



National Transportation Safety Board
Railroad Accident Brief
Collision of Two Union Pacific Railroad Freight Trains
Texarkana, Texas

The Accident

On September 8, 2015, at 12:34 a.m. central daylight time, westbound Union Pacific Railroad (UP) freight train AMNML-07 (striking train) collided into the side of northbound UP freight train ALDAS-06 (struck train) near Texarkana, Texas.¹ (See figure 1.) The striking train was traveling west on the main track of the Pine Bluff Subdivision, and the struck train was traveling north on the Little Rock Subdivision. The trains collided at a diamond crossing (Texarkana Interlocking) of the two subdivisions.² Two locomotives of the striking train and seven cars (numbers 13–19) of the struck train derailed. The engineer and conductor of the striking train sustained minor injuries; neither crewmember in the struck train was injured. The lead locomotive of the striking train released about 4,000 gallons of diesel fuel. The locomotive event recorder data indicated the striking train was traveling at 19 mph when the engineer made an emergency brake application. At the time of the collision, the train had slowed to about 6 mph. The estimated damage was \$4.66 million. At the time of the accident, it was dark, the sky was clear, the visibility was 10 miles or more, and the temperature was 82°F.



Figure 1. Accident scene. (Photo courtesy of News Radio KEEL, Shreveport, Louisiana.)

¹ All times in this report are central daylight time.

² A *diamond crossing* is a railroad crossing in which the rails cross obliquely forming a diamond-shaped center.

Collision of Two Union Pacific Railroad Freight Trains

At milepost (MP) 419.1, a single main track and a siding track of the Pine Bluff Subdivision crosses the two main tracks of the Little Rock Subdivision MP 0.54. (See figure 2.) The maximum authorized train speed on the Pine Bluff Subdivision at the Texarkana Interlocking was 20 mph; the maximum authorized speed on the Little Rock Subdivision was 30 mph.

