



National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.: DCA-09-FR-010
Location: San Francisco, California
Date: July 18, 2009
Time: 2:50 p.m., Pacific daylight time¹
Railroad: San Francisco Municipal Railway Transit System (MUNI)²
Property Damage: \$4.5 million
Injuries: 48
Type of Accident: Collision

The Accident

On July 18, 2009, about 2:50 p.m., at West Portal Station, San Francisco, California, San Francisco Municipal Railway Transit System (MUNI) L Line train 1433 struck the rear end of standing MUNI K Line train 1407. The operators of both trains and 46 passengers were taken to hospitals. The operator of the striking train and 27 of the passengers had serious injuries. The incident was not affected by weather; it occurred as the trains were just exiting a tunnel. Estimated damages were \$4.5 million.

Before the accident, the automatic train control system (ATCS)³ had been operating the K Line train through the underground section of the MUNI railway system on the outbound track from downtown San Francisco. (See figure 1.) When the train automatically stopped at West Portal Station platform, the operator, as she was supposed to, cut out the ATCS and slowly moved the train forward in manual. At the end of the platform she stopped the train and prepared to enter the street and proceed onto the K Line.

The L Line train, also operated by the ATCS, had been following the K Line train through the underground portion of the MUNI system, making numerous station stops. According to the L Line train operator, his train had stopped automatically just inside the West Portal tunnel. He could see that the train ahead (the K Line train) had moved to the far end of the platform leaving enough room at the platform for his train. He later explained, "I went into cutout after my train stopped, which is a normal thing that we usually do." He then attempted to move the train

¹ All times in the brief are Pacific daylight time.

² The San Francisco Municipal Transportation Agency manages transportation in San Francisco, California, including the San Francisco MUNI.

³ The ATCS operates a train without any operator intervention. The ATCS automatically keeps the train a safe distance from other trains and stops it at the station platform. When the ATCS is operating a train, the train is said to be in automatic mode. When the operator is operating a train, the train is said to be in manual mode.

forward to the platform using the manual mode. He said that he started moving about 5 mph and that was the last thing he could remember until the impact. He said he had “blacked out” (that is, lost consciousness). When MUNI officials arrived at the accident, they found that the emergency pushbutton on the control panel was not engaged and that the T-Stick⁴ was all the way forward in the maximum power application, indicating that the operator had taken no action to stop the train. The MUNI officials also found that the L Line train’s auto mode switch was in the cutout position.

