fire truck might be harmed. The wind did change direction (west to east). He could not tell the speed of the wind. There was quite a bit of smoke at this site coming from the vehicle fire as well as from the Wilson Fire itself.

Finding 34: On June 14, 2006, the SAIT found that the S&S installed primary power switch located next to the driver's seat on the National Park Service F-450 was in the "off" position.

Finding 35: According to an employee at S&S (SAIT phone conversation August 18, 2006); once the primary power switch is turned to the "off" position, it disconnects power to everything in the vehicle except for: two fuses that are kept open to power the computer of the vehicle and the clock in the factory installed dash radio; the starter – wired directly to the battery; the alternator – wired directly to the battery; and the glow plugs, which indicate if the vehicle is ready to be started. He also mentioned that any after-market items might not be disconnected by the primary power switch when in the off position.

Finding 36: According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) these are the after-market items added to the crew truck: Bendix King radio (wired through the primary power switch); an added radio/CD (wired to the battery); a power inverter, for the use of their Dell and their IBM laptop computers (wired to the battery).

Finding 37: In the SAIT phone conversation August 19, 2006, with the Zion Fire Use Module Leader, it was said that there was a suspension upgrade to the truck on 06/01/06; during the trip down to Reserve New Mexico the parking lights, the dashboard lights, and the air conditioning were not working; fuses were removed and inspected during a stop while on the way to Reserve; there have been no brake problems; no brake light warning indicated problems; no break fluid leakage; no low brake pedal problems; prior damage to the vehicle – doors replaced from a backing accident; no difficulty shifting out of PARK (the vehicle is a manual); and no problems with the glow plugs. The problem with the air conditioning has been a problem for quite some time. The Zion Crew brought the truck in three times in the past for this problem. Once the mechanic said it needed a

new wiring harness (one was installed) and once the mechanic said the A/C was over charged. (RECORDS Tab K)

Finding 38: Wires to the air conditioning needed to be "rigged' by duct tape. It seems that taping the wires in a certain position would cause the air conditioning to operate. (RECORDS Tabs B&G)

Finding 39: June 13, 2006, SAIT looked at a comparable National Park Service Vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept - the SAIT also found that a wire bundle went through a hole in the compartment (#4). This wire bundle was not protected by any rubber tubing. The compartment bulkhead is made of fiberglass. SAIT noticed that there is an element of play or slack in the wire bundle. The wire bundle then leads to the rear of the S&S Support package. There is a possibility the wire bundle is hooked into the rear lights.

Finding 40: According to a local Tucson, Arizona vehicle mechanic (SAIT phone conversation August 14, 2006) a short in a wire even with low amps could cause a fire. This is also true even if the vehicle were shut off. Electrical current runs to different parts of the vehicle even when the vehicle's engine is shut off. For example with the engine shut off a person can step on the brake pedal and the rear brake lights will light. If the battery is totally isolated/disconnected from the shorted wires, the possibility of a fire is impossible because there is no current to heat up the wires.

Finding 41: On November 19, 2004, the U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), Office of Defects Investigation (ODI), opened an investigation on speed control deactivation switch (SCDS) failures and related engine compartment fires that were occurring in model year 2000 F-150's, Expeditions and Lincoln Navigators. In January 2005, Ford announced it was recalling certain 2000 F150 Expedition, Lincoln Navigators and certain 2001 F150 Super Crew trucks due to an extremely high SCDS failure/fire rate when compared with other vehicles using the same switch. (RECORDS Tab V)

Finding 42: On August 02, 2006, ODI closed the investigation of the speed control deactivation switch. The Texas Instruments speed control deactivation switch can develop an internal short circuit resulting in an engine compartment fire while the vehicle is parked with the ignition in the "off" position. The brake systems generate a vacuum that can potentially cause the SCDS to fail, and in certain switch installation orientations, catch fire. (RECORDS Tab W)

Finding 43: Ford's July 27, 2006, recall for vehicles that have the defective SCDS includes 2002 Ford F450s. However, the recall is only for gasoline or natural gas engines. NHTSA's Office of Defects Investigation believes that the vehicles recalled by Ford correlate well with observed SCDS failure rates on these vehicles by model and model year. (RECORDS Tabs X, Y, Z, & 1)

Finding 44: The National Park Service Ford 2002 F450 Super Duty crew truck involved in the incident on June 10, 2006, had a diesel engine. The VIN number of the National Park Service's vehicle is not included in the Ford recall.

Finding 45: According to the NHTSA's Office of Defects Investigation (SAIT phone conversation on August 14, 2006) the diesel engines do not have an electric current running to the SCDS when the engine is turned off. Only the gasoline engines have the current to the SCDS when the engine is turned off.

Finding 46: July 27, 2006 Ford's Supplement to Ford Recall No. 05S28: Ford is supplementing an earlier voluntary safety recall to also include certain model year 1994-2002 F-250 through F-550 Super Duty trucks , 2000-2002 Excursions, 1994-1996 Econolines, 1996-2002 E-450 vans equipped with gasoline or natural gas engines, and 1998 Explorers and Mountaineers. A speed control system interaction can occur that may cause the speed control deactivation switch to overheat and lead to an under hood fire. In rare cases, brake fluid may leak through the speed control deactivation switch into the speed control system electrical components, potentially corroding them. This corrosion in the electrical components can lead to increasing resistance and higher electrical current flow through the system. Together, these conditions could lead to overheating and, possibly, a fire at the switch. This system interaction is the result of several contributing factors including the specific orientation of the switch on the brake master cylinder and repeated high vacuum events that may occur at the switch due to typical brake system operation in the vehicles included in this action. Over time, these vacuum events may cause some speed control deactivation switches to be susceptible to brake fluid leaks and corrosion, which may result in the switch overheating. Ford estimates that there are approximately 1.2 million additional affected vehicles currently registered in the U.S.. Owners will be instructed to return their vehicles to dealers for installation of a fused wiring harness. As of April 2006, Ford has identified approximately 250 incidents that appear to allege a fire or smoke incident related to the speed control deactivation switch on the affected vehicles. In September 2004, Ford began investigating reports of under hood fires related to a speed control deactivation switch. Also according to Ford, investigation of under hood fires is complex because fires can occur for a variety of reasons, including improper vehicle modification (such as aftermarket accessories), arson, prior accident damage, lack of maintenance, or a faulty repair. (RECORDS Tab 2)

Finding 47: Various items from the NHTSA's Office of Defects Investigation Engineering Analysis Closing Report August 6, 2006:

(a) ODI developed an extensive testing and analysis program during this investigation to understand the root cause of the SCDS failures and understand why certain Ford model / model year vehicles had very high rates of key off engine compartment fire, while other models using the same part number SCDS had very low rates of fire. Understanding the failure mode would enable ODI and Ford to identify what additional vehicles should be recalled and remedied.