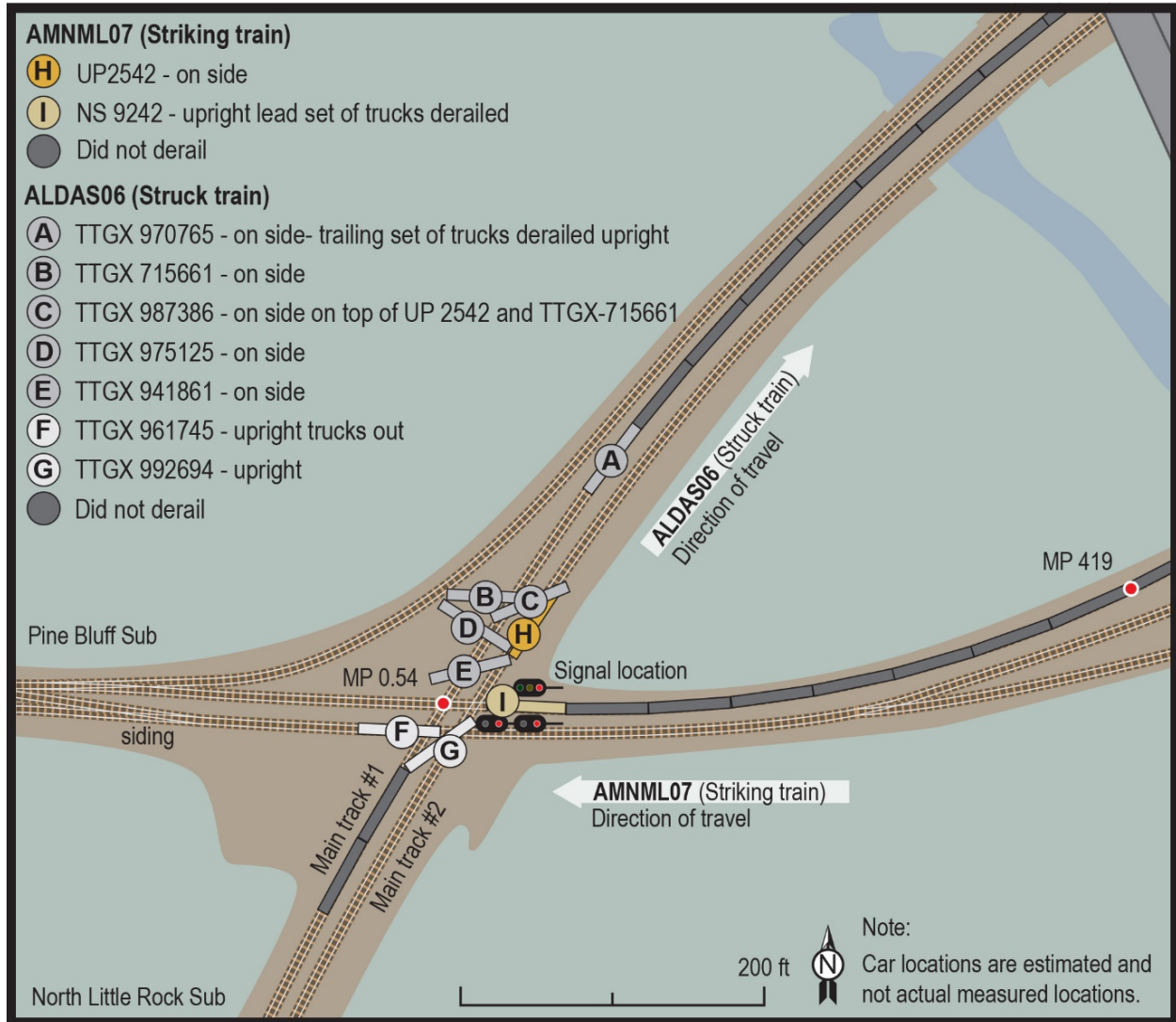


Figure 2. Accident diagram.

Investigative Factors

Railroad Operations

UP operating rules, the timetable instructions, and the traffic control system (signal indications) govern train movements on both subdivisions. The Pine Bluff Subdivision extends from MP 266.4 in Pine Bluff, Arkansas, to MP 525.1 in Big Sandy, Texas, in a timetable east-west direction. The maximum authorized speed on the subdivision was 70 mph for freight trains. The Little Rock Subdivision extends from MP 343.6 in North Little Rock, Arkansas, to MP 89.6 in Longview, Texas, in a timetable north-south direction. The maximum authorized speed on that subdivision was 70 mph for freight trains and 75 mph for passenger trains.

Collision of Two Union Pacific Railroad Freight Trains

Westbound Train AMNML-07 (Striking Train)

The crew of the striking train consisted of a locomotive engineer and a conductor. They went on duty on September 7, 2015, at 6:50 p.m. at the UP Pine Bluff yard in Pine Bluff. Both crewmembers had more than 24 hours of off-duty time prior to reporting for duty. The engineer and conductor said that they conducted a job briefing, which included a review of their track warrants, train profile, and speed restrictions for their train movement.

The striking train departed the Pine Bluff yard with three locomotives (two in the lead and one at the rear of the train) and 67 auto-rack cars. The train was a through train; no cars were to be switched during the trip. The engineer initialized the trip optimizer on the lead locomotive at the beginning of the trip.³

The event recorder data indicated the trip optimizer had electronically placed the throttle into idle and activated dynamic braking at 12:27:01 a.m. (about 7 minutes before the collision). The train remained in dynamic braking until an engineer-induced emergency occurred at 12:34:21 a.m. The striking train was traveling about 30 mph as it approached a clear signal at (MP 416.35).⁴ The train crew had an approach signal at MP 417.41; the train was traveling about 28 mph.⁵ (See figure 3.) The event recorder data show that as the striking train approached the Pinehurst Street highway-rail grade crossing (adjacent to the intermediate signal at MP 417.41), the horn was not activated on the lead locomotive. The train passed another highway-rail grade crossing at MP 417.55; the locomotive horn was sounded after the train entered the crossing.

³ A trip optimizer is an intelligent, fuel-saving cruise control for a locomotive that optimizes fuel consumption based on a specific train's make up and the route traveled. The system calculates the optimum speed profile by considering factors like train length, weight, track profile, and then automatically controls throttle and dynamic brake according to the plan to provide smooth operation while keeping the train on schedule and minimizing fuel use.