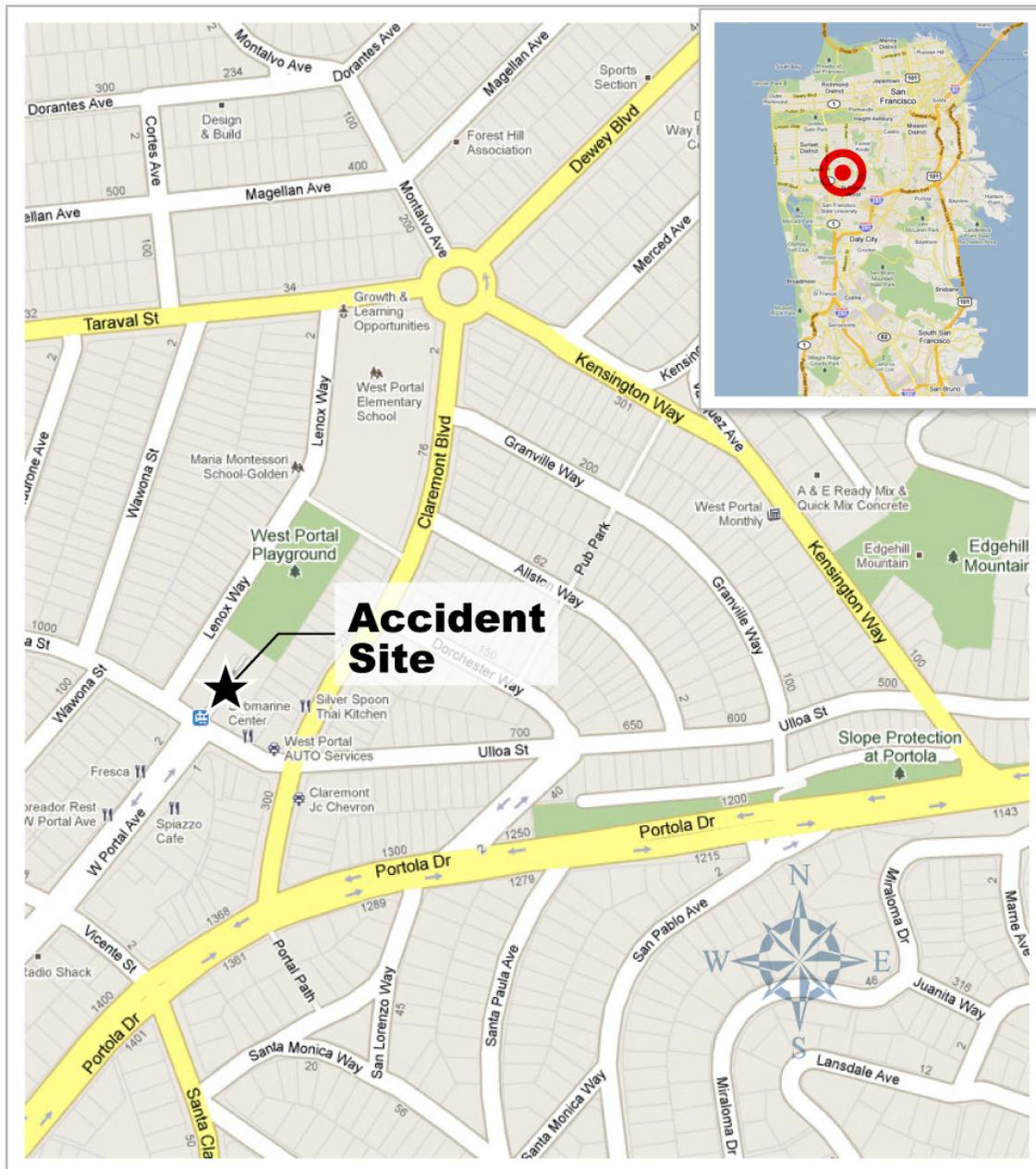


Figure 1. Map of Accident Site.

⁴ The T-Stick is the controlling lever. When it is pushed forward, power is applied; when it is pulled back past the center position, braking is applied.

According to the ATCS logs, the L Line train was in cutout at 14:48:41. At 14:48:44, the train started to move, and at 14:49:01, it was operating at 23 mph while occupying the signal-controlled section of track at the platform. The L Line train struck the rear of the K Line train before the operator of the K Line train started moving it from the platform. (See figures 2 and 3.)

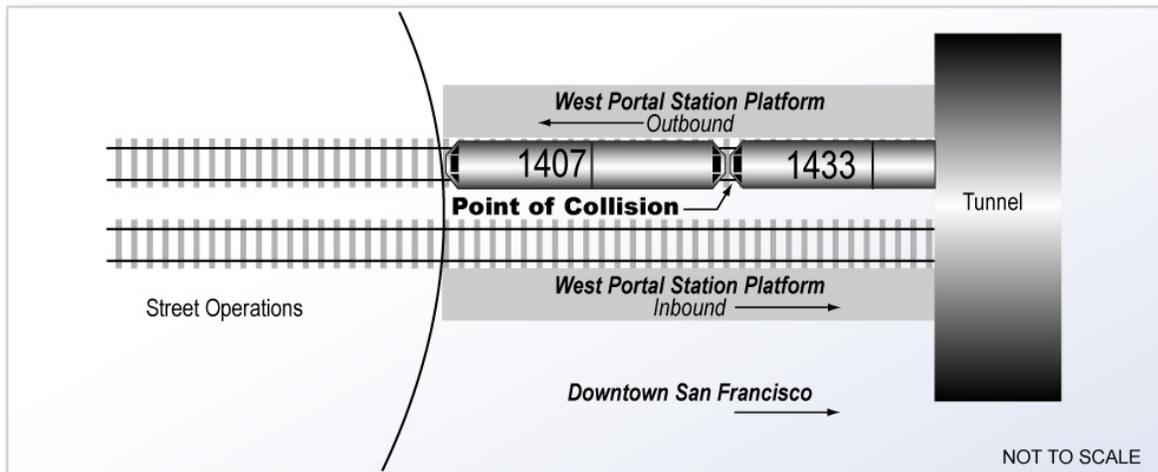


Figure 2. Accident Diagram.



Figure 3. Photograph showing damage to front of striking train at site of collision.

