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RAILROAD ACCIDENT INVESTIGATION

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REPORT NO 4173

UNION PACIFIC RAILROAD COMPANY

ATCHISON, TOPEKA AND SANTA FE RAILWAY COMPANY

FULLERTON, CALIF

FEBRUARY 17, 1970



FEDERAL RAILROAD ADMINISTRATION

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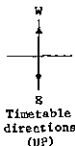
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DEPARTMENT OF TRANSPORTATION

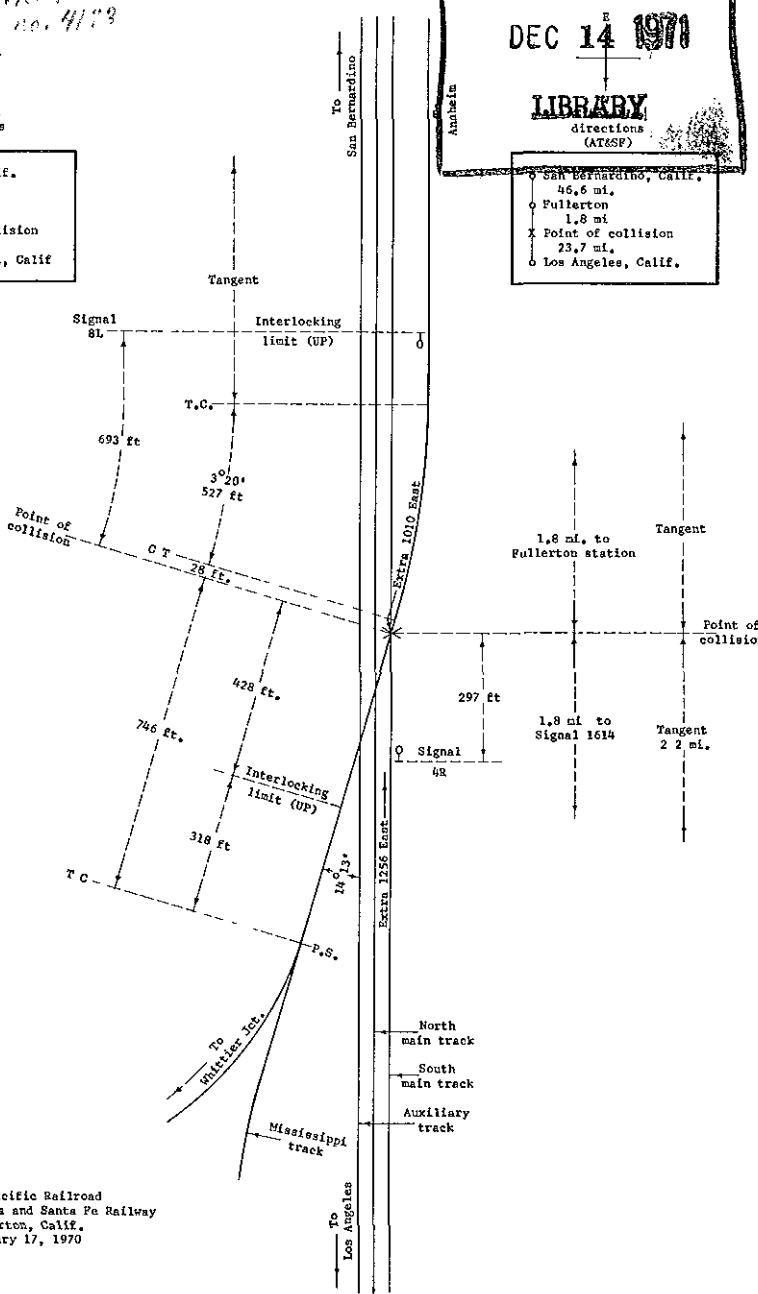
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directions
(AT&SF)

- San Bernardino, Calif. 46.6 mi.
- Fullerton 1.8 mi
- X Point of collision 23.7 mi.
- Los Angeles, Calif.