⁴ The Union Pacific System Special Instructions defines a wayside signal with the aspect of green over red as *Clear* in UP rule 9.2.1. The indication of a *clear* signal is *proceed*.

⁵ The Union Pacific System Special Instructions defines a wayside signal with the aspect of yellow as *approach* in UP rule 9.2.6. The indication of an *approach* signal is proceed prepared to stop before any part of train or engine passes the next signal. Freight trains exceeding 30 mph must immediately reduce to 30 mph. Passenger trains exceeding 40 mph must immediately reduce to 40 mph. When the next signal is seen to display a proceed indication, the requirement to proceed prepared to stop no longer applies. Speed may be resumed after the leading wheels of the train have passed the signal.

Collision of Two Union Pacific Railroad Freight Trains



Figure 3. Approach signal.

When the train passed the *intermediate* signal at MP 417.41, the crew was required by the UP rule to operate under Cab Red Zone (CRZ) conditions.⁶ Under CRZ conditions, the conductor must record on a form the train's location by the MP, the signal indication, and the time. The last entry the conductor made on his form was at MP 408.8 at 12:18 a.m.

The train passed Texarkana yard on the south side of the siding track and approached the stop signal at Texarkana Interlocking. The striking train approached the interlocking in a 6-degree right-hand curve. The event recorder showed that the engineer placed the striking train into an emergency brake application at 12:34:12 a.m. The forward-facing video shows the view at 12:34:15 a.m. of the red aspect of the positive stop signal and the soon-to-be struck train traversing the interlocking northbound.

As the striking train was slowing, it struck the northbound train at about 6 mph. (See figure 4.) After the impact, the lead locomotive turned over on its side. The engineer and conductor of the struck train helped the crew of the striking train to exit their damaged locomotive. Emergency personnel transported the engineer and conductor of the striking train to a local hospital. They were treated for minor injuries and released.

⁶ UP rule 1.47.1, *Cab Red Zone*, requires crewmembers to create and operate in an environment in the controlling locomotive that focuses exclusively on controlling the train, verbally communicating restrictions and proper application of rules.

Collision of Two Union Pacific Railroad Freight Trains



Figure 4. Train AMNML-07 (striking train) approaching the occupied interlocking.

The engineer of the striking train told investigators that after observing and calling the clear signal at control point (CP) 416, “everything went blank.” He added “about 15 or 20 seconds before the impact my senses come back and I saw the red [signal].” He said he heard the conductor say that there was a red signal. After he saw a train, he placed his train in emergency and got behind the control stand to brace for impact.

The engineer and conductor said that they did not recall seeing the approach signal indication at MP 417.41. The engineer was unable to state whether he had either fallen asleep or blacked out. When questioned as to the activities of the conductor before CP 416, the engineer recalled that the conductor was sitting in his chair opposite him with a dim light on. He added that he did not notice whether the conductor was either sleeping or struggling to stay awake. The conductor told investigators he had been speaking with the engineer about “random stuff,” and that they had a “good sense of teamwork.” The conductor recalled coming into the interlocking on a clear signal and that everything was normal. He continued, “I saw a red signal and I said, ‘red, red.’ The train was put in emergency, and that’s all I remember.” The conductor’s last entry in the conductor logbook was when the train was at MP 408.9. The conductor’s logbook did not show an entry noting the approach signal indication at MP 417.31, nor did it show that the crew was under CRZ as required in UP General Code of Operating Rules 1.4.74.

Northbound Train ALDAS-06 (Struck Train)

The crew of the struck train consisted of a locomotive engineer and a conductor. The crew reported for duty on September 7, 2015, at 8:45 p.m. at the UP Little Rock yard in Little Rock, Arkansas. The engineer and conductor had a job briefing, which included reviewing track warrants and speed restrictions that applied to the movement of their train. The train departed the Little Rock yard with two locomotives and 70 freight cars. The train crew received a clear northbound signal at the Texarkana Interlocking.

Collision of Two Union Pacific Railroad Freight Trains

The northbound train crew said that they were traversing the Texarkana Interlocking when they saw the headlight of the approaching (striking) train. They discussed whether the approaching train was traveling too fast to stop at the interlocking. A few moments later, the approaching train struck their train. The train crew of the struck train was not injured.

