

North Eden Fire

Faciliated Learning Analysis

Date of Incident: August 16, 2018



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Figure 1 – Cover Photo of the two burned vehicles on the North Eden Fire on August 17, 2018. Photo Credit: Brandon Everett.

This was a close call that leads to many learning opportunities.

1. Summary

The North Eden Fire was reported on August 16, 2018 at 1250. The fire was approximately 15 acres, however it grew very quickly. Ninety minutes later, at 1340, Air Attack reported the fire's size at 40-50 acres. Historically, a fire of this size would have been extinguished very quickly by local resources. However, on this day—due to very abundant dry flashy fuels—it proved to be difficult to extinguish.

At 1415, Dispatch was notified that two vehicles were damaged. Two fire trucks were engulfed in flames. A disabled vehicle in combination with advanced fire behavior and a resistance to suppression created an instance that could have easily led to a loss of life or injury. All firefighters involved in this event escaped with no injuries. This was a close call that leads to many learning opportunities.

2. Introduction

The objective of this Facilitated Learning Analysis (FLA) review is to tell the story of what happened on this incident. The State of Utah Division of Forestry, Fire and State Lands chose to utilize an FLA approach to learn from this unintended outcome.

An FLA Team was assembled to carry out an information-gathering process to tell the story of those involved in this incident. The U.S. Forest Service and other local resources were assigned to help complete this FLA.

The FLA process shares the experiences and thoughts of the individuals involved and provides lessons learned to ensure that others have the opportunity to gain insights from these experiences. The North Eden Fire FLA process included interviewing the individuals who were involved or present during the incident, as well as reviewing available records from Air Attack, Dispatch, and personal accounts. By utilizing all of these resources, a story and timeline of these events were created.

The key purpose of explaining this story is to identify lessons learned. These lessons are gathered and presented in this FLA to inform others about this incident in hopes of preventing future similar unintended outcomes.

On August 16, 2018 two vehicles were a total loss when they were burned during Initial Attack on the North Eden Fire in Rich County, Utah. This FLA will tell the story of how this occurred and what key insights we can learn from this close call experience.

3. The Story

On the morning of August 16, the Rich County Fire Warden stopped at the local mechanic shop to pick up inspection paperwork. Some members of The Woodruff Fire Department are employed at the mechanic shop. The Fire Warden talked to two of the department's Engine Operators (who would later be involved in this incident). They spoke about fuel moistures and recent fire behavior.

This Fire Warden has been involved in fire suppression for 45 years and has thousands of days of fire experience. This year was different than previous years. Record-high Energy Release Components (ERC) and record-low fuel moistures were prevalent throughout Utah.

