RAILROAD SIGNAL & TRAIN CONTROL GROUP
FACTUAL REPORT OF INVESTIGATION

Train Collision at End of Track
Long Island Rail Road Commuter Train 2817
Atlantic Terminal – Brooklyn, New York
January 4, 2017

DCA 17 FR 002

(7 Pages)

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF RAILROAD, PIPELINE & HAZ-MAT INVESTIGATIONS
WASHINGTON, D.C. 20594

RAILROAD SIGNAL & TRAIN CONTROL – FACTUAL REPORT

A. ACCIDENT

Location:	Track 6, Atlantic Terminal in Brooklyn, New York
Carrier:	Long Island Rail Road (LIRR)
Train 1:	Westbound Commuter Train 2817
Date:	January 4, 2017
Time:	8:18 am, Eastern standard time
NTSB No.:	DCA 17 FR 002

B. SIGNAL & TRAIN CONTROL GROUP

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C. SYNOPSIS

For a summary of the accident, refer to the *Accident Summary* within this docket.

D. DETAILS OF THE INVESTIGATION

D.1 Description of Railroad Signal System

D.1.1 Far Rockaway Branch

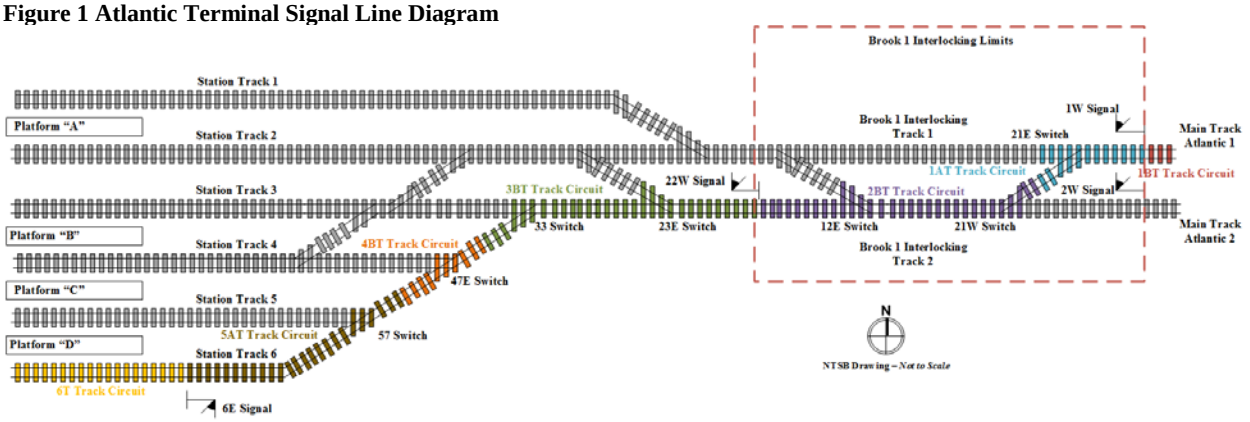
The Far Rockaway branch line of the Long Island Rail Road is oriented in an east/west timetable direction. The branch line runs from the Far Rockaway train station to the Valley Stream train station where the branch line connects to the Atlantic branch two main tracks in the borough of Queens in New York City (Queens County). The Atlantic branch continues west and terminates at the Atlantic Terminal train station in the borough of Brooklyn in New York City (Kings County).

LIRR train movements on the Far Rockaway branch are governed by operating rules, general orders, timetable special instructions and the signal indications of a Traffic Control System (TCS) supplemented with an Automatic Train Control System (ATC). Alternating current track circuits provide train occupancy detection. Wayside position light and colorlight signals display movement authorities.

D.1.2 Atlantic Terminal

Train movements into the Atlantic Terminal are coordinated by the Brook 1 tower operator located at the Atlantic Terminal train station.

Figure 1 Atlantic Terminal Signal Line Diagram



Cab signal track codes are not transmitted west of the 1W signal on Brook track 1 and the 2W signal on Brook track 2 for westbound train movements approaching the Atlantic Terminal train station. Train movements into the passenger terminal platforms are at restricted speed. The ATC enforces a maximum speed of 15 mph into the Atlantic Terminal platform tracks. Train 2817 was routed into the Atlantic Terminal train station on track 1, through the 21 crossover switches and into platform track 6. LIRR uses US&S, A-5 pneumatic switch machines.

D.2 Postaccident Signal Data Logs

Table 1 is a summary of the signal and train control download from the Brook 1 Interlocking at the Atlantic Terminal. Signal data log clock times are from the independent local computer and are not synced to any central clock.