(b) ODI was aware of 218 key off fires in parked subject vehicles.

(c) On the subject vehicles, the SCDS receives uninterrupted voltage from the battery so that it is Powered All the Time (PAT).

(d) There are two significant stages in a failure associated with the alleged defect. The first stage involves the development of a leak path from the hydraulic side of the switch to the electrical side of the switch. The second stage involves the corrosion of the switch contacts and the development of a resistive short to ground that generates heat in the switch cavity, which can result in melting of the plastic base and, in some cases, fire.

(e) SCDS failure is sometimes detected by evidence of brake fluid leakage (e.g. brake fluid on the pavement, brake fluid observed dripping from the switch, low brake fluid level in the reservoir, low brake pedal).

(f) The short circuit condition within the SCDS may also cause the fuse protecting the circuit to open and provide additional symptoms of switch failure. These include: 1) Difficulty shifting the vehicle out of PARK; 2) inoperative brake lamps; and 3) brake warning light illumination on the dash. If the fuse opens, the subject switch and the stop lamp switch are isolated from battery voltage and the speed control, stop lamps, and brake transmission shift interlock become inoperative. The operator will not be able to shift out of PARK. A switch fire cannot occur after the fuse has opened, unless the fuse is replaced without diagnosing the problem and replacing the SCDS.

(g) Three primary factors contribute to the alleged defect. These include the vacuum pressure (duration and magnitude) generated by the master cylinder on the brake system when the brake pedal is released, the orientation of the SCDS in the master cylinder, and power being supplied to the SCDS at all times.

(h) The data and burn patterns collected from this series of live burns showed that a defective SCDS could catch fire and the fire could then spread to the reminder of the vehicle.

(i) …ODI and Ford were convinced that the magnitude of the vacuum at the end of the brake pressure cycle could have a significant impact on the life expectancy of the SCDS.

(j) The amount and quality of the evidence varied considerably in the engine compartment fire complaints reported to ODI. Therefore, to better assess which fires had evidence of SCDS involvement, ODI carefully analyzed all of the available information and called consumers to gather additional information when necessary. ODI sought any photographs taken of the vehicle during or after the fire, receipts for any service performed before or after the fire, eyewitness accounts of the fire, cause and origin reports written by a professional fire investigator, physical evidence including the SCDS removed from the vehicle, and the owners testimony as to what events occurred before the fire. ODI often contacted insurance companies, fire investigators, attorneys, and eye

witnesses in order to gather the required evidence. ODI attempted to collect this type and quantity of evidence for over 1,400 alleged fires. Once collected, the evidence related to a complainant's fire was used to evaluate if the fire appeared to be caused by a failed SCDS. ODI established the following criteria to determine whether an incident would be counted as a "Yes": 1) the fire originated in the area where the speed control deactivation switch is located (left-rear corner of the engine compartment, near the master cylinder) and 2) there was evidence of speed control deactivation switch failure prior to the fire (e.g. inoperable speed control, speed control deactivation switch fuse open – sometimes repeatedly, difficulty shifting out of PARK, evidence of brake fluid leakage from the switch) or 3) evidence of speed control switch failures was discovered during post-fire forensic examination. The complainants could often not be contacted. The owners may have moved or changed contact information. ODI then mailed a certified letter to the last known address to try and contact the owner. If the owner could not be contacted, the complaint was marked as a "No". This "No" did not mean that the fire was not related to the SCDS, but that not enough data could be collected to make a determination. After reviewing all of the fires reported to ODI and Ford during investigations PE04-078 and EA05-005, there were a total of 1,472 engine compartment fire incidents reported on Ford model vehicles equipped with a SCDS that was powered all the time and mounted in the master cylinder and where the key position was either off or unknown. ODI did not request complaint information from Ford on the Excursion or Super Duty models. For this reason Ford did not report the number of engine compartment fire related complaints to ODI on these models.

(k) With the three recalls that Ford has announced, all of the models that were built with a TI SCDS and that exhibit the three factors that can cause the switch to fail resulting in a fire while the ignition is in the off position, will be candidates for a free remedy.

(l) Ford stopped manufacturing vehicles equipped with a Texas Instruments SCDS in model year 2002.
(RECORDS Tab 3)

Finding 48: Excerpts from Insurance Report and Interview February 01, 2000:
Location of vehicle at time that fire broke out.
Driving down State Route 376.
What was the date and time of the fire?
The date was January 28th and I left for work approximately 20 after 4 a.m. and I got probably five miles up the road and I don't remember, you know, however long it takes to get there. So probably around 4:30 to 20 until 5 something like that.
Had you done any recent repairs or any work on the vehicle?
No. Just changed oil in it.
Where do you normally have the vehicle serviced?
I do it myself. I change my oil every 3,000 miles.
Were there any mechanical defects with the vehicle?
No.
Any electrical defects with the vehicle?

I called Ricart's and set up an appointment to take it in the first, that would be Tuesday the 1st to get it checked. I had trouble when you got in it in the morning or when it set like over night your inside lights didn't work and your power windows didn't work, your door locks didn't work and your power mirrors didn't work. And I had it scheduled to go in today to get it checked.
Can you think of any reason that would have caused the vehicle to catch fire?
I would say it had to be in the electrical system. That's where it you know. Because when I opened the door the wires that goes through in from the door in to the fender well. That's where the fire was coming out of that hole where the tube goes through.
(RECORD Tab 4)

Finding 49: Excerpt from Insurance Report January 10, 2005:
We have completed our investigation of the above loss. Our findings indicate that this fire that damaged our insured's vehicle was due to failure of the brake pressure switch. (RECORD Tab 5)

Finding 50: Excerpt from Insurance Report March 29, 2005:
Customer said: Cust had a veh F150/1995 which was caught on fire and burned her house to the ground. She heard on the news NHTSA is conducting research on veh from 1995 to 1999 for veh engine fire issue. There are other veh catching on fire. Ford is liable for this… (RECORD Tab 6)

