

Rapid Lesson Sharing

Event Type: Engine Wheel Stud Failure

Date: April 14, 2026

Location: Washington & Jefferson National Forests, Virginia



Background

While in support of prescribed fire and fuels management activities on the George Washington & Jefferson National Forests (GWJ) in Virginia, a U.S. Wildland Fire Service (USWFS) Type-6 engine experienced a wheel stud failure. Due to the crew's situational awareness, the issue was detected before it could lead to a catastrophic outcome. The engine had been away from its home unit for 42 days, with its crews swapping out every two weeks. The crew, on the last day of their 14-day assignment, had originally planned to drive the engine back out west to their home unit the following day.

Narrative

The engine had just left the forest road and began traveling on the asphalt highway at about 50 mph when the crew noticed a slight shake and heard something—indicating a possible flat on an inside dual tire.

It sounded like “a loose tire hitting asphalt, almost like a bouncing,” the engine operator noted. He immediately pulled to the side of the highway, where a visual inspection of a rear tire revealed that two of the wheel studs were completely sheared. One was partially sheared and the remaining studs showed signs of additional wear. Although they did not have cell service, one crew member used a Starlink connection from his personal phone to call dispatch and have the engine towed to a service station.



Photo 1: *The wheel rim of a rear tire shows two missing lug nuts.*

Lessons Learned and Shared

- 1. The transition from forest to paved road is an important checkpoint.**
When transitioning from dirt or 4-wheel-drive roads to asphalt, operators should do a 360-degree visual inspection of the vehicle, paying special attention to undercarriage, wheels and tires, loose gear, and tools. Any broken, missing, or loose items can be mitigated prior to travel.
- 2. Detailed inspections are critical.**
Daily pre-use and post-incident inspections are an important part of the operational shift and will

determine if fire apparatus is fire-ready and safe to operate. Additionally, when an engine has been handed off from crew-to-crew, the operator does not necessarily know the vehicle's history. Each new crew should conduct a complete and thorough inspection using their organization's standard checklists.

3. Tire rims should be kept clean and freshly painted.

Fresh scratches or shiny metal around a lug nut usually indicate movement. Damage to the paint can reveal new wear by exposing bare metal underneath. Keeping wheel rims clean and freshly painted helps operators quickly identify any exposed metal near the lug nuts. If rims require repainting, they should be painted while mounted on the vehicle or the contact area where the lug nuts seat against the rim must be masked off. This prevents paint buildup that can compromise proper seating and potentially lead to wheel loosening, even when correct torque is applied. Overtightening of lug nuts is difficult to detect. Overtightening lug nuts on heavy-duty vehicles like wildland engines can damage wheel studs and lead to failure. While torque wrenches ensure proper tightening, damage from previous overtightening can only be identified through inspection and correct service practices.



Photo 2: Note the exposed metal around the tops of the lug nuts.

Important Note:

Simply “checking torque” without loosening and resetting can gradually increase clamping force over time. Each partial adjustment may add a small amount of additional torque, which can cumulatively result in overtightening and eventual stud failure. Always follow the full loosen-and-re-torque process using the correct sequence and specifications from the vehicle's owner manual.

4. Good situational awareness is crucial.

The outcome could have been much worse if the crew hadn't recognized the issue so quickly. Their swift response allowed them to catch the wheel stud failure before the wheel itself came loose. This engine operator noted that he had never experienced a wheel stud failure before. His detailed descriptions of the sound and feeling of the early stud failure can now help guide others.

For a summary of similar incidents and lessons going back to 2016, read this [Data Points](#) from June 2024.



Submitted by:
Keith Hackbarth
Jane Gordon
Elden Alexander

Do you have a Rapid Lesson to share?
(<https://lessons.wildfire.gov/submit-a-lesson>)

[Share Your
Lessons](#)