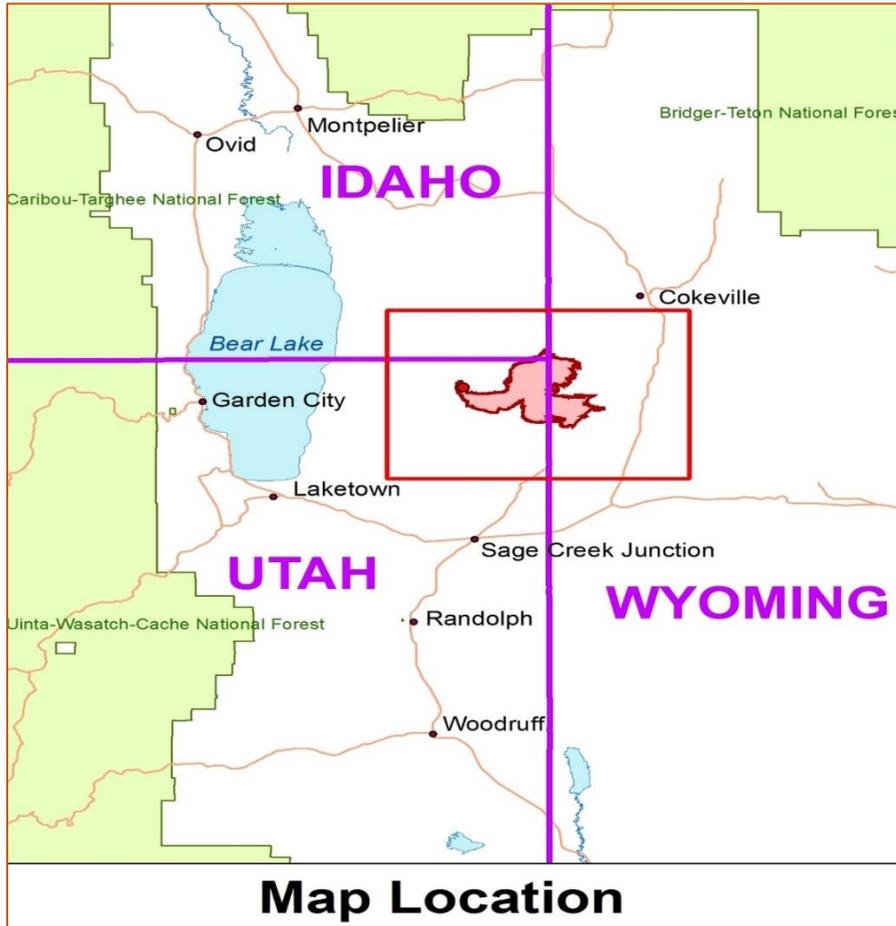
Local Ranchers Spot a Smoke

At 1250, local ranchers spotted smoke near a powerline on private land being managed under the Conservation Reserve Program (CRP). (For more information on the CRP, see page 14.) They contacted

the Rich County Fire Warden directly. It is a typical occurrence to have fires in this area start by lightning. At the time of this incident, however, there had been no recent thunderstorm or lightning activity. (The cause of this fire was determined to be a physical failure of the powerline structure.)

At approximately 1256, interagency fire resources in addition to Rich County resources were dispatched, including: the Rich County Fire Warden and Assistant Fire Warden, the Randolph Fire Department, the Woodruff Fire Department, two U.S. Forest Service Engines, and an interagency Air Attack.

Figure 2 – North Eden Fire Location. Map Credit: Steve Winward.



The Rich County Assistant Fire Warden was the first to arrive on scene and established Incident Command. Shortly after he arrived, the two Engines from the Randolph Fire Department also arrived.

Air Attack arrived on scene and made contact with the Assistant Fire Warden at 1340. Air Attack noted the fire behavior as “moderate” to “high” with an active head and estimated the fire was approximately 40-50 acres in size.

The Rich County Fire Warden picked up the Woodruff Fire Chief in route to the fire in Engine 623 (a Type 6 Engine), arriving on scene at 1347. Shortly after, Woodruff Fire Department Heavy Brush Trucks 12 and 13 arrived. These Heavy Brush Trucks 12 and 13 are 5-ton Federal Equipment Personal Property (FEPP) M923A2 6X6 military cargo trucks converted for use as rural and wildland fire trucks. (See truck differences details on page 12.)

Figure 3 – The North Eden Fire on August 16 at 1336 hours. While this image is blurry, it is the only photo taken upon arrival at the fire, showing relative fire size. Photo Credit: Rob Leifson, Woodruff Fire Department Chief.



Two Single Engine Air Tankers Ordered

The winds were light and variable with intermittent gusts and were predominantly out of the west and northwest. The fire was burning on Conservation Reserve Program ground with 1-2 foot tall grass and 2-4 foot tall sagebrush. Fuel moistures collected were last reported below 74 percent, which would categorize fire behavior to be “Advanced”. (See the table on page 14.)

“I thought it was a little overkill, in the past we’ve shut it down.”