Finding 51: Excerpt from Investigation Report July 24, 2002:
From the interview with___ was learned that he discovered the fire shortly after he was awoke to go to the bathroom at about 2:30 AM. He heard the horn blowing on the 1997 Ford F150 pickup parked in the garage addition on the rear of the house. He went to the garage to investigate the noise; when he opened the door from the rear house addition halfway to the garage, he saw that the truck hood was on fire. __-said the truck was burning at the front of the engine compartment on the passenger side. _also noticed that the 1996 Lincoln Town car was parked next to the 1997 F150 truck was not involved in the initial fire….both the 1997 Ford F150 and the 1996 Town Car were totally consumed. Also, the garage burned and collapsed onto the vehicles. The odometer reading at the time of the fire was estimated to be around 60,000 miles. The vehicle had been driven to Paducah on the day prior to the fire, but it had been parked since 9:30 PM. The truck was running normally prior to the fire. Everything was in good working condition, and nothing unusual was noted. _did note that the cruise control was not working on the truck. The dealer had diagnosed the cruise control problem as part of a service request in the Fall of 2001, and a new control module was recommended. Because of the expense of the electronic module, _ elected not to repair the cruise control. ..it is this engineer's opinion that the probable cause of the fire was an electrical system malfunction involving the 1997 Ford F150 truck. (RECORDS Tab 7)

Finding 52: Excerpt from Insurance Report September 01, 1999:
He parked the truck for the night in front of his room at approximately 5:00 PM. He retrieved some paper work from the cab at about 6:00 PM and received a pizza at his door at 7:00 PM. He then proceeded to do some paper work with the curtains open until 8:30 PM., then took a shower. Upon getting out of the shower, he heard a "deep boom", opened his door and observed flames coming from the engine compartment near the fire wall. He said the vehicle was a 1997 Ford F-150 with approximately 60,000 miles on the odometer. He mentioned that it had never required any repairs and he was not aware of any recalls. (RECORDS Tab 8)

Finding 53: Excerpt from Insurance report August 08, 2003:
Findings were that the fire started under hood. Veh had not been turned on at all that day it was parked and veh went up in flames.
Odometer: 65,000 MI (RECORDS Tab 9)

Finding 54: Excerpt from Investigation Report February 15, 2005:
It is suspected that the fire was caused by a defective cruise control deactivation switch that had been attached to the top of the master cylinder. The burn patterns indicated that when the vehicle burned there was a slight breeze which had pushed the fire from the engine compartment to the passenger's side. The burn damage to the rear cargo area indicated that the fire had traveled under the roof from the front of the vehicle. As aforementioned, the burn patterns around the windshield suggested that the fire's travel was controlled by ventilation.
(RECORDS Tab 10)

Finding 55: Excerpt from Insurance Report and Interview July 12, 1999:
Okay, um, and what was the purpose of your trip at the time of the accident?
I was ..I was taking it to be dropped off at Lincoln Mercury for an appointment on Monday morning to .. because the electric windows stopped working.
Okay, um, had you had any other problems with the vehicle at the time it.. it caught fire?
No, nothing.
Okay.
It was running fine, everything was going good.
Do you know what the mileage was approximately on the.. on the vehicle?
I..I.. I would .. I'm just gonna' guess, I want to say it was around 30 somewhat thou..33,000, 34,000 miles.
Okay, were you aware of any.. any mechanical problems with the vehicle at all?
Just I was taking it up to have the windows fixed.
Okay, so it was.. it was the win.. you had a problem with the window?
With the electric windows, right.
And what.. what were the electric windows, what were the problem with that you were having with them?
Well, there was a .. there was a short in them 'cause you.. it kept blowing the fuse and we brought it to our service station and uh, they put a new fuse in it, then it worked for a minute, then it blew the fuse again. So I went back and they uh, with my uh, daughter in-

law and they put another fuse in and then they said uh, there's no sense putting anymore fuses in it because you have a short somewhere, you need to bring it to the.. your.. where it's under warranty, just bring it back to Ford.
Oh.
So that's ..we immediately called Concord Lincoln Mercury and uh, they said the.. they gave us an appointment for Monday, which this happened on a Sunday night, I.. I know it happened on a Sunday night 'cause we were bringing it there on Monday.
(RECORDS Tab 11)

Finding 56: Excerpt from Investigation Report November 24, 2003:
There was approximately 65K miles on the vehicle when the fire occurred. __ stated that he had experienced problems with the air conditioner compressor prior to the fire.
(RECORDS Tab 12)

Finding 57: Excerpt from District Court Baltimore City December 30, 2003:
On August 16, 2003, __- used the 1998 Ford Expedition to run a short errand and then returned home, parking the vehicle in the driveway next to her house in order to unload it, and removed the key from the ignition. Approximately 25 to 30 minutes later, after __ returned from a neighbor's house, she heard the vehicle alarm from the 1998 Ford Expedition sounding. As a result of the fire __ suffered a complete loss of the vehicle, as well as significant damage to her house and a loss of numerous personal items in the vehicle, which had been packed with items for a vacation. Ford Motor Company was negligent in its design or construction of Ford Triton 5.4-liter, V-8 engine installed in the 1998 Ford Expedition owned by ___. (RECORDS Tab 13)

Finding 58: Excerpt from Insurance Report April 04, 2001:
The origin of the fire was the top front driver's side area of the engine. The probable causes of the fire are power steering fluid, gasoline, engine oil, or brake fluid leaking onto the driver's side exhaust manifold. Yes, the engine was running. Yes, the keys were in the ignition. The purchase date was December 24, 2000, the miles at the time of purchase was, according to the owner, less than 500 miles. (RECORDS Tab 14)

Finding 59: Excerpts from detnews.com August 4, 2006: The National Highway Traffic Safety Administration said Thursday that it closed a complex investigation into the cause of the fires that spanned nearly two years. NHTSA said it did not expect any additional recalls tied to the defect. About 20 million of the switches in question are used in both Ford and non-Ford vehicles, but Rae Tyson, spokesman for the NHTSA, said similar problems have not been found in non-Ford vehicles. (RECORDS Tab 15)

Finding 60: Excerpts from Insurance Report and Interview October 22, 2002:
And approximately how long ago did you purchase it?
Uh, just about exactly three months ago.
Okay, have you had any prior problems with the vehicle since you purchased it?
None whatsoever. Its been perfect.
How many miles did it have on it before the fire?