Medical Review

The engineer of the striking train had mild amblyopia (a reduction in the acuity of his visual ability to focus, which was caused by abnormal visual system development in early life). Additionally, he had a 15-year history of Bell's palsy resulting in facial muscle weakness and an inability to completely close his right eye. This inability likely resulted in dry eye. Four days prior to the accident, his recorded distant visual acuity was 20/100 (a disqualifying condition). However, subsequent testing by an ophthalmologist (about 1 month after the accident), recorded his uncorrected vision in his right eye as 20/30, which is in compliance with the Federal Railroad Administration (FRA) standards. Additionally, the engineer had no deficits in either his color vision or his field of vision. Since the engineer had a longstanding mild decrease in vision in his right eye, he likely relied more on his left eye, which was within standard. This condition had remained unchanged over time. The engineer's mild amblyopia and slightly decreased right-eye vision should have not impaired his ability to see and interpret the colored-light signals.

The striking train's conductor tested positive for diphenhydramine in his urine, but not in his blood. The FRA reporting cutoff for diphenhydramine in blood is 50 ng/ml; however, the therapeutic and impairing levels range from 25.0 to 112.0 ng/ml. Additionally, the half-life of diphenhydramine ranges from 3 to 14 hours. The investigation was unable to estimate the drug's blood level at the time of the accident, because of (1) the diphenhydramine's half-life variability, (2) the 4 1/2 hours between the accident and the blood collection, and (3) the FRA's reporting cutoff. Therefore, the investigation was unable to determine if the diphenhydramine impaired the conductor at the time of the accident. Specimens for toxicological testing were obtained from the two crewmembers of the struck train. Their test results were negative for alcohol and tested-for drugs.

Cell Phones

The cell phone records for each crew member were examined.⁷ The records showed no activity for either crewmember of the striking train just before or at the time of the accident. The last phone activity for a crew member of the striking train was an incoming call recorded on September 7, 2015, at 6:45 p.m. The last call for either member of the struck train occurred on September 7, 2015, at 8:27 p.m.

Mechanical Systems

Review of the preaccident mechanical inspections on both trains did not reveal anything unusual. The preaccident inspections consisted of a Class I Air Brake Test and a Pre-Departure Inspection as required by Title 49 *Code of Federal Regulations* Parts 232 and 215. Qualified personnel performed the prescribed tests, and the required documentation was maintained. Postaccident inspections of the derailed equipment did not disclose any defective condition that

⁷ Activity related to data usage is not necessarily indicative of user interaction with the phone, because smartphones may engage in background activities not initiated by the user. Furthermore, incoming text messages may not be indicative of user interaction with the phone, because text messages may be received but not read.

Collision of Two Union Pacific Railroad Freight Trains

would have contributed to the accident. The postaccident air brake tests revealed that the brake systems of both trains performed as designed.

Signal System

The UP signal system was displaying the proper signal sequence for train movements on the Pine Bluff Subdivision, the Little Rock Subdivision, and the Texarkana Interlocking. The wayside signals were adequately spaced to allow trains traveling at authorized speeds to operate and to stop in accordance with the displayed signal aspects. The testing of the color light and searchlight signal units determined the signal lamps and roundels were not damaged and were operating properly. The signal lamps, when energized, were adequate for proper signal visibility and aspect recognition. The signal inspection and maintenance records did not indicate any deficiencies that would have affected the operation of the signal system. The investigation did not identify any physical obstructions that would affect a train crew's preview of the applicable signals. Hence, the UP signal system functioned as designed.