~ Woodruff Fire Chief

At 1353, two Single Engine Air Tankers (SEAT) were ordered. The Fire Warden does not typically request retardant for his county. Local firefighters commented that in the past these types of fires have been caught within 30 minutes. After air support was confirmed, the Fire Warden worked with the power company to ensure that the power was shut down due to high voltage power lines running north to south through the middle of the fire.

Suppression Plan Developed

Once coordination was in place, a plan was developed to establish an anchor point and work the flanks of the fire in an attempt to pinch it off. Due to the lack of available firefighters, the Operator of Heavy Brush 13, worked alone.

Figure 4 – The Woodruff Fire Department’s Heavy Brush 12, 5-ton truck. (This is the sister truck to Heavy Brush 13 that was burned over in this incident). Photo Credit: Susie Tracy.



A decision was made to work the west flank of the fire. Heavy Brush 13 moved across the head of the fire in a large loop through the green to the west flank. Once on the west flank, Heavy Brush 13 stayed in the green and headed in a southeast direction knocking down the flame front. The Heavy Brush 13 Operator was spraying out the driver’s side window.

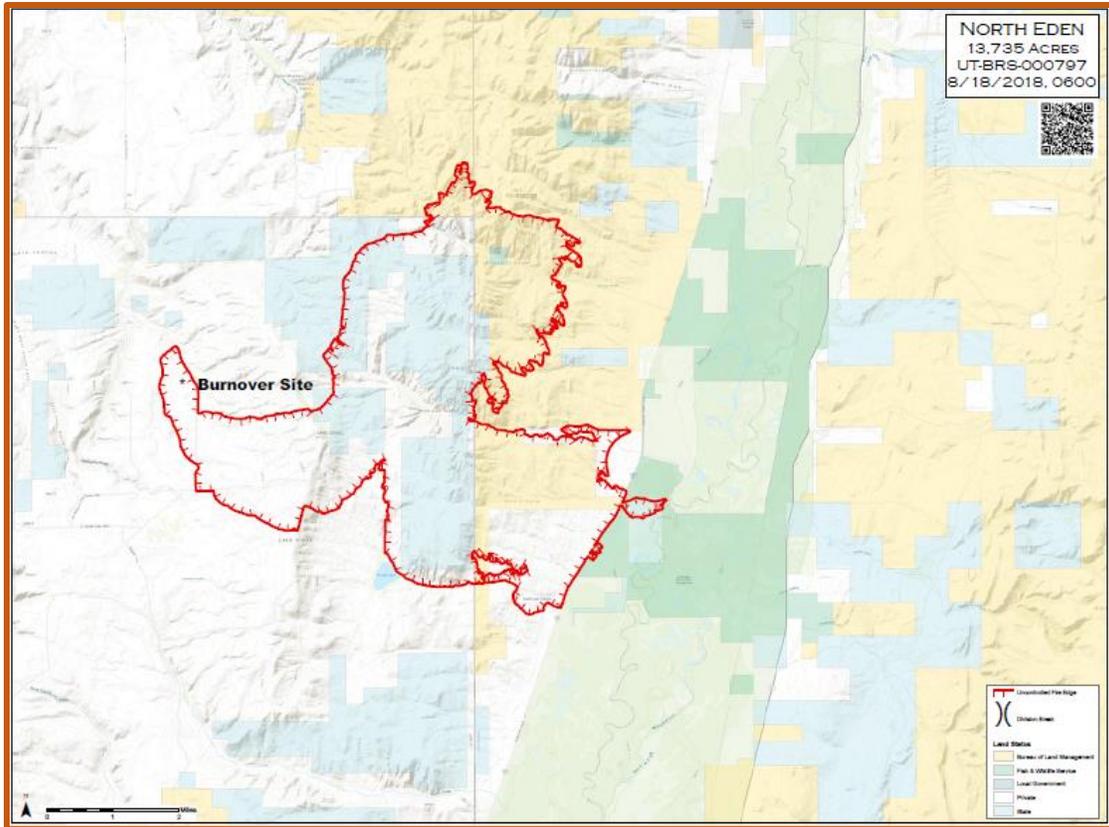
The Fire Warden and Fire Chief were working in Engine 623 along the fire’s east flank. They had visual contact with Heavy Brush 13 as it worked along the west flank. However, they temporarily lost visual contact due to smoke. Engine 623 was establishing an anchor point and engaged in suppression, working from the road west toward Heavy Brush 13. Engine 623 disengaged twice due to increased fire behavior.

