



National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.: DCA-04-MR-003
Location: Kelso, Washington
Date: November 15, 2003
Time: 7:40 a.m. Pacific standard time¹
Railroads: Burlington Northern Santa Fe Railway Company and
Union Pacific Railroad
Property Damage: \$2.7 million
Injuries: 2
Fatalities: None
Type of Accident: Side collision

Synopsis

About 7:40 a.m. on Saturday, November 15, 2003, Union Pacific Railroad (UP) northbound train UGLSE-14, consisting of 3 locomotives and 90 empty cars, struck southbound Burlington Northern Santa Fe Railway Company (BNSF) train UINBR001-14, consisting of 3 locomotives and 32 loaded cars. The BNSF train was struck about seven container platforms behind the locomotives, resulting in five derailed cars. The striking UP train had all 3 locomotives and 15 of its cars derail as a result of the collision. Both members of the UP crew were seriously injured. The two BNSF crewmembers did not sustain any injuries. The railroad in the area of the accident is owned by BNSF and is used jointly by BNSF and UP. The accident occurred at milepost (MP) 102.7 at the interlocking of Longview Junction South, near Kelso, Washington. About 2,800 gallons of fuel were released from the ruptured fuel tanks of the UP locomotives. A nearby train crew extinguished a minor fire. Weather conditions were overcast with light rain and a temperature of 44° Fahrenheit. Estimated damages were \$2.7 million.

The Accident

This accident occurred on BNSF's Northwest Division, Seattle Subdivision, at MP 102.7, Longview Junction South. The track is owned and operated by BNSF.

The maximum timetable speed for trains operating in the vicinity of the accident was 60 mph for freight trains and 79 mph for passenger trains. Train movements on the main tracks were governed by wayside signal indications as part of a centralized traffic control

¹ All times in this brief are Pacific standard time.

system controlled by the BNSF train dispatcher located at the Network Operations Center in Fort Worth, Texas.

The UP train and engine crewmembers involved in the accident boarded their train in Champ, Oregon, after having gone on duty at Albina yard in Portland, Oregon, at 1:00 a.m. on November 15, 2003. UP train UGLSE-14 departed Champ at 6:15 a.m. en route to Argo, Washington, a distance of 141 miles. BNSF train UINBR001-14 departed Interbay yard in Seattle, Washington, at 11:40 p.m. on November 14, 2003, en route to Roosevelt, Washington, a distance of approximately 181 miles. Before departure, both trains were given a Class I air brake test and predeparture equipment inspections. Both train crews were qualified on the territory and had the required time off duty as specified by the hours-of-service regulations. Neither the BNSF nor the UP train crews had reported any operating difficulties or physical problems prior to the accident. At the time of the collision, the weather was cold with light rain. Visibility was clear.

The UP train entered the BNSF territory at North Portland Junction in the Vancouver Terminal dispatching district and remained in that district until transferred to the Centralia South dispatcher. The Centralia South train dispatcher told investigators that he never had any radio conversation with the crew on UGLSE-14. He explained that the Vancouver dispatcher had issued the UP crew its train's paperwork and operating authorities, and that he did not need to talk to the crew before the accident occurred.

The northbound UP train passed the approach signal for the interlocking at Longview Junction South about 7:38 a.m., moving at 46 mph. The event recorder indicated that the train gained speed to 49 mph at the point of collision at Longview Junction South. The collision occurred as the BNSF train was proceeding through the crossover from the No. 1 main track to the No. 2 main track. After the accident, the event recorders on the BNSF locomotives confirmed that the train was moving about 31 mph as indicated by the crew.

The BNSF engineer told investigators that after the head-end of his train had passed through the crossover, he noticed the opposing UP train was traveling fast on the No. 2 main track. Initially, he thought that the UP train was only *lite power*² or a short consist of locomotives with a few cars. When he saw it was a train, he told investigators that he knew that the UP train was going too fast to stop clear of the interlocking. The BNSF conductor told investigators that when the two trains were about to pass each other, he turned around and looked at the interlocking signal for the No. 2 main track behind him. He saw that the signal was displaying a stop indication and knew the UP train was not going to stop. The conductor stated that he did not detect motion in the cab of the opposing train.

