Rapid Lesson Sharing

Event Type: Missing Rear Stabilizer Engine Link Nut

Date: August 2, 2023

Location: Prescribed Fire on Private Ranch
Outside of Clarendon, Texas

Late evening firing ops with one of the affected engines holding the line.

Because this cab and chassis is widely used for Type 6 engines, superintendent trucks, and other fire-related vehicles, it was decided that this Rapid Lesson Sharing report be written to share this potentially important information with the wildland fire community.

***Success Story*:**
How They Discovered a Problem Before a Bad Outcome Occurred

Summary

On the same day, two engines with sequential VIN numbers experienced the loss of the same nut that connects the stabilizer link to the rear stabilizer bar. Damage was sustained to the threads on the lower end of the stabilizer link. No damage to the rest of the engine or injuries to any of the crewmembers were incurred. Thorough preventative maintenance checks by the most junior member of the engine crew resulted in an immediate recognition that something looked wrong with the undercarriage and led to the discovery of this problem before a bad outcome could occur.

The Story

Just after sunset on August 2, Western Fire Resources engines E323, E806, and E212 had just completed the fifth day of a six-day, 8,589-acre prescribed fire on a large private ranch in the Texas Panhandle. Temperatures had been in the low to mid 100s all week. The engine crewmembers were definitely feeling the effects of long days on the fireline in the oppressive heat. The ranch had provided dinner. Afterwards, crewmembers were milling around, calling loved ones, and readying their sleeping bags. That is when second-year firefighter, Noah Carter, made a very important discovery.

All three Type 6 engines were on 2022 RAM 5500 chassis. The pump packages for two of them, E323 and E806, were one-year-old U.S. Forest Service 643U specification Type 6 packages, built by BFX Fire Apparatus. The pump package for the other engine, E212, was a 2006 S&S Type 6 package, originally in service on a Bureau of Land Management engine in Yuma, Arizona before being installed on a new chassis in 2022.

The engines had been driven for several days on firelines consisting of two-track roads, dozer lines, and a notoriously wash-boarded county road. These engines are VIPR (Virtual Incident Procurement) resources that took on this project due to the relative slowness of the season.

Earlier that day, the head fire was completed on the larger of the two units (5,050 acres), on which engine personnel had previously completed blacklining the downwind sides over the last four days. The ranch owner is an experienced helicopter pilot and owns a sling-load plastic sphere dispenser and a helicopter. Therefore, on this day, engine crewmembers were employed primarily as holding resources.

During those first four days, these engine crewmembers had worked primarily on foot with miles of hand ignition and gridding for spot fires.

Also on this day, August 2, unexpected wind shifts—some terrain-influenced and some possibly due to the pulsing of the column—resulted in a fair number of small spot fires in the juniper duff that kept engine crewmembers busy. The ranch also has a bucket with which the ranch owner is also very experienced, allowing for an easier suppression of the largest spots. That said, cumulative fatigue, hunger, and a fair bit of dehydration was evident among all of the crewmembers by the end of shift.

Something was Not Right

After their dinner, at approximately 2030, as Noah was walking by his engine, E806, the light from his cell phone screen shined just at the right angle to illuminate the lower joint on the rear stabilizer link. Having done preventative maintenance checks dozens of times per the "Fire Engine Maintenance Procedure and Record," Noah was very familiar with how the undercarriage should appear.

Thus, even in this low-light situation—and as tired as Noah was—he quickly determined than something was not right.

Noah crawled under and found that the nut that normally fastens the stabilizer link to the rear stabilizer bar was missing. Furthermore, the threads on the lower end of the stabilizer link were damaged from the action of the link rubbing on the hole in the stabilizer bar once the nut fell off.

Next, Noah went to the other two engines and found that E212 was missing the same nut and also had damaged threads on the lower end of the link.

Analysis

- A missing nut on the stabilizer link can lead to the stabilizer link and the stabilizer bar separating. This can have a dramatic effect on the way an engine will handle, especially on wash-boarded roads or when tanks are half full of water and water shifts while making sharp or sudden turns.
- During upfit of a new chassis, upfitters often need to remove and reinstall factory fasteners. One of the affected engines was upfit in 2022 by BFX Fire Apparatus and the other was upfit at the same time in-house. Because we have first-hand knowledge of the upfitting process and know that this fastener *does not* need to be removed in the process (also confirmed by BFX), we concluded that the only time these nuts were torqued was during the original build at the factory.

Top Photo – Rear stabilizer link with missing nut and damaged threads.

Middle Photo – Rear stabilizer link with intact nut.

Bottom Photo – Beads of RTV silicone sealant that BFX Fire Apparatus places on any nut they install, designed to indicate when a nut is beginning to loosen.

- Considering that the same nuts on two trucks with sequential VIN numbers came loose on the same day—but neither nut was found loose during preventative maintenance checks that morning—seemed to be more than a coincidence.
- Because this cab and chassis is widely used for Type 6 engines, superintendent trucks, and other fire-related vehicles, it was decided that this Rapid Lesson Sharing report be written to share this potentially important information with the wildland fire community.

Had Noah not become very familiar with his engine by completing dozens of daily preventative maintenance checks with pride and thoroughness, it would have been very unlikely that he would have noticed that a single nut was missing underneath the engine as he was walking by in the dark.

Lessons

- It is often the least experienced members of an engine crew, or any crew for that matter, that have the clearest view of the small problems that often lead to major consequences. Empower people to seek responsibility early in their careers. Encourage them to do all tasks thoroughly, even the small ones.
- Detailed preventative maintenance checks are important, not only to identify potential problems like this, but also to familiarize engine crewmembers with what "Right" looks like. Performing these checks will help to ensure that when something is not right, it can be noticed immediately. Had Noah not become very familiar with his engine by completing dozens of daily preventative maintenance checks with pride and thoroughness, it would have been very unlikely that he would have noticed that a single nut was missing underneath the engine as he was walking by in the dark.
- This nut cannot be torqued to proper specifications with a standard torque wrench because the other end of the threaded rod is a ball in a socket, much like a tie rod. Therefore, there is no easy way to check if the nut is properly torqued. One way to check if the nut is beginning to back off is to put a line of RTV silicone sealant from the nut onto the threads. If the nut is loosening, the line of sealant will appear broken. This, however, will not guarantee that it will be noticed in time. It is believed that these two nuts both backed off in a single operational period after driving on wash-boarded roads.

This RLS was submitted by:

Derrick P. Holdstock
Owner and Engine Captain
Western Fire Resources, LLC
Canadian, Texas

Do you have a Rapid Lesson to share?
Click this button:

Share Your Lessons