Investigation

The National Transportation Safety Board (NTSB) investigators established that the ATCS had been functioning properly at the time of the accident and that the weather had not limited visibility. The tracks were owned, inspected, maintained, and operated by MUNI. No track defects were identified after the accident. The train operators were properly trained to perform their jobs. Both had routine schedules and regular sleep cycles and were rested when the accident occurred. Both train operators said that their trains had operated normally before the accident. MUNI records indicate that the train equipment had been inspected and tested within the required intervals. The equipment was inspected and tested following the accident. No exceptions were noted. The emergency response to the accident was prompt and appropriate.

Personnel Information

L Line Train Operator

MUNI hired the operator of the L Line train as a bus driver on May 16, 1979. In October 2006, he transferred to the Green Division (rail) and had operated trains since that date.

As a train operator, he had five previous incidents. Three were classified as miscellaneous; one was an unavoidable collision (an automobile struck his parked train); and one was an avoidable collision. The avoidable collision was on August 24, 2007. The record stated that while the ATCS was cut out, the operator had hit a train at West Portal Station. The 2007 accident appeared to be similar to the 2009 accident, except that the speed of impact was different and he had not blacked out. As a result of the 2007 accident, he had been suspended for 5 days.

The NTSB investigators reconstructed his work just before the 2009 accident. (See table 1.)

Table 1. Work schedule of L Line train operator.

Date/Day	On Duty	Off Duty
July 13, Monday	Off	
July 14, Tuesday	5:11 a.m.	2:01 p.m.
	2:33 p.m.	4:51 p.m.
July 15, Wednesday	5:11 a.m.	2:01 p.m.
	2:33 p.m.	4:51 p.m.
July 16, Thursday	5:11 a.m.	2:01 p.m.
	2:33 p.m.	4:51 p.m.
July 17, Friday	5:11 a.m.	2:01 p.m.
	2:33 p.m.	4:51 p.m.
July 18, Saturday	5:20 a.m.	10:24 a.m.
	12:10 p.m.	4:21 p.m. (the accident was at 2:50 p.m.)

He had a routine work/rest cycle and went to bed between 9:00 p.m. and 9:30 p.m. every night and woke up at 3:45 a.m. each morning. He said he had felt rested, never had or been diagnosed with a sleep disorder, and always felt that he had adequate sleep time.

K Line Train Operator

The operator of train 1407 had started with MUNI on July 8, 1987, driving trolleys. She had transferred to the rail division and had become a train operator in 2004. She said that her schedule was routine and her sleep cycles were consistent. During the postaccident interview she said, “I was very rested” The NTSB investigators reconstructed her work just before the 2009 accident. (See table 2.)

Table 2. Work schedule of K Line train operator.

Date/Day	On Duty	Off Duty
July 13, Monday	5:47 a.m.	2:27 p.m.
	3:25 p.m.	4:43 p.m.
July 14, Tuesday	Off	
July 15, Wednesday	Off	
July 16, Thursday	5:47 a.m.	2:27 p.m.
	3:25 p.m.	4:43 p.m.
July 17, Friday	5:47 a.m.	2:27 p.m.
	3:25 p.m.	4:43 p.m.
July 18, Saturday	6:26 a.m.	3:08 p.m. (The accident was at 2:50 p.m.)

Medical and Toxicological Information

The K Line train operator was treated at a hospital and released. The L Line train operator remained in the hospital for several days for continued observations and tests. Toxicological tests results for him were negative. According to medical records, aortic stenosis (that is, narrowing of the outflow valve of the heart) had probably caused his blackout. The operator required surgery 5 days after the accident and further care from a specialist.

Operations Information

The MUNI train operators were governed by a rule book titled *San Francisco Municipal Railway, Rules and Instructions Handbook*. According to Rule 4.9.4 in the handbook, “Operators must not cut-out or bypass any vehicle function, or change operating modes without approval from [the Operations Control Center].”

The *Operator’s Training Program* manual, effective September 2008, also explained the proper method of exiting the ATCS territories:

EXIT PROCEDURES

After exiting the portal, the train will stop at a predetermined location.

Select Cabs/Street on the ATCS mode switch and set the Master Controller to On/Forward.

Move the T-Handle to the power zone and drive the train out of ATCS territory at no more than 9 mph at Duboce and Ferry Portals and no more than 5 mph at West Portal.

When the train has exited ATCS territory, the DDU will display 'Street Mode.'

Upon exit of ATCS territory at West or Duboce Portals, the right side steps must be placed in the low position.