The Fire Chief spotted Heavy Brush 13 working toward the south in the green along the west flank. Following the fire’s edge, working from the green, Heavy Brush 13 turned east toward Engine 623, continuing suppression efforts.

The Heavy Brush 13 Operator was engaging in what he calls the normal “Lather, rinse, repeat”—referring to anchor, flank and pinch. As he made his way along the fire’s edge in green fuels, he headed east, continuing to spray from the driver’s window toward the road.

Next, the Heavy Brush 13 Operator stopped and began to back-up to reinforce his wet line. While traveling in reverse, the operator noted an increase in heat intensity inside the truck and turned to avoid the heat (see Figure 6).

Figure 5 – Burn over site location. Map credit: Steve Winward.



Heavy Brush 13 Operator Reports His Truck is Down

At this time, Heavy Brush 13 came to an abrupt stop. The operator heard the sound of air escaping. A buzzer and light began going off. The Heavy Brush 13 Operator said, "I stood on the gas and it just hummed on me." He relayed over the radio that the truck was down. He said, "I'm okay, but the truck's not." The Fire Warden on Engine 623 responded that they were on their way!

The Heavy Brush 13 Operator got out and walked past the back of the truck about 30 feet. He stopped when he noticed the fire behavior increasing. "I saw the fire in front of me and I knew there was no way I could out run it," he said. "I went back to the truck because I needed my fire shelter." The Engine Operator headed back to his truck and got his line gear with his fire shelter.

He then realized that the truck was parked in sparse fuels and fire behavior had decreased, so he picked up his hose and began spraying.

Engine 623 arrived promptly. The distance from the road to Heavy Brush 13 was approximately 130 yards. Engine 623 came from the road through the black and then passed through the active flame to the green. It was now positioned on the north side of Heavy Brush 13.

“It doesn’t take long for things to change in a hurry.”

~ Woodruff Fire Chief

The Fire Chief joined the Heavy Brush 13 Operator to spray the east flame front. The flame front approximately 10 yards to the north began to move southwest, which prompted the Fire Warden and Fire Chief to get into and reposition Engine 623.

They passed behind Heavy Brush 13 to its passenger side (south side)—(where it was located when it was burned). The Fire Warden in conjunction with Heavy Brush 13 utilized their hoses and began engaging the now advancing fire front.

Fire Behavior Increases

The fire behavior suddenly increased as wind gusts and direction changed—now coming directly south.

The Fire Warden used Heavy Brush 13 as a shield and sprayed down the 20-foot flames as the Fire Chief and Engine Operator ran to the black. The Fire Chief looked back and saw the Fire Warden “on his knees spraying into a wall of fire.”

Instincts and training kicked in. The Fire Warden recalls “I pulled them to the front of my truck, dropped the nozzle and told them to get into the black.” The Fire Warden then dropped the hose and also retreated into the black. He went approximately 15 feet where he joined the Fire Chief and Engine Operator. Flames were shooting out of the window of both trucks.

Within seconds, the tires of the trucks began exploding. From the time the Heavy Brush 13 was first reported down until the two trucks were engulfed in fire was a total of approximately three minutes.

“I always tell my folks to have a plan for when your truck or your pump quits.”

~ Rich County Fire Warden

First Priority: Safety

At 1415, the vehicles were reported to Dispatch as damaged.

In retrospect, none of the individuals involved said they ever felt their lives were in danger at any time.