It had, uh, 3,150 miles.
And when you saw that it was smoking, what, what did you do at that point?
Well [laugh}, I said a few words. But, uh, I uh, uh, I went immediately and got the, uh, hose, which was at the dog pen and, and pulled it back and turned it on. And then about this time I, uh, got back to the car, it was already flaming up so, flaming out. I could see flames under the hood.
Seeing the smoke, any indications like gauges or anything like that?
None whatsoever. All the gauges worked perfect, I was just, you know, amazed how nice everything was, you know, when I came home. And, and there was no indication of anything, no smell of anything.
Were the flames higher at that point?
Uh, I-, they shot out everywhere. They scorched my hair and, um, and the fig tree and my arms and burned all the hair off my arms… (RECORDS Tab 16)

Finding 61: Excerpts from Insurance report May 26, 2004:
When questioned regarding any complaints or problems with the vehicle prior to the fire, it was learned that the driver's window would go up and down by itself and the door locks would lock and unlock by themselves when going over a bumpy road. The mileage at the time of the purchase was approximately 60,000 miles and the mileage at the time of the fire loss was approximately 150,000 miles. Since ownership, no recall notices, campaigns or correspondence have been received from the manufacturer. No aftermarket accessories have been added since ownership, and it has not been involved in an accident since ownership. At the time of the fire, the vehicle had been parked for approximately seven hours, and upon hearing noises and looking out the window, smoke and flames were observed, emanating out from the center to rear through the aluminum hood. During the course of the fire, all doors and windows were closed.
…it is the opinion of this Investigator that the fire was accidental in nature. It is further the opinion of this Investigator that the fire originated within the right rear of the engine compartment, in factory wiring traveling from the solenoid at the bulkhead where there is evidence of electrical faulting sufficient to ignite the wiring insulation and immediate combustibles into open flame, with the fire extending upward and outward from that location, causing the damage present. The fire is deemed to be an accidental fire, electrical in nature. (RECORDS Tab 17)

Finding 62: Excerpt from Attorney Report and Interview April 7, 2004:
The fire occurred on January 12, 2004. That morning __ had driven just a short distance to return a weed eater and came back home. She had lunch at her home and also watched a movie in her bedroom. A little after 5:00 p.m. ___ responded to someone pounding on her door only to find that a neighbor was telling her that her truck was on fire in the driveway.
What was the mileage at time of occurrence?
Approximately 59,000 miles. (The exact mileage on July 24, 2003, was 58,413.)
What is the alleged defect?
Electrical failure at the relay/fuse box.
List all after market additions or modifications that were made to the vehicle.

Diesel tank, a tool box, tailgate cover, mat in back, headache rack, rails, floor mats, trailer hitch.
Was the engine running?
No.
(RECORDS Tab 18)

Finding 63: Excerpt from a Letter to Insurance Company May 25, 2001:
We returned to Oxbow from Presque Isle and went to our camp. About 3 hours later our neighbor came down to our camp to tell us that our pickup had burned in their yard. The only work done to the truck was front end ball joint replacement, about one month before. Engine was not running. Mileage at the time of purchase was about 63,000. This vehicle was purchased in December, 1999. (RECORDS Tab 19)

Finding 68: According to ODI (SAIT phone conversation August 22, 2006) the main difference between a diesel engine that has the SCDS vs. a gasoline engine that has the SCDS is because the circuitry in a gasoline engine has the power all the time (PAT) to the switch whereas the diesel does not. Yes, there have been failures in the SDCS in diesel engines and, yes, there have been failures in SCDS with gasoline engines that do not have the power all the time to the switch (some gasoline engines are Non-PAT). The classic scenario for a PAT vehicle with a failed SCDS is to have the vehicle parked for a period of time (this varies from minutes to weeks) and then as the electric current runs through the failed switch it catches fire. Those vehicles that were PAT and running at the time - there was obviously someone (the driver) to witness the fire. Likewise for those Non-PAT vehicles (including diesel engines) that caught fire from a failed SCDS someone was there to witness the fire (the driver). According to ODI once the switch catches fire it takes about 15 minutes for the rest of the engine compartment to catch on fire.

Finding 71: From the Catron County Deputy Sheriff's State of New Mexico Uniform Crash Report #22055801: "I also spoke with ____ from the Quemado Ranger District and he advised me that when he saw the fire it was along the right side from the rear of the vehicle to the rear of the cab." (Tab H)

Finding 72: According to ODI (SAIT phone conversation August 22, 2006) the reason the SCDS symptoms were not mentioned in the various insurance reports, fire investigations, and witness statements, was that the interviewers did not know to ask about the specific symptoms. The specific symptoms for a failed SCDS that were later asked by ODI from the owners of the Ford vehicles which caught on fire were: evidence of brake fluid leakage (e.g. brake fluid on the pavement, brake fluid observed dripping from the switch, low brake fluid level in the reservoir, low brake pedal); difficulty shifting the vehicle out of PARK; inoperative brake lamps; and brake warning light illumination on the dash. Once the questions were asked about the specific symptoms then the Ford owners said yes they had these symptoms.

Finding 76: Excerpt from the California Department of Forestry and Fire Protection, Fire Engine Air Cleaner Fires, February 10, 2002: 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 (RECORDS Tab 20).

Finding 77: At the request of the SAIT, the Consumer Product Safety Commission conducted a product safety survey of consumer complaints concerning power inverters. SAIT asked CPSC to survey the complaints starting on January 01, 2001, and ending on August 23, 2006. Here are three excerpts from the survey:

- A man, age 40, was burned while using a power inverter, which connected into a deep cycle RV battery that was in a battery box. A TV & game system was plugged into the inverter when the clamps on the battery fried & a fire started inside the battery box.

- A 1000 watt power inverter was installed in a truck less than a year ago. Owner smelled an electrical fire & noticed the sleeper cab was full of smoke & the inverter was very hot to the touch & was smoking. No injury.

- A power inverter that was being used in a van failed & filled the van with thick black smoke & started a fire. Now both the power sockets in the van do not work. No injury. Fire hazard.

(RECORDS Tab 21)

Discussion:
The Zion National Park Fire Use Module Crew had problems with their crew truck (Findings 01, 02, 03, 04, 05, 37, and 38). During the trip down to Reserve, New Mexico, the parking /running lights, the dashboard lights, and the air conditioning were not working. The fuses were inspected on this trip to Reserve by Crew Member A, but nothing was detected. The problem with the air conditioning has been a problem for quite some time. The Zion Crew brought the truck in three times in the past for this problem. Once a mechanic said it needed a new wiring harness (one was installed) and once a mechanic said the A/C was over charged. The way the crew solved the A/C problem was by duct taping the A/C wires. It seems that taping the wires in a certain position would then cause the air conditioning to operate.

