National Transportation Safety Board

Railroad Accident Brief

Collision of Two Union Pacific Railroad Freight Trains

Accident No.:	DCA14FR012
Location:	Galva, Kansas
Date:	September 25, 2014
Time:	5:44 a.m. central daylight time
Train 1:	Eastbound train ILXG4X-22 (UP 8572 East)
Train 2:	Westbound train KG4GSX-23 (UP 8120 West)
Railroad:	Union Pacific Railroad
Property Damage:	$3,156,000
Injuries:	2
Fatalities:	0
Type of Accident:	Collision of two freight trains

The Accident

On September 25, 2014, at about 5:44 a.m., eastbound Union Pacific Railroad (UP) train ILXG4X-22, collided with the side of westbound UP train KG4GSX-23 near Galva, Kansas.[1] (See figure 1.) The westbound train was entering a siding, but it had not cleared the main track when it was struck by the eastbound train.[2] Five multi-platform intermodal cars derailed from the westbound train. Two locomotive units and four multi-platform intermodal cars derailed from the eastbound train.[3] The UP estimated about 200 gallons of diesel fuel leaked from the fuel tank of one of the derailed locomotives. No crewmembers on either train were seriously injured. No fire resulted from the collision.

The collision occurred at the clearance point where the UP single main track approached the east switch at the Galva siding at milepost (MP) 207.67, located at latitude 38°23'4'' and longitude -97°28'9". (See figure 2.)

The eastbound train originated in Los Angeles, California, with a final destination of Chicago, Illinois. It included two head end locomotives (UP 8572 and UP 3904) and one distributed power locomotive (UP 7726) on the rear of the train. The train had 34 intermodal cars loaded with containers.

The westbound train originated in Chicago with a final destination of Los Angeles. It was comprised of three locomotives (UP 8120, UP 8065, and UP 7422) and one distributed power locomotive (UP 8142) on the rear of the train. The train had 49 loaded, intermodal cars.

[1] All times in this report are central daylight time.

[2] A siding is a track auxillary to the main track for meeting or passing trains.

[3] An intermodal car is a railcar designed specifically for handling trailers, containers, or both. Intermodal cars may be long flatcars with collapsible trailer hitches or shorter, lightweight platforms with rigid hitches for use at mechanized terminals. Some new designs are articulated and have as many as 10 platforms connected to form one car.

The trains were on the UP Herrington Subdivision of the Salina Service Unit that ran between the Herrington yard limits at MP 171.4 and control point (CP) Pratt at CP 298. The subdivision extended from Herrington, Kansas, to Pratt, Kansas. Through this subdivision, the UP operated trains on a single main track, which was signaled for both directions with multiple sidings. The track MP numbering decreased going eastward, and the track was geographically aligned in an east- west direction.

On the Herrington Subdivision, train movements were governed by operating rules, timetable instructions, general orders and bulletins. [4] The UP Herrington dispatcher in Omaha, Nebraska, coordinated train movements with the signal indications of a traffic control system, except between CP 210 and CP 248 where train movements were coordinated by the dispatcher using track warrants and the signal indications of an absolute block system.

Figure 1. Accident scene.

[4] UP *General Code of Operating Rules* (I), 6th edition, effective April 7, 2010.
UP Salina Division Timetable No. 5, effective December 16, 2013.
The general order in effect was the Herington Subdivision General Order No. 7, effective December 16, 2013.

Figure 2. Accident location.

At the time of the collision, it was dark. The National Weather Service reported the sky was clear; it was 61˚ F with southerly winds of 6.9 miles per hour (mph).

The maximum authorized timetable speed for freight trains on the main track was 70 mph at the accident location. The timetable speed for freight trains operating on the Galva passing siding was 30 mph.

Between MP 214 and 206, the main track was straight with slight grade undulations. The siding extended between the switches at MP 209.62 and 207.63 and was parallel to the main track on a 20-foot track center line on the same grade. On average, 17 freight trains operated on the UP Herrington Subdivision each day for a total of 37 million gross tons.

The Investigation

Personnel Information

The locomotive engineer of the eastbound train was hired on May 5, 2008. UP records indicated his engineer certification was dated July 11, 2012. The conductor was hired on May 5, 2014. UP records indicated his conductor certification was dated September 1, 2014.

The locomotive engineer of the westbound train was hired on January 7, 2008. UP records indicated his engineer certification was dated July 17, 2014. The conductor was hired on May 5, 2014. UP records indicated his conductor certification was dated August 1, 2014.

None of the crewmembers on either train reported taking any prescription or non-prescription medications, suffering from any chronic medical conditions, or being diagnosed with a sleep disorder. All reported normal vision and hearing. All indicated feeling alert at the time of the accident.