They all made it to the black safely and no injuries were sustained. There was also never a second

thought about leaving the vehicles. The first priority was safety.

Figure 6 – Depiction of travel for Heavy Brush 13 and Engine 623.

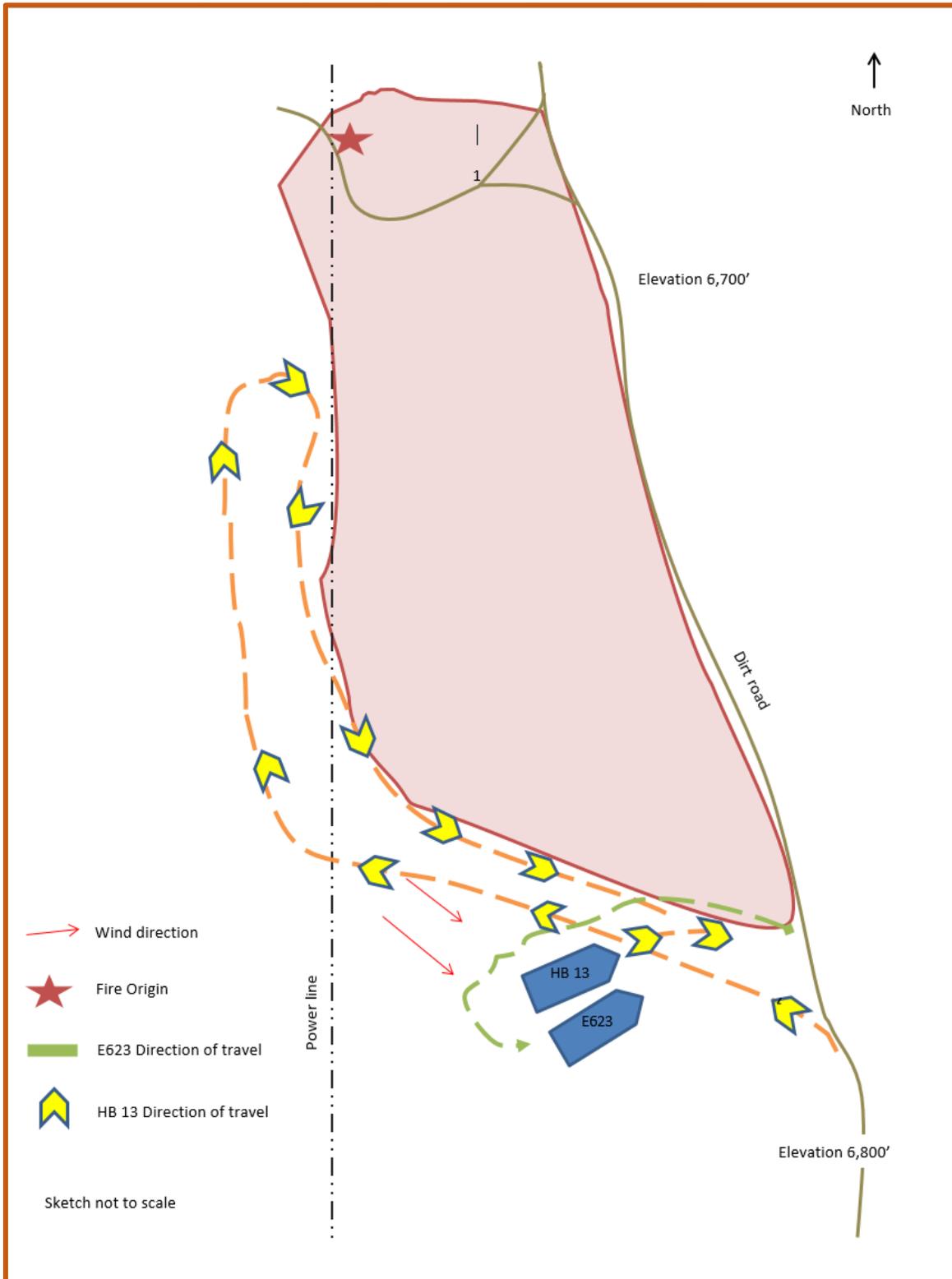


Figure 7 – One hour after burn over at 1451. This photo shows this incident’s fuels and topography. Photo Credit: David Stacey, Woodruff Fire Department.