- Anaheim, Calif. 2.7 mi
- Fullerton 1.8 mi.
- X Point of collision 15.5 mi.
- Whittier Jct., Calif



Union Pacific Railroad
Atchison, Topeka and Santa Fe Railway
Fullerton, Calif.
February 17, 1970

Summary

DATE:	February 17, 1970	
RAILROADS:	Union Pacific	Atchison, Topeka & Santa Fe
LOCATION:	Fullerton, Calif	
ACCIDENT TYPE:	Side Collision	
TRAINS:	Freight	Freight
TRAIN NUMBERS:	Extra 1010 East	Extra 1256 East
LOCOMOTIVE NUMBERS:	1010	1256, 1454, 1860
CONSISTS:	2 cars, caboose	38 cars, caboose
SPEEDS:	Standing	40 m.p.h
OPERATION:	Interlocking	
TRACKS:	Single; tangent; level	Double; tangent; level
WEATHER:	Clear	
TIME:	8:28 p m	
CASUALTIES:	1 killed; 2 injured	
CAUSE:	Portion of UP train left standing across ATSF tracks within interlocking limits contrary to appli- cable UP rule and inability of the inter- locking system to de- tect this occupancy.	

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ATCHISON, TOPEKA AND SANTA FE RAILWAY COMPANY
FEBRUARY 17, 1970

Synopsis

On February 17, 1970, a side collision occurred between UP and ATSF freight trains at a railroad grade crossing at Fullerton, Calif. It resulted in death to one and in injury to two members of the train crews.

The accident was caused by a portion of UP train left standing across ATSF tracks within interlocking limits contrary to applicable UP rule and inability of the interlocking system to detect this occupancy.

Location and Method of Operation

The accident occurred on that part of the UP extending from Anaheim to Whittier Jct, Calif, a distance of 20 miles, and on that part of the ATSF extending from Los Angeles to San Bernardino, Calif, a distance of 72 1/2 miles. In the accident area, the UP is a single-track line over which trains operate under yard-limit rules. The ATSF in that area is a double-track line over which trains operate by signal indications of a traffic control system. From the north, the ATSF main tracks are designated as the north main track and the south main track.

The timetable directions for both railroads are eastward and westward, and such directions are used in this report. In the accident area, trains of both railroads run

in eastward and westward directions, geographically. However, UP trains operating eastward by timetable directions are moving westward by geographical directions. Conversely, UP trains operating westward by timetable directions move eastward by geographical directions.

At Fullerton, 2.7 miles east of Anaheim and 25.5 miles east of Los Angeles, the main tracks of the UP and ATSF cross at grade, at an angle of $14^{\circ}13'$, within limits of a remote-controlled interlocking. Movements of both railroads through the interlocking are governed by signal indications of the interlocking system. This system is controlled from the traffic control machine in the ATSF train dispatcher's office at San Bernardino.

The collision occurred 1.8 miles west of the ATSF station at Fullerton, and within limits of the Fullerton interlocking, at the point where the UP main track and ATSF south main track cross at grade.

In the collision area, a long ATSF auxiliary track parallels the ATSF main tracks on the north. It also crosses the UP main track at grade.

With respect to the UP main track, the limits of the Fullerton interlocking are 693 feet west and 428 feet east of the crossing. An industrial spur track, known as the Mississippi Track, diverges southward from the UP main track, 318 feet east of the easterly limit of the interlocking. Its switch is facing point for eastbound movements on the UP main track.

Tracks

From the west on the UP main track there are, in succession, a tangent of considerable length, a $3^{\circ}20'$ curve to the right 527 feet, and a tangent 28 feet to the collision point and 746 feet eastward.

From the west, the ATSF main tracks are tangent 2.2 miles to the collision point and a considerable distance eastward.

The grade of each railroad in the collision area is practically level.