There was a suspension upgrade to the truck on June 06, 2006 (Finding 37). There was prior damage to the rear door from a backing accident. The doors have been replaced (Finding 37).

June 13, 2006, SAIT looked at a comparable National Park Service vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept the SAIT also found that a wire bundle went through a hole in the compartment (#4). This wire bundle was not protected by any rubber tubing. The compartment bulkhead is made of fiberglass. SAIT noticed that there is an element of play or slack in the wire bundle. The wire bundle then leads to the rear of the S&S Support package. There is a possibility the wire bundle is hooked into the rear lights (Finding 39).

According to a local Tucson, Arizona vehicle mechanic (SAIT phone conversation August 14, 2006) a short in a wire even with low amps could cause a fire. This is also true even if the vehicle were shut off. Electrical current runs to different parts of the vehicle even when the vehicle's engine is shut off. For example, with the engine shut off a person can step on the brake pedal and the rear brake lights will light. If the battery is totally isolated/disconnected from the shorted wires, the possibility of a fire is impossible because there is no current to heat up the wires (Finding 40).

According to an employee at S&S (SAIT phone conversation August 18, 2006); once the primary power switch is turned to the "off" position, it disconnects power to everything in the vehicle except for: two fuses that are kept open to power the computer of the vehicle and the clock in the factory installed dash radio; the starter – wired directly to the battery; the alternator – wired directly to the battery; and the glow plugs, which indicate if the vehicle is ready to be started. He also mentioned that any after-market items might not be disconnected by the primary power switch when in the off position (Finding 35). The SAIT found that the S&S installed primary power switch located next to the driver's seat on the National Park Service F-450 was in the "off" position (Finding 34). According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) these are the after-market items added to the crew truck: Bendix King radio, which was wired through the primary power switch; an added radio/CD, which was wired directly to the battery; a power inverter, for the use of their Dell and their IBM laptop computers, which was wired directly to the battery (Finding 36).

On November 19, 2004, the U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), Office of Defects Investigation (ODI), opened an investigation on speed control deactivation switch (SCDS) failures and related engine compartment fires that were occurring in model year 2000 F-150's, Expeditions and Lincoln Navigators. In January 2005, Ford announced it was recalling certain 2000 F150 Expedition, Lincoln Navigators and certain 2001 F150 Super Crew trucks due to an extremely high SCDS failure/fire rate when compared with other vehicles using the same switch (Finding 41).

July 27, 2006 Ford's Supplement to Ford Recall No. 05S28: Ford is supplementing an earlier voluntary safety recall to also include certain model year 1994-2002 F-250 through F-550 Super Duty trucks, 2000-2002 Excursions, 1994-1996 Econolines, 1996-2002 E-450 vans equipped with gasoline or natural gas engines, and 1998 Explorers and

Mountaineers. A speed control system interaction can occur that may cause the speed control deactivation switch to overheat and lead to an under hood fire. In rare cases, brake fluid may leak through the speed control deactivation switch into the speed control system electrical components, potentially corroding them. This corrosion in the electrical components can lead to increasing resistance and higher electrical current flow through the system. Together, these conditions could lead to overheating and, possibly, a fire at the switch. This system interaction is the result of several contributing factors including the specific orientation of the switch on the brake master cylinder and repeated high vacuum events that may occur at the switch due to typical brake system operation in the vehicles included in this action. Over time, these vacuum events may cause some speed control deactivation switches to be susceptible to brake fluid leaks and corrosion, which may result in the switch overheating. Ford estimates that there are approximately 1.2 million additional affected vehicles currently registered in the U.S.. Owners will be instructed to return their vehicles to dealers for installation of a fused wiring harness. As of April 2006, Ford has identified approximately 250 incidents that appear to allege a fire or smoke incident related to the speed control deactivation switch on the affected vehicles. In September 2004, Ford began investigating reports of under hood fires related to a speed control deactivation switch. Also according to Ford, investigation of under hood fires is complex because fires can occur for a variety of reasons, including improper vehicle modification (such as aftermarket accessories), arson, prior accident damage, lack of maintenance, or a faulty repair (Finding 46).

On August 02, 2006, ODI closed the investigation of the speed control deactivation switch. The Texas Instruments speed control deactivation switch can develop an internal short circuit resulting in an engine compartment fire while the vehicle is parked with the ignition in the "off" position. The brake systems generate a vacuum that can potentially cause the SCDS to fail, and in certain switch installation orientations, catch fire (Finding 42). According to ODI (SAIT phone conversation August 22, 2006) the main difference between a diesel engine that has the SCDS vs. a gasoline engine that has the SCDS is the circuitry. In a gasoline engine the circuitry has the power all the time (PAT) to the switch whereas the diesel does not. Yes, there have been failures in the SDCS in diesel engines and, yes, there have been failures in SCDS with gasoline engines that do not have the power all the time to the switch (some gasoline engines are Non-PAT). The classic scenario for a PAT vehicle with a failed SCDS is to have the vehicle parked for a period of time (this varies from minutes to weeks) and then as the electric current runs through the failed switch it catches fire. Those vehicles that were PAT and running at the time - there was obviously someone (the driver) to witness the fire. Likewise for those Non-PAT vehicles (including diesel engines) that caught fire from a failed SCDS someone was there to witness the fire (the driver). According to ODI once the switch catches fire it takes about 15 minutes for the rest of the engine compartment to catch on fire (Finding 68). The National Park Service Ford 2002 F450 Super Duty crew truck involved in the incident on June 10, 2006, had a diesel engine. The VIN number of the National Park Service's vehicle is not included in the Ford recall (Finding 44).

The following is an excerpt from an from Insurance Report and Interview February 01, 2000:
Location of vehicle at time that fire broke out.
Driving down State Route 376.
What was the date and time of the fire?
The date was January 28th and I left for work approximately 20 after 4 a.m. and I got probably five miles up the road and I don't remember, you know, however long it takes to get there. So probably around 4:30 to 20 until 5 something like that.
Had you done any recent repairs or any work on the vehicle?
No. Just changed oil in it.
Where do you normally have the vehicle serviced?
I do it myself. I change my oil every 3,000 miles.
Were there any mechanical defects with the vehicle?
No.
Any electrical defects with the vehicle?
I called Ricart's and set up an appointment to take it in the first, that would be Tuesday the 1st to get it checked. I had trouble when you got in it in the morning or when it set like over night your inside lights didn't work and your power windows didn't work, your door locks didn't work and your power mirrors didn't work. And I had it scheduled to go in today to get it checked.
Can you think of any reason that would have caused the vehicle to catch fire?
I would say it had to be in the electrical system. That's where it you know. Because when I opened the door the wires that goes through in from the door in to the fender well. That's where the fire was coming out of that hole where the tube goes through.
(Finding 48).