According to the UP engineer, he activated the emergency brake and applied the independent brake just prior to impact. The UP conductor stated that he did not remember seeing the signal at Longview Junction South, but remembers jumping to the floor of the locomotive just before impact.

² *Lite power* is one or more locomotives without cars.

During National Transportation Safety Board interviews, the UP engineer told investigators that he thought that the approach signal before Longview Junction South was displaying a clear³ indication when he passed it, and he did not observe the stop signal at Longview Junction South when it was first visible because he was working with his radio. The second time the signal was visible, he did not observe the stop indication until he was passing the BNSF train just before impact. According to signal event recorder information, the signal at Longview Junction South displayed a stop aspect from 6:38 a.m. until the time of the collision, which occurred more than an hour later. The UP conductor did not remember seeing or calling the approach signal at MP 104.6 and did not see the stop signal at Longview Junction South. His signal log did not show an entry for the approach or the stop signals. The UP conductor told investigators that the BNSF train was moving northbound (it was actually southbound) and that he did not see a headlight on the BNSF train for that reason. He stated that he did not remember seeing the BNSF train until the collision occurred.

The distance from the approach signal at MP 104.6 to the interlocking at Longview Junction South was 10,873 feet. An examination of the signal system began immediately after the accident. The signal case at Longview Junction South was locked when Safety Board investigators arrived, and there was no evidence of tampering with or vandalism to any of the signal equipment. A time stamp was verified and the data recorder log was downloaded. The signal system operated as designed during testing⁴ and inspection.

Sight-distance tests indicated that the engineer on the UP train would have had a clear sight of the approach signal at MP 104.6 for 1,519 feet before the train reached the signal. The sight-distance tests also indicated that the UP engineer would have been able to view the stop signal at the Longview Junction South interlocking signal on two separate occasions. The engineer could have observed the stop signal from a distance of 2,618 feet and again from 1,609 feet before reaching the stopping point. (See figure 1.)

³ A *clear* indication is the most favorable signal that can be conveyed. A crew that receives a *clear* signal may proceed at track speed.

⁴ The following tests were performed: grounds check, insulation resistance, searchlight mechanisms, relays, indication locking, approach locking, bulb voltages, and visual inspection. No exceptions were taken to any of the test results or inspections.



Figure 1. The signal at Longview Junction South facing north.

UP Train Crew Performance

The investigation determined that the UP train crew was experienced and qualified on the territory. Weather conditions did not limit visibility. No impairing substances were found during the Federal Railroad Administration (FRA) postaccident toxicological tests, and examination of the signal system indicated that all signals were properly displayed.

Event recorder data for the UP train indicate that there were no control inputs as the train traveled for about 2 1/2 minutes toward the impending collision. In the seconds before the collision, at a recorded speed of 49 mph, an emergency application of the brakes occurred.

UP Crew Health

Investigators examined medical records obtained from the UP engineer's personal physician. These records revealed that the engineer had been diagnosed as having moderate to severe obstructive sleep apnea 2 years before the accident.⁵ Records showed that the engineer had to be desensitized for a phobic reaction to the facemask used in conjunction with the continuous positive airway pressure (CPAP)⁶ device prescribed as therapy for the disorder, and the device was never properly adjusted through titration to establish a therapeutic air pressure level. Furthermore, documentation provided showed that the prescribed CPAP treatment was not well tolerated and that there was no indication the device was providing adequate relief from the disorder. The UP engineer told investigators that he did not have the CPAP device with him for the layover on the day before the accident.

If the engineer's sleep disorder was not effectively treated, he would have accumulated a long-term sleep debt resulting from deficient proportions of sleep staging and from poor sleep quality, both of which are consequences of this disorder. This sleep debt would be expected to result in a higher than normal tendency to fall asleep.⁷

The UP conductor's physician noted that the conductor had complained several times about fatigue and was having difficulty sleeping. He also described the conductor as significantly obese.⁸

Based on the train crew's actions, it is likely that neither employee was alert when passing the approach signal at MP 104.6 nor during the period when the stop signal at MP 102.5 could have been observed in time to initiate control inputs that would have slowed the train before the collision. The crewmembers' failure to recognize the impending collision suggests that they were most likely asleep.