Signals - UP

Interlocking signal 8L, governing eastbound UP movements through the Fullerton interlocking, is 693 feet west of the railroad crossing. It is of the color-light type and is continuously lighted. The applicable signal aspects, and the corresponding indications and names are as follows:

<u>Signal</u>	<u>Aspect</u>	<u>Indication</u>	<u>Name</u>
8L	Red	Stop	Stop
	Green	Proceed on main route	Clear

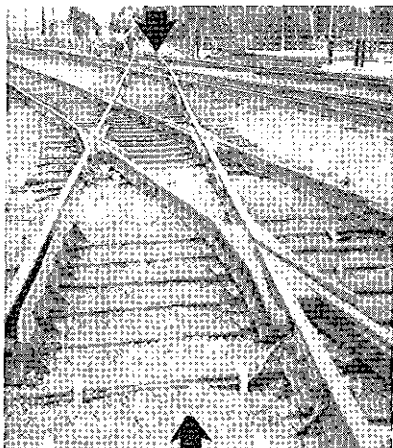
Signals - ATSF

Automatic signal 1614 and interlocking signal 4R, governing eastbound movements through the interlocking on the ATSF south main track are, respectively, 1 8 miles and 297 feet west of the crossing. They are of the color-light type and are continuously lighted. The applicable signal aspects, and the corresponding indications and names are as follows:

<u>Signal</u>	<u>Aspect</u>	<u>Indication</u>	<u>Name</u>
1614 4R	Yellow	Proceed preparing to stop at next signal; if exceeding Medium Speed immediately reduce to Medium Speed	Approach
4R	Red	Stop	Stop

The circuits are so arranged that when the route has been established for an eastbound UP train to proceed through the interlocking, UP signal 8L displays a Clear aspect, and ATSF signals 1614 and 4R display Approach and Stop aspects, respectively. The portion of the UP main track within the interlocking limits is provided with a trap circuit to detect movements on the UP main track through the interlocking. At the time of the accident, the trap circuit was permanently jumpered around a 173-foot section of the UP main track at the crossing. Thus, insofar as the interlocking signal system was concerned, the jumpered-out section of the UP main track constituted "dead" track.

The 173-foot dead section of the UP main track extended across the ATSF tracks at the crossing, as indicated in the photograph below:



View eastward on UP main track. Jumpered-out section shown between arrows.

UP Operating Rule

801 Trains and engines must not be permitted to stand across the tracks of another railroad when it can be avoided

ATSF Operating - Rule (Definition)

Medium Speed - A speed not exceeding 40 miles per hour

Time and Weather

The collision occurred at 8:28 p m , in clear weather

Authorized Speeds

The maximum authorized speeds for all UP trains and ATSF freight trains through the Fullerton interlocking are 15 and 60 m p h., respectively

Train Equipment

The locomotives and cabooses of both trains had radio equipment tuned to their respective railroad radio channels. The caboose of the UP train had, in addition, radio equipment tuned to the ATSF radio channel.

Circumstances Prior to Accident

UP Train Extra 1010 East

Extra 1010 East, an eastbound UP local freight train consisting of 1 yard-switcher type diesel-electric unit, 2 cars and a caboose, left Anaheim at 8:00 p m the day of the accident. Approximately 15 minutes later, it approached the interlocking at Fullerton. The engineer and front brakeman were in the control compartment of the locomotive; the conductor and flagman were in the caboose.

ATSF Train Extra 1256 East

Extra 1256 East, an eastbound ATSF freight train consisting of 3 road-switcher type diesel-electric units, 38 cars and a caboose, left Los Angeles at 8:05 p m. the day of the accident, after having received the prescribed brake test. Approximately 20 minutes later, while moving eastward on the south main track, it approached the Fullerton interlocking. The engineer, front brakeman and flagman were in the control compartment of the first locomotive unit. The conductor was in the caboose.