This interview is interesting because the Ford vehicle was running at the time, and the previous immediate problems the owner had with the vehicle were electrical – the inside lights did not work and the power windows, power locks, and power mirrors all did not work.

This is an excerpt from Investigation Report July 24, 2002:
From the interview with___ was learned that he discovered the fire shortly after he was awoke to go to the bathroom at about 2:30 AM. He heard the horn blowing on the 1997 Ford F150 pickup parked in the garage addition on the rear of the house. He went to the garage to investigate the noise; when he opened the door from the rear house addition halfway to the garage, he saw that the truck hood was on fire. __-said the truck was burning at the front of the engine compartment on the passenger side. _also noticed that the 1996 Lincoln Town car was parked next to the 1997 F150 truck was not involved in the initial fire….both the 1997 Ford F150 and the 1996 Town Car were totally consumed. Also, the garage burned and collapsed onto the vehicles. The odometer reading at the time of the fire was estimated to be around 60,000 miles. The vehicle had been driven to Paducah on the day prior to the fire, but it had been parked since 9:30 PM. The truck was running normally prior to the fire. Everything was in good working condition, and nothing unusual was noted. _did note that the cruise control was not working on the

truck. The dealer had diagnosed the cruise control problem as part of a service request in the Fall of 2001, and a new control module was recommended. Because of the expense of the electronic module, _ elected not to repair the cruise control. ..it is this engineer's opinion that the probable cause of the fire was an electrical system malfunction involving the 1997 Ford F150 truck (Finding 51).

According to the owner the Ford pick up truck was fine except for a faulty cruise control. This vehicle was parked for 5 hours before the fire started.

Excerpt from Insurance Report September 01, 1999:
He parked the truck for the night in front of his room at approximately 5:00 PM. He retrieved some paper work from the cab at about 6:00 PM and received a pizza at his door at 7:00 PM. He then proceeded to do some paper work with the curtains open until 8:30 PM., then took a shower. Upon getting out of the shower, he heard a "deep boom", opened his door and observed flames coming from the engine compartment near the fire wall. He said the vehicle was a 1997 Ford F-150 with approximately 60,000 miles on the odometer. He mentioned that it had never required any repairs and he was not aware of any recalls (Find 52).

According to the owner the car was parked for 3 ½ hours before the fire started. He mentioned that it had never required any repairs and he was not aware of any recalls.

Excerpt from Insurance Report and Interview July 12, 1999:
Okay, um, and what was the purpose of your trip at the time of the accident?
I was ..I was taking it to be dropped off at Lincoln Mercury for an appointment on Monday morning to .. because the electric windows stopped working.
Okay, um, had you had any other problems with the vehicle at the time it.. it caught fire?
No, nothing.
Okay.
It was running fine, everything was going good.
Do you know what the mileage was approximately on the.. on the vehicle?
I..I.. I would .. I'm just gonna' guess, I want to say it was around 30 somewhat thou..33,000, 34,000 miles.
Okay, were you aware of any.. any mechanical problems with the vehicle at all?
Just I was taking it up to have the windows fixed.
Okay, so it was.. it was the win.. you had a problem with the window?
With the electric windows, right.
And what.. what were the electric windows, what were the problem with that you were having with them?
Well, there was a .. there was a short in them 'cause you.. it kept blowing the fuse and we brought it to our service station and uh, they put a new fuse in it, then it worked for a minute, then it blew the fuse again. So I went back and they uh, with my uh, daughter in-law and they put another fuse in and then they said uh, there's no sense putting anymore fuses in it because you have a short somewhere, you need to bring it to the.. your.. where it's under warranty, just bring it back to Ford.

Oh.
So that's ..we immediately called Concord Lincoln Mercury and uh, they said the.. they gave us an appointment for Monday, which this happened on a Sunday night, I.. I know it happened on a Sunday night 'cause we were bringing it there on Monday.
(Finding 55)

According to the owner the vehicle was running at the time of fire – she was on the way to the mechanic. The immediate problem with the vehicle was that the electric windows were not operating - fuse kept blowing.

Excerpt from Investigation Report November 24, 2003:
There was approximately 65K miles on the vehicle when the fire occurred. __ stated that he had experienced problems with the air conditioner compressor prior to the fire (Finding 56).

Here is a summary of the SCDS reports taken at random from the National Highway Traffic Safety web site:

Total number of SCDS reports taken at random that had police reports, fire department reports, court reports, insurance data, and/or fire investigation data: 15 (Findings 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 62, and 63)

Number of these finding that the engine was running: 3 (Findings 48, 55, and 58)

Number of cases the engine was not running: 10 (Findings 50, 51, 52, 53, 54, 57, 60, 61, 62, and 63)

Unknown if running or not due to lack of documents in the SCDS report: 2

Immediate previous mechanical/electrical problems with the vehicle:

- Inside lights did not work, nor did the door locks, power mirrors (Finding 48)
- Cruise control problem (Finding 51)
- Electric windows did not work – fuse kept blowing (Finding 55)
- Air compressor problems (Finding 56)
- Driver's window would go up and down by itself; door locks would lock and unlock by themselves when going over a bumpy road (Finding 61)
- Front end ball joint replacement (finding 63)

No problems reported: 2 (Findings 52 and 60)

What the fire investigator believes to be the cause:

- Power steering fluid, gasoline, engine oil, brake fluid leaking onto driver's side exhaust manifold – April 04, 2001 (Finding 58)
- Electrical system malfunction – July 24, 2002 (Finding 51)
- Electrical failure at the relay/fuse box – April 7, 2004 (Finding 62)
- Factory wiring traveling from the solenoid – May 26, 2004 (Finding 61)
- Brake Pressure switch - January 10, 2005 (Finding 49)
- Defective cruise control deactivation switch – February 15, 2005 (Finding 54)

The random reports and documents did not have all of the information listed above. For example, some had the fire investigator reports, and some did not.

It is interesting to note that in January 2005, Ford announced it was recalling certain 2000 and 2001 vehicles due to an extremely high SCDS failure/fire rate. Look at the list of "What the fire investigator believes to be the cause". Notice that the fire investigators did not pick-up on the SCDS problem until January 2005.