⁵ The engineer also had a history of hypoglycemic (low blood sugar) episodes with one episode occurring as recently as 5 months before the accident. Although there was no evidence that he suffered an episode immediately before the collision, impairment from low blood sugar could include incapacitation caused by a loss of consciousness.

⁶ (a) J. Hausfeld, *Don't Snore Anymore* (New York: Three Rivers Press, 1999) 147–151. CPAP refers to a mechanical device used to force air into a patient's upper nasal passages to prevent the throat from collapsing and obstructing breath. The device consists of an adjustable pressure air pump, a hose, and a mask worn over the nose (or nasal plugs in the nose). The device supplies air under prescribed pressure, usually based on oxygen levels in the patient's blood during sleep. (b) R. Grunstein and C. Sullivan, "Continuous Positive Airway Pressure for Sleep Breathing Disorders," eds. M.H. Kryger and others, *Principles and Practice of Sleep Medicine* (Philadelphia, PA: W.B. Saunders Co., 2000) 894–912. See chapter for an elaboration on CPAP.

⁷ National Transportation Safety Board, *Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue*, Safety Report NTSB/SR-99/01 (Washington, DC: NTSB, 2001) 68–72. *Sleep debt* refers to sleep loss that accumulates when a person is deprived of all needed sleep time for recovery over an extended period of time. This type of sleep loss will significantly degrade performance, alertness, and mood.

⁸ Although there is no conclusive evidence that obesity by itself causes obstructive sleep apnea, the Safety Board's medical officer continues to monitor the literature for the development of a screening tool for sleep disorders based on weight and height. Certain weight and height calculations provide a body mass index (BMI) that can distinguish between weight problem conditions (for example, a BMI greater than 29 typically refers to an obesity problem versus a severely overweight condition). There is evidence that higher BMIs are associated with sleep disorders and as a result may have potential along with other criteria for screening employees in safety-sensitive jobs for sleep disorder conditions.

UP Crew Work and Rest Cycles

The UP engineer's work records indicate that he had worked 6 days in the 14-day period preceding the accident trip. He worked on the day before the accident trip after 4 consecutive days off. During those 4 days off, he slept nighttime hours. Prior to this break in service, his work schedule for the reviewed period included days, evenings, and one early morning start time. The trip to Portland the night before the accident required the UP engineer to work through the evening and change his sleep pattern from nighttime to daytime in preparation for the return trip to Seattle (the accident trip). This inversion of the sleep wake cycle degrades the quality of sleep, as well as desynchronizes the circadian system, causing sleepiness with severe effects on performance.⁹ The UP engineer's work schedule requiring this inverted cycle likely contributed to an increased propensity for unintended sleep on the morning of the collision.

In the 14 days before the accident, the UP conductor had worked 8 days. On 6 of those days, he worked consecutive trips starting in the morning. The last 2 days he worked before the accident trip, he reported for duty in the late afternoon and early evening. However, he did not work the day before the accident trip and slept nighttime hours on November 13 and 14, 2003. The UP conductor told investigators that he was sleeping prior to receiving the call to report for duty at 1:00 a.m. on November 15, 2003. On the morning of the accident, he was working when his circadian system was accustomed to nighttime sleep. As a result, he may have been at increased risk for unintended sleep because of inverted work and off-duty times.

Railroad Fatigue Management of Train Crews

The Safety Board's investigators found important sleep health information for both train crewmembers that was documented by their personal physicians. These medical problems, if known to UP medical officials, should have led to a careful evaluation. Enough is known from sleep science about the risks of compromised rest from sleep disorders, circadian systems that are in continuous readjustment, and accumulated sleep debt from insufficient recovery sleep to predict risk for assigning any employees to schedules with inverted sleep and work times.