In accordance with federal regulations, following the accident, specimens taken from the crewmembers involved in the accident were tested for the presence of illicit drugs and alcohol. The results were negative for all four crewmembers.

Mechanical Equipment Information

UP train documents indicated a Class I brake test, initial terminal inspection, was performed at 4:40 p.m. on September 23, 2014, on the cars of the eastbound train in Santa Teresa, New Mexico. The lead locomotive was equipped with a crash-hardened event recorder and a forward-facing video recorder.

UP train documents indicated an initial terminal inspection was performed at 10:20 a.m. on September 24, 2014, on the cars of the westbound train in Chicago. The lead locomotive was equipped with a crash-hardened event recorder and a forward-facing video recorder.

Data from the locomotive event recorders and the forward-facing video recorders indicated the eastbound train was traveling on the main track and passed the front of the westbound train, which was still moving onto the siding. The signal at the east end of the main track (CP 208) was displaying a red aspect or “stop” indication while the signal beyond that (CP 207) was displaying a green aspect or “proceed” indication. Event recorder data indicated the engineer of the eastbound train advanced the throttle and increased the speed of the train as it continued past the westbound train. However, the end of the westbound train was still on the main track as the eastbound train passed, causing the eastbound train to collide with the side of the westbound train at the east end of the Galva siding.

A postaccident examination of the mechanical equipment of both trains did not identify any mechanical conditions as having contributed to the accident.

Signal and Train Control Information

The investigation determined that the UP had recently constructed an industrial track loop near Canton, Kansas, located about 6,200 feet to the east of the Galva siding (CP 208). The industry track connected to the Herrington Subdivision main track at MP 207, and a new signal CP was installed at that location. A power-operated switch machine and signals equipped with light-

emitting diode (LED) light units were installed at CP 207 to coordinate train movements. The new signal installation was completed and tested in accordance with the recommended industry standards for the design, installation, testing, and maintenance of railroad signal and train control systems, which were maintained by the American Railway Engineering and Maintenance-of-Way Association.

On September 22, 2014, CP 207 was placed into service. The signals at CP 208 and CP 210 were equipped with incandescent lamps, and those signals were not changed.[5]

The postaccident signal examination did not find any defects, and the signal system or the associated signal equipment functioned as designed. Maintenance, inspection, and test records were reviewed and were found to be in accordance with FRA requirements.

The investigation determined that all mandatory operational signal tests were performed as required when CP 207 was installed and placed into service. However, the UP did not conduct a hazard analysis that included testing signal visibility (conspicuity) with input from train crews after changing the configuration of a critical railroad system.

Postaccident Interviews

Postaccident interviews by NTSB investigators determined the UP dispatcher had planned to route the westbound train into the Galva siding and have the eastbound train stay on the main track so they could pass each other. The dispatcher requested a westbound route into the siding and an eastbound route on the main track. The computer-aided dispatch (CAD) system stacked the requests, and the eastbound train should have stopped at the red signal until the entire westbound train was in the siding.[6]

Both train crews described their trips as uneventful until the time of the accident. As the eastbound train traveled toward the advanced approach signal at CP 212, the crew observed it was a flashing yellow aspect.[7] The eastbound locomotive engineer then slowed the train and observed the next signal at CP 210, which was displaying a solid yellow aspect over a mile away.[8] Before the eastbound train passed the signal, the conductor communicated with the westbound train, telling the crew their locomotive unit number and that the eastbound train would be stopping on the main track at Galva. The westbound crew repeated this information back to the eastbound crew.

The eastbound train passed CP 210 while traveling about 35 mph. After passing CP 210, the crew observed the westbound train (about three quarters of a mile away) already proceeding into the siding. The crew of the eastbound train stated they dimmed the train's headlight and soon passed the head end of the westbound train, and saw the westbound train's headlights dim. The eastbound locomotive engineer estimated that the westbound train was two-thirds of the way into

[5] CP 208 and CP 210 were the control points at each end of the Galva Siding

[6] A stacked request would automatically send the signal code for the next intended signal when the opposing train had cleared the signal circuit.

[7] A flashing yellow aspect requires that the train speed be reduced to 40 mph before passing and be prepared to pass the next signal at no more that 30 mph.

[8] A solid yellow aspect requires that the train speed be reduced to 30 mph before passing and be prepared to stop at the next signal.

the siding at this time. The eastbound locomotive engineer reduced the throttle to reduce speed below 30 mph after passing the signal in preparation to stop at CP 208.

After passing the head end of the westbound train and turning on the headlights, the locomotive engineer and conductor of the eastbound train said they observed a green (proceed) signal at CP 208 and communicated that to each other. The engineer said, "It was bright. It was clear." The engineer then increased the throttle to increase speed; however, the CP 208 signal was actually red (stop).