The Accident

UP Extra 1010 East

The crew members of this train were regularly assigned to the local freight run involved. Before leaving Anaheim, they were aware that their train was required to remove a cut of seven cars from the Mississippi Track east of the

Fullerton interlocking and to switch at an industrial plant located a short distance farther eastward. Following a common practice, they intended to begin this work by stopping their train within limits of the Fullerton interlocking, and uncoupling the locomotive from the first car at that point. After this was done, the locomotive was to proceed to the Mississippi Track, couple to the cut of seven cars, and return to the portion of the train left standing on the UP main track within the interlocking. The train would then proceed eastward on the UP main track from the interlocking, pushing the cut of seven cars, to the industrial plant for further switching operations. Prior to the accident, the crew members of the local freight run erroneously believed the circuits of the interlocking were so arranged that the ATSF dispatcher could not establish the route for an ATSF train to move through the Fullerton interlocking while any portion of the UP main track within the interlocking was occupied by a train, locomotive, or car.

Soon after UP Extra 1010 East left Anaheim, the conductor radioed the operator at the ATSF Fullerton station and requested him to have the ATSF dispatcher establish the route for the UP train to proceed through the interlocking. In reply, the dispatcher informed the conductor, through the operator, the route would be established as requested after an eastbound ATSF passenger train, No. 78, moved through the interlocking and over the railroad crossing. Apparently about 8:15 p m, Extra 1010 East stopped on the UP main track short of signal 8L, which displayed a Stop aspect. A few minutes later, ATSF No. 78 moved through the interlocking and the ATSF dispatcher established the route for Extra 1010 East to proceed through the interlocking, causing signal 8L to display a Clear aspect. At that time, according to his statements, the ATSF dispatcher anticipated the UP train would move through the interlocking without stopping as he had received no information to indicate otherwise.

At 8:24 p m, after the aspect of signal 8L changed to Clear, UP Extra 1010 East proceeded eastward and entered the interlocking. One or two minutes later, it stopped on the railroad crossing, across all three ATSF tracks, and the front brakeman uncoupled the locomotive from the train (2 cars and caboose). The locomotive then proceeded eastward on the UP main track; passed the easterly limit of the interlocking at 8:26 p m, entered the Mississippi Track; coupled to the cut of seven cars on that track and, immediately afterward, began to re-enter the UP main track and return to the portion of the train that had been left standing on the crossing within the interlocking. At the latter time, the front brakeman was standing near the switch of the Mississippi Track. The flagman was at the crossing, waiting to recouple the locomotive with seven cars to the train. The conductor was apparently standing alongside the caboose.

About the time that the UP locomotive with seven cars re-entered the UP main track at the Mississippi Track switch, the flagman (at the railroad crossing) observed the headlight of an ATSF train approaching from the west on the ATSF south main track. Erroneously assuming that the ATSF home inter-

locking signals (including ATSF signal 4R) were displaying Stop aspects due to the UP caboose and two cars occupying the interlocking, the flagman felt no concern about the ATSF train until he realized it was approaching too closely and rapidly to stop short of ATSF signal 4R and the railroad crossing. He then gave the ATSF train violent stop signals with a lighted lantern. The UP engineer saw those signals and promptly stopped the UP movement with the front end (locomotive) on the UP main track just outside the easterly limit of the interlocking. Moments later, at 8:28 p m, the ATSF train entered the Fullerton interlocking and struck the side of the UP caboose standing across the ATSF south main track at the crossing, overturning the caboose and pinning the UP conductor underneath.

ATSF Extra 1256 East

This train approached ATSF signal 1614 and the Fullerton interlocking while moving on the ATSF south main track at 45 m p h, as indicated by the speed-recording tape. According to his statements, the engineer saw that signal 1614 and 4R were displaying Approach and Stop aspects, respectively, and he initiated a service brake application in preparation for stopping at signal 4R. A few moments later, however, he saw the aspect of signal 4R change to Approach, and released the brake application before the speed of his train had been reduced materially. As the ATSF train neared signal 4R and approached the railroad crossing within the Fullerton interlocking at a distance of about 1300 feet, the crossing came within range of the headlight and the engineer saw the UP caboose standing across the ATSF south main track at the crossing. He immediately applied his train brakes in emergency. Realizing a collision was inevitable, both the engineer and front brakeman then laid on the floor of the locomotive control compartment. The flagman left the control compartment, and jumped from the locomotive. Moments later, when its speed had been reduced to 40 m p h, the ATSF train struck the UP caboose at the railroad crossing.