Their ability to communicate, to trust one another, and to make good decisions brought them home at the end of the day.

4. Conclusion

Many individuals from these local fire departments commented that they have never seen a fire burn so hot and move so fast. The people involved in this incident had to rely on each other, remember their training, and make life-determining decisions in seconds.

Their ability to communicate, to trust one another, and to make good decisions brought them home at the end of the day.

The safety of our firefighters always has to be the first priority. Understanding what these individuals did right, having awareness of your equipment, and utilizing the information provided in the Lessons Learned section in this FLA may contribute to another safe return in the future.

5. Lessons Learned

- Taking time to troubleshoot and examine mechanical failures may place you in a difficult situation. (Had the Heavy Brush 13 Operator got under the truck to troubleshoot the vehicle's mechanical problem, his escape route may have been compromised.)
- Understanding that safety always comes first and having no loyalty to a vehicle may save lives. (All fire departments have pride, loyalty and attachment to their equipment. But when you recognize that your equipment is compromised and personal safety is in jeopardy, leaving your equipment may be required.)
- Have the appropriate wildland Personal Protective Equipment (PPE) on prior to engaging the fire.
- Train for and have a contingency plan. What would you do if your truck broke down or the pump stopped working? Train for the fire you are going to, not the fire you have been to.
- Maintain situational awareness and establish "LCES"—Lookouts, Communication, Escape Routes, Safety Zone—prior to engaging your incident.
- "Take 5", "Huddle Up", "Make a Plan", "Establish Safety Zones", and "Attack from the Black, Anchor and Flank".
- If at all possible, a firefighter should not go out in a truck or engage a fire by themselves. In remote areas where water is critical and additional vehicles/water are helpful but are only manned with a single person, look for staging opportunities to park resources and pair-up before engaging the fire.
- Installation of spray bars or remote nozzles may help the operator when there is only one person responding to an incident.
- When fires are difficult to suppress due to numerous factors such as low fuel moistures, high ERC, low RH, and high fuel loading, an indirect attack strategy may be necessary. (See pages 82-83 in your Incident Response Pocket Guide.)
- Evaluate the need for additional protection for critical components of your equipment (such as air lines and skid plates).
- Utilize information provided by aviation resources. Air Attack may be able to give you aerial observations on the fire.
- When possible, to help prevent fires starting in the cab, windows and doors in vehicles should be closed before engaging the fire.
- Complete inspections of equipment pre and post incident, looking for mechanical defects or damages.
- Share, educate and promote training on the importance of critical thresholds such as ERCs, live fuel moistures, and fuel loading.
- Consistent training and refreshers help firefighters when quick decisions need to be made.
- Review initial attack run cards and update run cards as severity changes, adding Air Tankers, Heavy Equipment, etc.
- Share, educate, and promote training. Review the Wildland Fire Lessons Learned Center's website which can be found at: <https://www.wildfirelessons.net/home>. A similar incident occurred in 2016

in Kansas. A “Rapid Lesson Sharing” report on this incident can be found at:
<https://www.wildfirelessons.net/viewdocument/engine-air-brake-failure-2016>.

- Ensure that all resources have pre-programmed radios with interagency Initial Attack communication plans.
- Utilize the national standard for resource identification (such as rooftop identification, call signs and designators). This may add to aviation resources being able to identify equipment.