The eastbound train continued and the locomotive engineer told investigators he did not think about the signal anymore. Soon afterward, they observed the rear of the westbound train still traveling into the siding. Both he and the conductor confirmed the train was still pulling into the siding and the locomotive engineer and the conductor both applied the emergency brake. The engineer braced himself against the back wall, while the conductor got below his desk. The eastbound train collided with the westbound train and derailed. The eastbound crew was tossed to the side of the cab. After the train came to rest, the eastbound crew left the train. The locomotive engineer stated he grabbed his cell phone from his bag, and the conductor grabbed the portable radio. The conductor contacted the train dispatcher and the westbound train to inform them of the collision. The engineer called and notified a UP official of the accident.

Signal Conspicuity and Recognition

On September 27, 2014, signal conspicuity and recognition observations of the wayside signals in the vicinity of the accident location were conducted by NTSB investigators. The environmental conditions were similar to those on the day of the accident. The purpose of the observation was to determine the optimal distance where signals located at CP 212, CP 210, CP 208, and CP 207 could correctly be identified by an operating crew. The locomotive used for NTSB's postaccident observation was operated by an experienced UP locomotive engineer and conductor who were both qualified to operate over the territory. The crew had not operated an eastbound train since the signal at CP 207 had become operational.

As the eastbound train used in NTSB's postaccident observation approached the signal at CP 212, the crew saw a flashing yellow aspect. As the train continued east, the crew saw a yellow aspect at CP 210. Between CP 212 and 210, they observed a red aspect ahead. Initially, the crew concluded that the red aspect originated from the signal at CP 208. After additional observations of the signals at CP 207 and 208, the crew conducting the observations concluded that the red aspect originated from the signal at CP 207. The crew also concluded that they could not distinguish the red aspect at the signal at CP 208 from the red aspect at the signal at CP 207.

As the train in the NTSB observation passed the signal at CP 210, the signal aspect for the signal at CP 207 changed from red to green (as it was on the day of the accident), while the signal aspect at CP 208 remained red. As a result, the crew could only see the visually dominant LED green signal because it was masking the weaker incandescent red signal. The train continued to travel east, and, after several seconds, the crew saw a red aspect that had just become visible to them; however, the observations demonstrated the crew could not have determined the source of the red aspect—whether it was from a wayside train signal, highway-rail grade crossing warning system, or a highway traffic signal. As the train traveled farther east, the crew began to discern

that the red aspect was not part of the grade crossing warning system that was located near CP 208. Shortly afterward, the crew recognized the red signal was from the signal at CP 208.

Postaccident Actions

Following the accident, the UP implemented blocking devices on the approach signals in both directions at CP 208. These blocking devices prevented train dispatchers from using the computer-aided dispatch system to automatically line (stack) a route for a train.

The UP also reviewed other locations on its system where similar conditions existed with both LED signal lamps and incandescent signal lamps located in proximity to each other. As a result, the UP enacted new train dispatcher operating procedures that addressed similar signal conditions. Specifically, permanent blocking devices were placed onto signal controls, and special instructions were developed for those specific locations.

At the accident site, the UP changed the incandescent signal at CP 208 to an LED light unit and used a higher mast to raise the signal head, enhancing a train crew's ability to see the signal and determine its sequence in relation to the subsequent signal. The UP also realigned the existing LED signal at CP 207 to limit the range of visibility. In addition, the UP reviewed other signal locations with signal block spacing of less than 10,000 feet and where LED and incandescent signals were used.

On January 2, 2015, the NTSB issued *Safety Alert—Railroad Signal Visibility (Conspicuity)*.[9] The safety alert notified railroads to be aware that LED signals may mask signal aspects being displayed from incandescent signals.

Following the accident, UP suspended the crew of the eastbound train pending an investigation. After the NTSB's signal conspicuity observations identified a signal aspect recognition problem, UP decided not to pursue disciplinary action against the crew of the eastbound train. The train crew was returned to service by the UP, and their certification was not impacted.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the green LED signal at CP 207 masking the red signal aspect at the east end of the Galva siding at CP 208, resulting in the crew of eastbound train ILXG4X-22 passing the red stop signal and colliding with westbound train KG4GSX-23. Contributing to the accident was the Union Pacific Railroad's failure to conduct a risk assessment of the new control point installation at CP 207.

[9] SA-038, December 2014 (www.ntsb.gov/safety/safety-alerts).

For more details about this accident, visit www.ntsb.gov/investigations/dms/html, and search for NTSB accident ID DCA14FR012.

Adopted: December 9, 2015

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 U.S. Code § 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).