Positive Train Control

The UP's Positive Train Control (PTC) Implementation Plan, which was approved by the FRA, stipulates that a PTC system will be placed into service on both the Little Rock and the Pine Bluff subdivisions during the fourth quarter of 2017. Although UP installed signal and telecommunication equipment at the Texarkana Interlocking in January 2013 in preparation for PTC, the equipment was not activated at the time of the accident. UP is deploying the Interoperable Electronic Train Management System (I-ETMS) as its PTC technology. The equipment at each signal location continuously transmits the state of the signals and the switches at that location to the PTC onboard system of any approaching PTC-equipped trains by radio. The onboard PTC system continuously evaluates the train's speed, predicted braking characteristics, track characteristics, and proximity to the location of any signal that requires either a stop or a reduced speed. Between 60 and 75 seconds prior to the time a full-service brake application would be required to stop the train short of a stop signal, the on-board PTC system would provide a visual and audible warning to the engineer of an impending PTC penalty brake application. If the engineer does not either reduce the train's speed or otherwise control the train in a manner sufficient to allow a stop that is short of the signal, a full-service penalty brake application would occur. This penalty application is neither suppressible nor releasable until the train stops. A PTC system of this type could have prevented this accident.

Fatigue

The accident occurred at 12:34 a.m., which is a point in the human circadian rhythm when the human body naturally sleeps. The time between about midnight and about 6:00 a.m. is when the human body rests to restore its capabilities for normal physical and cognitive performance. This time period is known as a circadian low point. When a person does not sleep during this period, it causes circadian rhythm disruption, which can lead to human fatigue. Human fatigue degrades task performance, resulting in longer reaction times, memory problems, poor decision-making, workload shedding, inefficient information processing, excessive sleepiness, and difficulties staying awake.

The crew of the striking train demonstrated several behaviors consistent fatigue-induced performance degradation and disengagement from the task of operating the train. The crew failed to take action to slow and stop their train before the red signal at the interlocking. They failed to

Collision of Two Union Pacific Railroad Freight Trains

blow the horn as the train approached one highway-rail crossing, and they were late in blowing the horn at a subsequent highway-rail crossing. The conductor failed to make entries into his logbook, despite having entered CRZ territory. The UP crewmembers could not provide the NTSB investigators with detailed recollections of their transit from about MP 417 until immediately before the collision, when the conductor announced “red, red, red.” Therefore, the NTSB believes that both UP crewmembers experienced independent fatigue-induced disengagement that caused them to fall asleep while operating the train.

UP Postaccident Action

As of July 12, 2017, the UP’s Health and Medical Services is implementing process improvements to assist in preventing an employee from performing safety sensitive work after any exam component of an FRA Hearing and/or Vision Certification Examination is not passed. The process improvements are expected to be in place within 60 days. In connection with the circumstances surrounding the railroad’s handling of the transportation employee’s vision examination results, the UP plans to implement the following process improvements:

(1) the UP is modifying its FRA exam protocol to require an employee to immediately notify UP’s Crew Management System (CMS) when the employee is informed by the third-party clinic or on-site Occupational Health Nurse (OHN) that the employee did not pass any component, or requires additional review, of the FRA Certification Exam. The employee will be prevented from performing safety sensitive work for the carrier until clearance by Health and Medical; and

(2) the UP is requiring its vendor to follow up with the third-party clinics that performed the FRA Hearing and/or Vision Certification Exams to ensure that the written results of the examination are immediately provided by the third-party clinic to the vendor by facsimile or electronically. Upon receipt of the examination results from the third-party clinic, the vendor will check for quality assurance and review the results. If any component of the exam is not passed or requires additional review, then the vendor will defer the results and immediately forward the exam results to UP’s Fit for Duty (FFD) Nurse. The deferred examination results from the vendor or on-site OHN are queued for the FFD nurse’s review. Upon review, the FFD nurse immediately notifies CMS that the employee requires further review and to update their status to “pending physical” to prevent the employee from performing any safety sensitive duties.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the westbound train crewmembers to respond to the wayside signal indications that required them to slow and to stop the train prior to the Texarkana Interlocking, because they were likely asleep. Contributing to the accident was the lack of a functioning positive train control system.

For more details about this accident, visit the [NTSB Docket](#) and search for NTSB accident identification number DCA15FR014.

Collision of Two Union Pacific Railroad Freight Trains

Issued: October 12, 2017

The NTSB has authority to investigate and establish the facts, circumstances, and cause or probable cause of a railroad accident in which there is a fatality or substantial property damage, or that involves a passenger train. (49 *United States Code* Section 1131 - *General authority*)

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person.” 49 *Code of Federal Regulations*, Section 831.4. Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. 49 *United States Code* Section 1154(b).