6. Reference Information and Definitions

The Federal Excess Personal Property Program (FEPP)

The Federal Excess Personal Property (FEPP) program refers to U.S. Forest Service-owned property that is on loan to State Foresters for the purpose of wildland and rural firefighting. Most of the property originally belonged to the U.S. Department of Defense. Once acquired by the Forest Service, it is loaned to State Cooperators for firefighting purposes. The State Forester may then place it with local fire departments to improve these local fire programs. State Foresters and the Forest Service have mutually participated in the FEPP program since 1956.

Truck Differences: The “Deuce and a Half” vs the “5-Ton” – What’s the Difference?

The Deuce and a Half

The M35 2½-ton cargo truck “Deuce and a Half” (see photo on next page) is a long-lived 2½-ton 6x6 cargo truck initially used by the United States Army and subsequently utilized in the USDA FEPP Program. (More information about this vehicle can be found on the Wikipedia website at: https://en.wikipedia.org/wiki/2%C2%BD-ton_6x6_truck.)

The basic M35 cargo truck is rated to carry 5,000 pounds off-road or 10,000 pounds on roads. Trucks in this weight class are considered medium duty by the military and the U.S. Department of Transportation.

The drivetrain is manual transmission, 6-wheel drive and lacks power steering. In addition, tires were commonly not highway rated. The combination of these factors was found to be typically discouraging to inexperienced drivers. Nonetheless, this vehicle earned the reputation to be a very reliable platform.

The M35 brake system is an air-assisted-hydraulic 6-wheel drum brake with a driveline parking brake—although “glad-hands” exist on the rear of the vehicle for connection to trailers with full air service and emergency brakes.

Due to this brake system and a Gross Vehicle Weight Rating (GVWR) under 26,001 pounds, in most states the “Big Deuce” can be driven without a commercial driver’s license.

The 5-Ton

The M928A2 is a 5-ton 6x6 U.S. military heavy truck (see photo on next page) that is like the M35 in many ways. It is currently replacing many of the M35s in the USDA’s FEPP Program. The basic cargo versions were designed to transport 10,000 pounds of cargo load over all terrain in all weather.

The drivetrain is automatic transmission. The 6-wheel drive is air actuated and has power steering. In addition, the vehicle’s tires were commonly steel belted and highway rated. The newer components tend to be friendlier to the earlier users of the M35.

The M928A2 brake system is compressed air 6-wheel drum brakes with a driveline parking brake. This brake system and GVWR over 26,001 pounds requires a commercial driver’s license for interstate travel.

Figure 8 – A “Deuce and a Half”. Photo Credit: Wikipedia.



Figure 9 – A “5-Ton”. Photo Credit: Wikipedia.



Significant Difference

The significant difference between these two pieces of equipment is the extensive use of air systems in the newer M928A2. An air compressor feeds three separate air tanks and components that use this system in the 6-wheel drive, parking and braking systems. Air brakes are used on many wildland fire vehicles like Crew Carriers, Type 3 and 4 Engines. Many new contracts for fire engines are being specified to provide protection to these critical components.

Air brake systems require compressed air to work. If a loss of air occurs, the brakes will engage and the truck cannot be moved.

Conservation Reserve Program (CRP)

CRP is a national USDA program established in 1985. Farmers enroll in the CRP program by receiving an annual rental payment in exchange for taking environmentally-sensitive land out of agricultural production and planting permanent cover. Species planted are normally introduced, as well as native species of grasses, forbs, and shrubs.

Contracts for land enrolled in CRP typically last for 10 to 15 years. Many of these contracts have been renewed for an additional 10-year period.

With the program focusing on improving water quality, preventing soil erosion, and reducing the loss of wildlife habitat, farmers are not allowed to graze or hay CRP fields unless under emergency drought conditions.

CRP fields do receive maintenance (such as mechanical treatment) usually twice in the 10-year period, based on their conservation plan. Therefore, years of growth can occur and a large thatch layer of dead grass can accumulate, creating a high fuel load and an increased potential for wildfires.