Table 1 ***Postaccident signal data log for Brook 1 Interlocking***

Time	Event
8:03:19	22W signal to 6E signal route indicates locked and lined
8:03:20	Hold applied to 6 Track
8:04:42	1W signal to 22W signal route requested
8:04:55	1W signal to 22W signal route indicates locked and lined
8:07:47	Track circuit 1BT indicates occupied
8:08:49	Track circuit 1AT indicates occupied, Train 2817 advances past 1W signal
8:09:07	Track circuit 2BT indicates occupied, Train 2817 traversing 21 crossover
8:09:33	Track circuit 3BT indicates occupied Track circuit 1BT indicates unoccupied
8:09:51	Track circuit 1AT indicates unoccupied
8:09:53	Track circuit 4BT indicates occupied
8:10:08	Track circuit 5AT indicates occupied
8:10:14	Track circuit 2BT indicates unoccupied
8:10:17	Track circuit 6T indicates occupied
8:10:51	Track circuit 3BT indicates unoccupied
8:11:00	Track circuit 4BT indicates unoccupied
8:11:01	Track circuit 5AT indicates unoccupied Train 2817 clears route from 1W signal to 6E signal

D.3 Postaccident Signal System Examination and Testing

The postaccident examination found the signal equipment and appurtenances at the Atlantic Terminal locked and secured with no indications of tampering or vandalism. Following the accident, signal cabinets were sealed as requested by FRA and NTSB.

The investigation group tested the pneumatic switch machines involved in the route for train 2817 and no exceptions were taken. Switch obstruction tests, point detector tests, restoring feature tests, valve locks and valve magnet tests were completed with no exceptions noted. Route locking tests were performed for the accident train route and no exceptions were noted. Ground tests of the signal cabinet and equipment in the train control room did not identify any grounds.

Maintenance, inspection and test records were reviewed. LIRR records were in accordance with FRA requirements. Daily ground test records were reviewed for November and December 2016. Quarterly switch controller, point detector, fouling circuits and restoring feature inspection and test records were reviewed and did not indicate any signal anomalies. Monthly switch obstruction tests, yearly valve locks, and valve magnet tests records indicate the tests were performed as required.

D.4 LIRR Signal Failure Reports

The signal investigation group reviewed signal failure reports for Atlantic Terminal for the previous year. Table 2 is a summary of the signal failure reports.

Table 2 ***LIRR Signal Failure Reports for Atlantic Terminal***

Date	Location	Reported Problem	Action Taken
1-08-16	Brook 1 Tower	A system grayed out, Operator is on B system	Operator error, computer rebooted and A system recovered control
2-01-16	Brook 2 Signal Hut	Link A and Brook 2 systems failing	Communication failure, re-set system and recovered. No further failures reported
2-13-16	Brook 2 Signal Hut	Low air pressure alarm at Brook 1	Weather related, ice removed from air lines at 12 switch
2-15-16	Brook 1 Tower	Low air pressure at Brook 1, high pressure air line broken	Air line repaired
2-25-16	Brook 1 Tower	33E switch failed to go reverse	Operator error, unable to duplicate error
2-27-16	Brook 2 2W Signal	100 Hz Buss out of phase	Split closed and Busses are in phase
3-08-16	Brook 1 Tower	Low air pressure alarm at Brook 1	Compressor was not running, it was repaired and corrected
3-08-16	Brook 2 Signal Hut	Signal indications not received from Tower 3	Outside facilities corrected problem
3-15-16	Brook 1 Tower	Switch A5 – A1 going normal and reverse very slow	CP valve replaced
4-02-16	Brook 2 Signal Hut	Brook 2 A link failure indicated	Follow up completed, no cause found and error cleared
4-04-16	Brook 1 Tower	Possible derailment reported	No derailment, train struck plywood
4-05-16	Brook Tower	32 Switch was reverse and needed to be normal in order to have 33 switch normal	Operator error, all switches operating correctly