NOTE!! At West Portal Station, when the train stops for passenger service, select cabs/street and set master controller to on/forward. Do not exceed 5 mph until fully clear of ATCS territory [boldface added].

The K Line operator was asked about putting the train in manual or cutout mode before reaching the station platform. Even though she had left the train in ATCS on the day of the accident, when she was asked, if there were a train at the platform would cutout mode be the simpler method to reach the platform, her response was, "yeah." Then she was asked whether she was required to contact the Operations Control Center (OCC) first. She responded, "Supposedly, but as a rule, they already are aware"

According to OCC data from before the accident, approximately 40 percent of the operators had changed from ATCS to manual before reaching the West Portal Station platform. OCC employees confirmed that the operators had not been asking permission before cutting out the ATCS prematurely. One of the OCC employees was asked whether it was a common practice for the operators to cut out the ATCS and operate the train manually when pulling into the West Portal Station. He answered, "It's been a common practice, yes." He explained that the system he monitored showed the train's number in black when the train was in ATCS and in yellow first then green when the train was in manual, making it easy to observe when a train switched to manual.

Governmental Oversight of MUNI

The Rail Transit Safety Section of the California Public Utilities Commission (CPUC) has regulatory oversight of MUNI. In 2005, the CPUC had performed a triennial safety oversight audit and, on October 5, 2006, approved the final report of the audit. The audit included the Cable Car System, the Historic Streetcar System, and the LRV System. In the report, the CPUC had proposed 43 safety recommendations for all three systems. To date, the CPUC has closed all but 5 of the 43 recommendations. MUNI has implemented corrective action plans that are still in process for those that have not been closed.

The CPUC continues to monitor the progress of the corrective action plans taken by MUNI and takes an active role in investigating accidents that occur on the MUNI rail division.

Management Oversight

Employee Monitoring

MUNI has had an observational monitoring program since June 8, 2004 (the plan was revised on February 6, 2009).⁵ The procedures are explained in a document titled *Rail Vehicle Transit Operator Compliance Program*. According to MUNI's program, the monitoring is done primarily by training instructors, who monitor the operators either "formally or surreptitiously" (that is, either with or without knowledge that they are being monitored).

Under the monitoring program, each operator gets a yearly formal compliance check, and at least 20 percent of the operators get an additional surreptitious compliance check. Additional checks are done at the discretion of operating management. The records indicated that the L Line operator had passed a formal compliance check on June 26, 2009, and the K Line operator had passed a formal compliance check on March 16 and May 13, 2009.

Medical Requirements

MUNI train operators are required to pass a physical every 2 years and to obtain a commercial driver's license (CDL) from the California Department of Motor Vehicles (DMV). The California DMV uses the medical requirements provided in the Federal Motor Carrier Safety Regulations, Title 49 *Code of Federal Regulations* 391.43, *Medical examination; certificate of physical examination*, when issuing CDLs. The medical certificates for both operators were current.

MUNI Actions Taken Since Accident

Entering West Portal Platform When It Is Occupied

Prompted by NTSB investigators, MUNI researched the number of times that a train had left the subway tunnel and entered the West Portal Station platform while the platform was already occupied by another train. (A train cannot enter the platform when it is already occupied unless the operator cuts out the ATCS.) Between July 2008 and July 2009, on average, each month 2,635 trains entered the platform at West Portal Station while it was occupied. The month after the accident the number dropped to 11 and averaged 8 for the next 9 months. (There was no record of whether these movements were made with permission from the OCC.)

Operating Rules

On July 20, 2009, 2 days after the accident, the superintendent of the Green Division (train operations) issued a bulletin reminding the train operators not to cut out the ATCS without OCC permission. The final sentence of the bulletin states, "Failure to comply with these existing rules outlined in the *Rules and Instruction Handbook* will result in discipline, up to and including termination."

⁵ The revision is a partial response to the CPUC's recommendation "... to include the newly adopted observation check procedures by the Cable Car Division." The recommendation is one of the open ones for which MUNI has implemented a corrective action plan and awaits a response from the CPUC.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the July 18, 2009, collision of two San Francisco Municipal Railway Transit System trains in San Francisco, California, at West Portal Station was the failure of the operator of L Line train 1407 to maintain the train in automatic mode until reaching the station stop at the West Portal platform, which would have been a safeguard against his loss of consciousness. Contributing to the accident was the San Francisco Municipal Railway Transit System's failure to monitor and enforce the requirement that the operator wait until reaching the platform before changing the operating mode of the train.

Adopted: April 13, 2011