Energy Release Component (ERC)

An “Energy Release Component (ERC)” definition is provided in the Incident Response Pocket Guide (IRPG) April 2018 edition. The ERC serves as a good characterization of local seasonal fire danger trends resulting from the area’s fuel moisture conditions. The ERC is a relative index and should be compared to historic trends and thresholds on the corresponding area’s pocket card. The ERC relies heavily on large and live fuels, has low variability, and is not affected by wind speed.

Burning Index

The “Burning Index (BI)” definition is provided in the Incident Response Pocket Guide (IRPG), April 2018 edition. The BI reflects the changes in fine fuel moisture content and wind speed and is highly variable day-to-day. The BI is more appropriate for short-term fire danger and can be loosely associated with flame length by dividing the BI by 10. The BI is readily affected by wind speed and fine fuel moisture.

Fuel Moistures

“Fuel Moisture” is the percentage of water content of vegetation. This is an important factor in predicting rate-of-spread—ranging from dead-fuel and fine-fuel moisture (FFM) of 10 percent or less, to live-fuel moisture (LFM) of 60 percent or more. FFM can be estimated by weighing calibrated wood sticks.

Advanced Live Fuel Moisture Example

The table below provides an example of live fuel moisture in sage with its corresponding expected fire behavior. The day of the North Eden Fire, live fuel moisture for sage was below 74 percent.

<i>Live Fuel Moisture</i>	<i>Expected Fire Behavior (Sage Only)</i>
> 181%	Very Low
151-180%	Low
126-150%	Moderate
101-125%	High
75-100%	Extreme
< 74%	Advanced

7. The FLA Team Members

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8. Appendix – Federal Excess Personal Property Equipment Alert

State of Utah
Forestry, Fire and State Lands



Federal Excess Personal Property Equipment Alert

August 23, 2018

FFSL-FEPP-EA-2018-01

Subject: A M923A2 Military 6X6 Truck "5 Ton" suffered a mechanical failure during suppression operations resulting in a catastrophic burn over.

Issue: A M923A2 Military 6X6 Truck "5 Ton" converted to a Wildland Fire Truck, acquired through the Federal Excess Personal Property Program (FEPP) was rendered inoperable while performing suppression operations resulting in a burn over. While performing suppression operations (mobile attack) from the green in 1' to 3' tall sage brush and grass, the operator experienced a sudden catastrophic failure of the air system rendering the equipment inoperable. The operator noted an increased heat in the cab while performing a short backing maneuver, the equipment's air brakes locked up shortly thereafter. Prior to escaping the running equipment the operator noticed the equipment's Low Air Warning System (Light and Alarm) was activated. Fire then impacted the equipment shortly thereafter, this resulted in a total loss of the equipment, and the exact cause of the failure is undetermined.

Recommended Action: Education of owners and operators that the newer 5 ton Military Vehicles are Air Controlled Systems, which are more susceptible to failure from heat and snagging hazards. This is very different from the M35 6X6 "Deuce & 1/2", which are hydraulically controlled. Continued examination of poly airlines and their condition is recommended. In addition it is recommended to inspect after each operational period. Owners and operators need to be situationally aware of the fuels driven through and possible heat/flame exposures. Shielding of the airlines with heat/flame resistant materials, relocation of airlines, or replacing with more durable and fire resistant braided lines is recommended.

Discussion: This notice applies to all FEPP Equipment, specifically the M900 Series Military Trucks, as well as those other variants that are in use in the Wildland Fire Environment. This notice should be distributed to all those who are responsible for the transfer, maintenance and operation of this equipment.

Additional Information: Recent Facilitative Learning Analysis FLA and Rapid Lesson Sharing RLS regarding this occurrence and others like it can be found at <https://wildfirelessons.net>

[Kansas-\(2016 Tall Grass Prairie National Preserve Rx\) RLS](#)

[USDA Federal Excess Personal Property Website](#)

For additional information, contact Muri Rawlins, FEPP Specialist at (801)560-7783 or murirawlins@utah.gov