ATSF Train Dispatcher

The train dispatcher stated that the graph of his traffic control machine indicated the UP train passed signal 8L and entered the Fullerton interlocking at 8:24 p m. At 8:26 p m, according to his statements, track occupancy lights associated with the traffic control machine indicated that the portion of the UP main track within the interlocking was no longer occupied. At that time, according to his statements, the dispatcher assumed the UP train had proceeded through and left the interlocking, and he immediately manipulated the controls of the traffic control machine to establish the route for the ATSF train to proceed through the interlocking. This caused ATSF signal 4R to display an Approach aspect, the most favorable aspect it could display due to a condition in the block of the next signal ahead.

CasualtiesUP Extra 1010 East

The conductor of this train was pinned under his overturned caboose. He died about 1 hour 30 minutes after the collision, before he could be extricated from under the caboose.

ATSF Extra 1256 East

The engineer was slightly injured. The flagman sustained a sprained ankle, as well as contusions and abrasions, as a result of alighting from the locomotive before the collision. The front brakeman escaped injury.

DamagesUP Extra 1010 East

The caboose and the rear truck of the car ahead of the caboose were derailed. The caboose overturned and stopped on its right side on the ATSF north main track. It was destroyed. The car ahead was damaged slightly.

ATSF Extra 1256 East

This train stopped with the front end 210 feet east of the collision point. All three locomotive units and the first six cars were derailed. This equipment stopped in various position on the ATSF & UP main track structures. The locomotive units and first four cars were considerably damaged. The fifth and sixth cars were slightly damaged.

According to the carriers' estimates, the cost of damages to the trains and track structures of both railroads was \$130,756.

Post-Accident Examinations and Tests

The ATSF maintains the Fullerton interlocking. Tests of the interlocking system disclosed that the system functioned properly, in accordance with its design. The design of the interlocking system, however, was such that it could not detect occupancy of a 173-foot section of the UP track extending from one side of the ATSF tracks at the crossing to the other. Thus, if a locomotive with a train not exceeding 173 feet in length between the front and rear pairs of wheels entered the interlocking and left the train standing entirely within the "dead" section of the UP main track at the crossing while it worked outside the interlocking limits, the effect on the interlocking system would be the same as if the UP main track within the interlocking was not occupied. Under such conditions, track occupancy lights associated with the ATSF dispatcher's traffic control machine would indicate the interlocking was unoccupied, and the dispatcher would be enabled, if he so desired, to establish the route for an ATSF train or another UP train to enter the interlocking.

The total length of the UP caboose and two cars left standing across the ATSF tracks at the crossing was 140 feet 2 inches, as measured between the front pair of wheels of the first car and the rear pair of wheels of the caboose. Evidence indicated the caboose was standing at the time of the accident with its rear pair of wheels about five feet east of the west end of the 173-foot "dead" section of the UP main track at the crossing. Hence, the caboose and two cars were evidently standing entirely within this "dead" section of the UP main track as the ATSF train approached the interlocking.

Train Crews' Hours of Service

The crew members of UP Extra 1010 East had been continuously on duty 9 hours 13 minutes at the time of the collision, after having been off duty in excess of ten hours.

The crew members of ATSF Extra 1256 East had been on duty 6 hours 28 minutes in the aggregate, after having been off duty more than ten hours.

Analysis of Accident

Two cars and a caboose comprised the consist of UP Extra 1010 East when it stopped at the Fullerton interlocking to pick up a cut of seven cars from the Mississippi Track. The caboose and two cars obviously could have been left standing on the UP main track outside of either end of the interlocking while the locomotive picked up the seven cars, or on the UP main track within the interlocking, but clear of the ATSF tracks at the crossing. In addition, considering its shortness, Extra 1010 East could have proceeded in entirety through the interlocking and onto the Mississippi Track to pick up the seven cars. However, contrary to UP operating rule 801, the UP crew members elected to leave their train standing across the ATSF tracks at the crossing within the interlocking while its locomotive picked up the seven cars from the Mississippi Track.