Investigators reviewed UP records for the train crew and found no medical information pertaining to the engineer's sleep disorder. UP medical records were in compliance with FRA requirements for vision and hearing for the engineer's certification. His examination records showed notations for "trace" sugar in urine specimens collected in 1980, 1984, and 1988, and "borderline diabetes" in 1988. No references were found assuring the disease was controlled. Company records also showed that the conductor had high blood pressure controlled by medication and made reference to an obesity condition. There was no reference to his complaints of difficulty sleeping or fatigue.

⁹ National Transportation Safety Board, *Uncontrolled Collision With Terrain, American International Airways Flight 808 Douglas DC-8-61, N814CK, U.S. Naval Air Station, Guantanamo Bay, Cuba, August 18, 1993*, Aircraft Accident Report NTSB/AAR-94/04 (Washington, DC: NTSB, 1994) 135–136.

The Safety Board has previously addressed the issue of inadequate medical information available to a railroad. On November 15, 2001, two Canadian National Railroad trains collided near Clarkston, Michigan, killing two crewmembers and seriously injuring two others.¹⁰ The investigation determined that the engineer and conductor were incapacitated by fatigue, and both crewmembers were found to be suffering from obstructive sleep apnea. These findings prompted the Safety Board to recommend Federal requirements for reporting and evaluating potentially incapacitating or impairing medical conditions for train crews.¹¹

Use of an Alerter

The lead locomotive involved in this accident, UP 6164, was not equipped with an alerter. UP reported there are 7,232 road locomotives in its fleet; 4,892 of those locomotives (67.6 percent) are equipped with an alerter. Additionally, UP representatives informed investigators that all new UP locomotives are purchased with an alerter.

The lead BNSF locomotive on the train involved in this accident was equipped with an alerter. BNSF reported there are 5,500 road locomotives in its fleet; 4,925 of those locomotives (89.5 percent) are equipped with an alerter.

Positive Train Control

The Safety Board has long been a proponent of systems that prevent train collisions by automatically interceding in the operation of a train when the crew fails to control its train in response to signal indications. Had a positive train control system been in place in this area, such a system could have intervened to slow and stop the train before it passed the stop signal at Longview Junction South.¹² Similar findings were reported by the Safety Board in a report that detailed the investigation of a head-on collision and derailment, which occurred on November 11, 1993, between BNSF and UP trains in the same Longview Junction South (Kelso) area and resulted in five fatalities.¹³

¹⁰ National Transportation Safety Board, *Collision of Two Canadian National/Illinois Central Railway Trains Near Clarkston, Michigan, November 15, 2001*, Railroad Accident Report NTSB/RAR-02/04 (Washington, DC: NTSB, 2002).

¹¹ NTSB/RAR-02/04, 28. Safety Recommendation R-02-25 issued as a result of the Clarkston, Michigan, accident reads: Require that any medical condition that could incapacitate, or seriously impair the performance of, an employee in a safety-sensitive position be reported to the railroad in a timely manner.

¹² National Transportation Safety Board, *Collision Involving Three Consolidated Rail Corporation Freight Trains Operating in Fog on a Double Main Track Near Bryan, Ohio, January 17, 1999*, Railroad Accident Report NTSB/RAR-01/01 (Washington, DC: NTSB, 2001) 49. Safety Recommendation R-01-6 issued to the FRA reads: Facilitate actions necessary for development and implementation of positive train control systems that include collision avoidance, and require implementation of positive train control systems on main line tracks, establishing priority requirements for high-risk corridors such as those where commuter and intercity passenger railroads operate.

¹³ National Transportation Safety Board, *Head-on Collision and Derailment of Burlington Northern Freight Train with Union Pacific Freight Train, Kelso, Washington, November 11, 1993*, Railroad Accident Report NTSB/RAR-94/02 (Washington, DC: NTSB, 1994).

Probable Cause

The National Transportation Safety Board determines that the probable cause of the November 15, 2003, Union Pacific Railroad collision with a Burlington Northern Santa Fe Railway Company train near Kelso, Washington, was the Union Pacific Railroad crewmembers' neglect of the information conveyed by the wayside signal system because they were asleep. The engineer's and conductor's respective health conditions in combination with irregular work schedules contributed to the accident. The lack of a positive train control system was also a contributing factor.

Adopted: June 6, 2005