Here is the way ODI collected the evidence from the owners:
"The amount and quality of the evidence varied considerably in the engine compartment fire complaints reported to ODI. Therefore, to better assess which fires had evidence of SCDS involvement, ODI carefully analyzed all of the available information and called consumers to gather additional information when necessary. ODI sought any photographs taken of the vehicle during or after the fire, receipts for any service performed before or after the fire, eyewitness accounts of the fire, cause and origin reports written by a professional fire investigator, physical evidence including the SCDS removed from the vehicle, and the owners testimony as to what events occurred before the fire. ODI often contacted insurance companies, fire investigators, attorneys, and eye witnesses in order to gather the required evidence. ODI attempted to collect this type and quantity of evidence for over 1,400 alleged fires. Once collected, the evidence related to a complainant's fire was used to evaluate if the fire appeared to be caused by a failed SCDS. ODI established the following criteria to determine whether an incident would be counted as a "Yes": 1) the fire originated in the area where the speed control deactivation switch is located (left-rear corner of the engine compartment, near the master cylinder) and 2) there was evidence of speed control deactivation switch failure prior to the fire (e.g. inoperable speed control, speed control deactivation switch fuse open – sometimes repeatedly, difficulty shifting out of PARK, evidence of brake fluid leakage from the switch) or 3) evidence of speed control switch failures was discovered during post-fire forensic examination. The complainants could often not be contacted. The owners may have moved or changed contact information. ODI then mailed a certified letter to the last known address to try and contact the owner. If the owner could not be contacted, the complaint was marked as a "No". This "No" did not mean that the fire was not related to the SCDS, but that not enough data could be collected to make a determination. After reviewing all of the fires reported to ODI and Ford during investigations PE04-078 and EA05-005, there were a total of 1,472 engine compartment fire incidents reported on Ford model vehicles equipped with a SCDS that was powered all the time and mounted

in the master cylinder and where the key position was either off or unknown. ODI did not request complaint information from Ford on the Excursion or Super Duty models. For this reason Ford did not report the number of engine compartment fire related complaints to ODI on these models" (Finding 47j).

If the fire investigators did not pick-up on the faulty SCDS until 2005, it would appear that quite a few of the fire incidents prior to January 2005 would not be listed under ODI's criteria to determine whether an incident would be counted as a "Yes".

It is also interesting to note that the owners of the vehicles did not mention the expected NHTSA Office of Defects Investigation symptoms of a failed SCDS.

According to ODI (SAIT phone conversation August 22, 2006) the reason the SCDS symptoms were not mentioned in the various insurance reports, fire investigations, and witness statements, was that the interviewers did not know to ask about the specific symptoms. The specific symptoms for a failed SCDS that were later asked by ODI from the owners of the Ford vehicles which caught on fire were: evidence of brake fluid leakage (e.g. brake fluid on the pavement, brake fluid observed dripping from the switch, low brake fluid level in the reservoir, low brake pedal); difficulty shifting the vehicle out of PARK; inoperative brake lamps; and 3) brake warning light illumination on the dash. Once the questions were asked about the specific symptoms then the Ford owners said yes they had these symptoms (Finding 72).

Only after the ODI interview did the owners say they had brake fluid on the pavement, difficulty shifting out of PARK, etc. How could an owner say there was a problem with the power windows and then later say the problem was something totally different? How could an owner say there was no problem at all with the vehicle and then later say that there was difficulty shifting out of PARK, and yes, there was a problem with brake fluid on the pavement? How could all these owners forget to mention the brake fluid problem and the difficulty shifting out of PARK at the initial fire investigation?

Using documents and interviews, ODI had 1,472 "complaints". ODI had confirmed that 65 of these "complaints" were caused by a faulty SCDS. ODI received more "complaints" from Ford models that were equipped with a SCDS that was powered all the time and where the ignition key was in the off position or unknown (Finding 47j).

In the 29 page Engineering Analysis Closing Report; Subject Speed Control Deactivation Switch Fires; EA05-005; August 2006, the ODI and Ford conducted various tests on the switch. They conducted a live burn testing, a pressure/temperature testing, an electrolysis/dendrite growth testing, and a vacuum testing. They collected switches that had some damage related to the alleged defect, switches that did not have any apparent damage, and switches that were new. The live burn testing showed that switches on the verge of failure could catch fire and have that fire spread to the rest of the vehicle. The pressure /temperature testing showed that neither the brake system pressure nor the SCDS temperatures were significantly different for model/year vehicles with a high or low rate

of SCDS failure. The electrolysis/dendrite test showed how a leak in the seal in the SCDS could result in arcing and melting of the plastic base on the SCDS. The vacuum testing showed that the magnitude of the vacuum at the end of the brake pressure cycle could have a significant impact on the life expectancy of the SCDS (Findings 46 & 47 a – g).

As far as the comparison between a switch powered all the time (PAT) vs. a switch not powered all the time (Non-PAT), the evidence is based on the number of complaints. Sometimes Ford did not give all the complaint data to ODI and sometimes ODI did not use all of the complaints that were sent directly to ODI.

The electrolysis/dendrite testing is interesting because ODI and Ford filled the base of the SCDS containing the electrical contacts with brake fluid. Then the contacts were connected to a power supply and the switch was monitored. The brake fluid along with the corrosion products created an electrolytic cell. This lead to a chemical process, which in turn caused arcing and melting of the plastic base on the SCDS (Finding 47d).

None of the tests on the switch itself explains why power all the time to the switch (PAT) can cause a fire - while not having power all the time to the switch (Non-PAT) does not cause a fire. Yet there have been cases where a Non-PAT SCDS has caused a fire.

The ODI should be given credit for their two year probe into the cause of the vehicle fires. Ford should be given credit for their recall of the vehicles. However, Non-Pat vehicles catch fire at the SCDS. ODI did not receive many complaints from the Non-Pat owners. Is that a reason to discount the Non-Pat switches? Why did not FORD recall all vehicles with the TI SCDS? Non-Pat vehicles catch fire at the SCDS as do the PAT SCDS, but maybe not as many. Should Non-Pat TI SCDS Ford vehicle owners be warned about the possibility of fire? Or for that matter, why is not Ford advertising the recall more vigorously? The SAIT only found out about the recall from the NHTSA web site.