In leaving their train across the ATSF tracks, the UP crew members mistakenly believed this would prevent the ATSF interlocking signals from displaying other than Stop aspects, due to their train occupying the UP main track within the interlocking limits. Thus, they also mistakenly believed their train was protected against ATSF movements approaching the interlocking. However, the fact remains that if the UP crew members had left their train standing clear of the ATSF tracks at the crossing as required by UP operating rule No. 801, the accident would have been averted.

The failure of the UP crew to leave its train clear of the ATSF tracks at the crossing was the primary cause of this accident. Other significant causal factors were the inability of the interlocking system to detect occupancy of a 173-foot section of the UP main track at the crossing and the dispatcher's and crew member's lack of knowledge concerning the extent of the protection afforded by this interlocking. The UP caboose and two cars evidently were stopped

within this "dead" track section. Consequently, after the UP locomotive left them and the interlocking to pick up cars from the Mississippi Track, the interlocking appeared to be unoccupied insofar as its signal system was concerned. This condition was reflected by track occupancy lights associated with the ATSF train dispatcher's traffic control machine, and released the machine for establishment of another route through the interlocking when the dispatcher so desired. The dispatcher, not knowing the UP main track remained occupied at the crossing and apparently unaware of the 173-foot dead section, immediately established the route for ATSF Extra 1256 East to enter the interlocking. This caused ATSF interlocking signal 4R to display an Approach aspect for the ATSF train and resulted in the accident soon afterward.

Corrective Action Taken by UP & ATSF

The UP issued instructions which reaffirmed the provisions of its operating rule No. 801 and specifically stated that trains, engines or cars must not be permitted to stand across the ATSF tracks at the Fullerton interlocking.

As a result of the accident, the ATSF installed an overlay track circuit on the existing UP trap circuit within the Fullerton interlocking. The installation of the overlay circuit reduced the 173-foot "dead" section of UP track at the crossing to a total length of 27 feet, broken into three 9-foot sections, and provides for the desired isolation of the UP track circuits from the ATSF track circuits at the crossing. Since the former "dead" section of the UP track has been reduced to three separate 9-foot sections, detection of occupancy of the UP track in the interlocking, including the railroad crossing, has been significantly expanded.

Findings

1. The UP train stopped across the ATSF tracks within the Fullerton interlocking. The locomotive then left the interlocking, leaving its train standing across the ATSF tracks contrary to an operating rule.

2. At the UP - ATSF railroad crossing in Fullerton interlocking, there was a 173-foot section of UP dead track. A trap circuit was installed to protect this dead section. Its function was to lock the interlocking during movements through the dead section. The UP crew, unaware of both the dead section and the resulting inability of the interlocking system to reflect track occupancy at that location, left their train standing in the railroad crossing and proceeded through the trap circuit and out of the interlocking.

3. Due to inability of the interlocking to detect occupancy of the UP main track in the dead section where the UP train was standing, track occupancy lights associated with the ATSF train dispatcher's traffic control machine appeared to indicate that the Fullerton interlocking was unoccupied and enabled the dispatcher to establish a route for another train to proceed through the interlocking whenever he so desired.

4 Not knowing that the UP train was standing across the ATSF tracks, the dispatcher established the route for the ATSF train to enter the interlocking. Soon afterward, the ATSF train entered the interlocking in accordance with applicable operating rules and struck the UP caboose stopped on the railroad crossing.

5 After the accident, both carriers took appropriate action to prevent recurrence at this location.

Dated at Washington, D C , this 25th
day of March 1971
By the Federal Railroad Administration

Mac E Rogers, Director
Bureau of Railroad Safety