



PRELIMINARY REPORT

RAILROAD

DCA17MR007

The information in this report is preliminary and will be supplemented or corrected during the course of the investigation.

On March 10, 2017, at 12:50 a.m. central standard time, 20 cars of a Union Pacific (UP) unit train derailed. Fourteen of the cars released about 322,000 gallons of ethanol near Graettinger, Iowa, causing a fire. The breached cars were not retrofitted to meet the new US Department of Transportation (DOT) safety standards required by May 1, 2023.

The accident train contained three locomotives, 98 loaded tank cars, and two buffer cars; tank cars in positions 21 through 40 derailed near milepost 56.8 at a railroad bridge near Jack Creek, a tributary of the Des Moines River. There were no injuries and no mandatory evacuations; about 400 feet of track and a railroad bridge were destroyed. The National Transportation Safety Board (NTSB) Unmanned Aircraft System (UAS) was used to photograph and map the accident scene. More than 500 aerial images were recorded by the UAS. (See figure 1.)



Figure 1. Aerial view of accident (NTSB UAS).

The lead locomotive's event recorder data showed the train was traveling about 30 mph with the throttle operating between P2, P1, and idle moments before the derailment. Shortly after the locomotives and 20 cars crossed the bridge, there was an emergency application of the air brakes (without input from the crew). According to the event recorder, the emergency brake activated about 12:50 a.m.

While at the scene, investigators inspected the track, recovered the displaced rail for examination, inspected the tank cars and mechanical equipment, and collected design and inspection records for track and engineering. The NTSB investigators collected samples of the rail and removed the leading locomotive's outward-facing image recorder. NTSB personnel directed the shipment of the rail samples and the image recorder to the agency's laboratory in

Washington, DC, for analysis. Investigators interviewed the accident train's crew and the crew of the train that preceded the accident train through the area and obtained information from local emergency responders.

The NTSB formed the following technical investigative working groups:

- Operations
- Track and engineering
- Mechanical equipment
- Hazardous materials
- Emergency response

The accident occurred on a Class 3 single main track, which allows for a maximum operating speed of 40 mph for freight trains.¹ This was not a passenger train route. The UP restricted freight train movements to a maximum operating speed of 30 mph or lower on this track. Investigators recovered and reconstructed about 390 feet of the damaged rail and identified the manufacture dates and rail fracture characteristics. The UP had inspected the track the day before the accident and documented no rail defects.

Inspection of the non-derailed cars (1 through 20) revealed that several wheels on the engineer's side of the train exhibited fresh horizontal impact marks on the wheel tread (marks perpendicular to the wheel tread).

The accident train was a high-hazard flammable train.² The tank cars involved were manufactured to older DOT-111 specifications, commonly known as legacy DOT-111 tank cars. Investigators determined 11 of the derailed tank cars were breached from mechanical damage. When the tank cars were constructed, federal regulations did not require either thermal protection or puncture resistant systems for tank cars transporting flammable liquids. The NTSB has identified such tank cars as having a high probability of releasing hazardous materials in accidents and has recommended crashworthiness requirements to improve safety.³ The Pipeline and Hazardous Materials Safety Administration responded with new federal regulations for tank cars used in flammable materials service. Accordingly, tank cars used to transport ethanol must be constructed to new DOT-117 specifications, and existing tank cars must be either retrofitted or removed from service by May 1, 2023.⁴ Specification DOT-117 tank cars have thicker heads and shells, full head shields, jackets with thermal protection systems, top fittings with a protective housing, and a bottom outlet valve designed to remain closed in derailments.

¹ Title 49, *Code of Federal Regulations*, Part 213, Track Safety Standards.

² In accordance with final rules HM-251 and HM-251C, carriers operating high-hazard flammable trains must perform a routing analysis that considers a minimum of 27 safety and security factors and select a route based on the findings. Additional requirements such as speed restrictions and enhanced braking systems also apply.

³ NTSB, *Derailment of CN Freight Train U70691-18 With Subsequent Hazardous Materials Release and Fire, Cherry Valley, Illinois, June 19, 2009*, RAR-12/01; NTSB Safety Recommendations R-15-14 through R-15-17, April 3, 2015, following derailment of CSXT freight train, Mount Carbon, West Virginia, February 16, 2015.

⁴ Hazardous Materials: FAST Act Requirements for Flammable Liquids and Rail Tank Cars, *Federal Register* 81, no. 157 (August 15, 2016): 53935.