There is one more troubling finding concerning the SCDS. Finding 59: Excerpts from detnews.com August 4, 2006: The National Highway Traffic Safety Administration said Thursday that it closed a complex investigation into the cause of the fires that spanned nearly two years. NHTSA said it did not expect any additional recalls tied to the defect. About 20 million of the switches in question are used in both Ford and non-Ford vehicles, but Rae Tyson, spokesman for the NHTSA, said similar problems have not been found in non-Ford vehicles.

NHTSA said similar problems have not been found in non-Ford vehicles. The SCDS was installed on non-Ford vehicles. What is it about the Ford vehicles with the SCDS that would cause a fire whereas in other vehicles with the SCDS it would not cause a fire?

If ODI is correct, according to ODI (SAIT phone conversation August 22, 2006) the main difference between a diesel engine that has the SCDS vs. a gasoline engine that has the SCDS is because the circuitry in a gasoline engine has the power all the time (PAT) to the switch whereas the diesel does not. Yes, there have been failures in the SDCS in diesel engines and, yes, there have been failures in SCDS with gasoline engines that do not have the power all the time to the switch (some gasoline engines are Non-PAT). The classic scenario for a PAT vehicle with a failed SCDS is to have the vehicle parked for a period of time (this varies from minutes to weeks) and then as the electric current runs through the failed switch it catches fire. Those vehicles that were PAT and running at the time - there was obviously someone (the driver) to witness the fire. Likewise for those Non-PAT vehicles (including diesel engines) that caught fire from a failed SCDS someone was there to witness the fire (the driver). According to ODI once the switch catches fire it takes about 15 minutes for the rest of the engine compartment catch on fire.

If ODI is correct, the timing for the June 10, 2006, vehicle fire does not match the 15 minutes it would take to catch the engine on fire with a faulty Non-PAT SCDS. The Ford F-450 crew truck was parked for at least an hour when it was then seen again by Crew Member A and Crew Member B. The truck was OK. The timing would match if there was an electrical short in a wire that had current running to it all the time. On June 14, 2006, the SAIT found that the S&S installed primary power switch located next to the driver's seat on the National Park Service F-450 was in the "off" position (Finding 34). According to an employee at S&S (SAIT phone conversation August 18, 2006); once the primary power switch is turned to the "off" position, it disconnects power to everything in the vehicle except for: two fuses that are kept open to power the computer of the vehicle and the clock in the dash radio; the starter – wired directly to the battery, the alternator – wired directly to the battery, and the glow plugs, which indicate if the vehicle is ready to be started. He also mentioned that any after-market items might not be disconnected by the primary power switch when in the off position (Finding 35). According to the Zion Fire Use Module Leader (SAIT phone conversation August 19, 2006) these are the after-market items added to the crew truck: Bendix King radio (wired through the primary power switch); an added radio/CD (wired to the battery); a power inverter, for the use of their Dell and their IBM laptop computers, (wired to the battery) (Finding 36).

There is a possibility one of these after-market items shorted out and caused the fire in the crew truck (Finding 77).

June 13, 2006, SAIT looked at a comparable National Park Service Vehicle, a Super Duty Ford F-450 with an S&S Fire Support package. In the compartment where the fusees, Quoin launcher, and grenades were kept - the SAIT also found that a wire bundle went through a hole in the compartment (#4). This wire bundle was not protected by any rubber tubing. The compartment bulkhead is made of fiberglass. SAIT noticed that there is an element of play or slack in the wire bundle. The wire bundle then leads to the rear of the S&S Support package. There is a possibility the wire bundle is hooked into the rear lights (Finding 39).

There is a possibility one of these wires shorted out and caused the fire in the crew truck. However, the main power switch was found to be in the off position (Finding 34).

Faulty installation or faulty past repairs could have caused the fire in the crew truck. However, the main power switch was found to be in the off position (Finding 34).

With the main power switch in the off position only four items that were directly wired to the battery had current running to them all the time: the starter, the alternator, the power inverter, and the radio/CD. Two of these items were factory installed and two of these items were after-market.

For the truck fire itself, there is a factor of time when the fire started and a factor of location where the fire started.

The crew truck was parked for the last and final time at 1330 (Finding 06). Crew Member A and Crew Member B hiked south down FS 49 and after taking weather observations hiked north on FS 49 passing the crew truck. The crew truck was parked just off the road. As they passed the truck everything looked OK (Finding 07). At 1706 the truck fire was reported by a Reserve District Employee delivering ice to the fire crew. This employee noticed that the fire was located in the right rear underside and moved along the right side of the truck (Finding 10). It is difficult to tell when exactly the truck fire started. The truck was parked at 1330. The crew members walked right by it at 1430. The fire was reported at 1706. For at least one hour the truck was OK.

It is difficult to tell exactly where in the truck the fire started. If the fire started earlier than 1706, the fire could have stared in one part of the truck and moved to another part by traveling along wires and the combustibles within the truck itself. According to the Rancho Grande Fire Chief (SAIT phone conversation August 19, 2006); he arrived at 1755 on June 10, 2006. The wind was blowing from the east to the west. While he was fighting the vehicle fire he was worried that the Rancho Grande Fire truck might be harmed. The wind did change direction (west to east). He could not tell the speed of the wind. There was quite a bit of smoke at this site coming from the vehicle fire as well as from the Wilson Fire itself (Finding 32). The wind could have pushed the fire from front to back, back to front, left to right, or from right to left. From the Catron County Deputy Sheriff's State of New Mexico Uniform Crash Report #22055801: "I also spoke with ____ from the Quemado Ranger District and he advised me that when he saw the fire it was along the right side from the rear of the vehicle to the rear of the cab" (Finding 71). The truck fire was seen by two witnesses who said they saw the fire on the right side (Finding 11). A fire can spread rapidly from one side to another especially in a windy condition and when the wind can change direction due to an upslope.

After-market electronic/electrical items installed in vehicles are a common source of vehicle fires. The two after-market items have been in the vehicle for approximately four years.

The time factor of an electrical caused fire from one of the after-market items would match the time approximate of the June 10, 2006, vehicle fire, if the malfunction (short) occurred after 1430.

In looking over past vehicle fires that were involved in wildfires, all the documentation SAIT found showed that all the vehicles caught fire because of the wildfire itself. Either the vehicle was a burn-over or the vehicle sucked up an ember into its air intake (Finding 76). The NPS Ford F-450 was parked at the time of the fire. The engine was not running.

The common problem of electrical fires caused by after-market items, the question of the SCDS PAT vs. Non-PAT Ford vehicle fires, and the electrical problems the crew truck had right before the fire - rates the factor "The Vehicle itself Due to Malfunction" as a high probability.