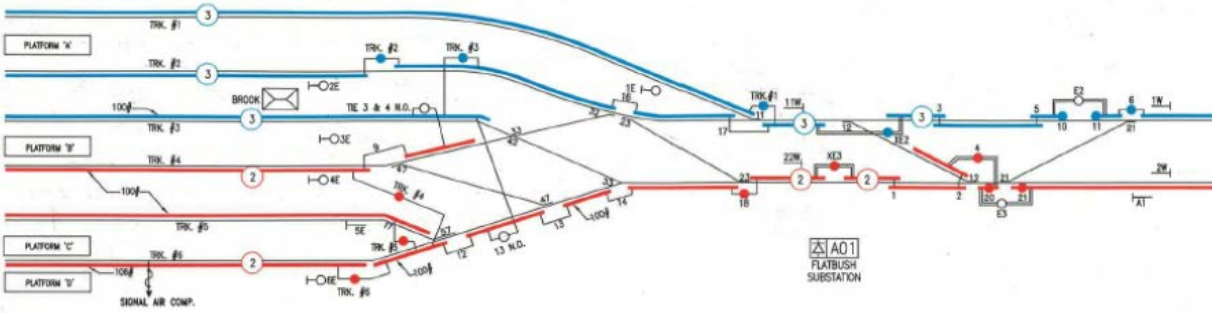
Date	Location	Reported Problem	Action Taken
4-26-16	Brook 2 Signal Hut	Unable to reverse 32 switch	Low air pressure not allowing switch to throw, points dragging with resistance due to surfacing, Track notified
5-04-16	Brook	Non-vital system reboot	Operator in training
5-14-16	Brook 2 Signal Hut	Operating off the alternate Communications System	Communication line rollover to alternate lines
5-31-16	Brook 2, 2W Signal	Dark signal	Battery leads of 2 cells broken, batteries replaced
7-17-16	Brook	22E signal went to Stop in front of train	Impedance bond connection replaced
7-17-16	Brook	Brook Tower model board went dark and switched to B system	Re-set A system and working as intended
7-17-16	Brook 2, 22E Signal	Trains reporting signal dropping out in front of them	Impedance bond repaired
7-18-16	Brook 2, 22E Signal	Trains reporting signal dropping out in front of them	Impedance bond repaired
7-23-16	Brook 2	A6TR track circuit out	Testing did not find any problems with circuit, bad insulated joint was found
7-24-16	Brook	Tower getting 15 code with 22E signal at clear	Insulated joint was replaced
7-25-16	Brook 2 Signal Hut	Communication line rollover to alternate system	Non–vital supervisory system rollover to alternate or B system
7-28-16	Brook 2 Signal Hut	22E signal dropped in front of train 2882	Insulated joint was replaced
7-29-16	Brook 2 Signal Hut	Train 770 reported 2E signal going from clear to restricting and back to clear	Insulated joint was replaced
8-01-16	Brook 2 Signal Hut	A6TR and A10TR track circuits observed going out	Insulated joint was replaced
8-10-16	Brook 2 Signal Hut	21 switch hung up going normal	Heavy grinding on gauge plates reported, Track notified
8-16-16	Brook Tower	21 switch unable to go reverse	Maintainers report excessive ballast in point due to third rail work
9-06-16	Brook 2 Signal Hut	Communication link rolled over to alternate, or redundant system	Working as intended
9-11-16	Brook 1 Tower	Intermittent track circuit problems causing 1W signal to drop	On-going track work causing third rail conditions
9-15-16	Brook	1ATR track circuit out	ET crews working on loose 54 jumper on 12 switch crossover inadvertently causing track circuit to fail
10-08-16	Brook 1 Tower	Track circuit out at Brook 1, Atlantic #2	Found lag screw and spike bridging rails

Date	Location	Reported Problem	Action Taken
11-04-16	Brook 2 Signal Hut	Unable to normal 12 switch at Brook 2	Track conditions
11-07-16	Brook 1 Tower	41W switch with no indications	Rail braces missing, Track notified
11-23-16	Brook 2	Non–vital supervisory working off B system	On alternate modem, working as intended
11-28-16	Brook 2 Signal Hut	Lost 60 Hz phase	Operating off alternate AC source
11-29-16	Brook 2 Signal Hut	Unable to reverse 32 switch at Brook 2	Switch hung up in reverse due to surfacing condition, Track notified
12-01-16	Brook 2 Signal Hut	Unable to normal 32 switch at Brook 2	Stock rail shifting when point go over, Track notified
12-02-16	Brook	33 switch problems at Brook 1	No issues found with 33 switch, switch found working properly
12-20-16	Brook 2 Signal Hut	Compressor wont activate	Compressor repaired and back online
12-26-16	Brook 2 Signal Hut	Unable to reverse 12 switch at Brook 2	Maintainer graphited all ends, tested and no further failures
12-26-16	Brook	22W signal running time but will not release route	Found 22WAS relay not fully seated into base
12-27-16	Brook 1 Tower	22W signal unable to display	High resistance wire termination

D.5 Description of Traction Power System

Train propulsion power is supplied from a 750 volt DC electrified contact rail. The third rail is located parallel to the running rails. The third rail is equipped with a cover board but allows for the contact rail shoes affixed to the rail cars to contact the top of the third rail as it moves along the track.

Figure 2 ***Atlantic Terminal Traction Power Layout***



The train propulsion power system is monitored using a SCADA system[1]. The SCADA log records changes in parameters such as circuit breaker conditions. LIRR power traction SCADA computer clocks are synchronized to GPS time. For the investigation, the SCADA clock times will be the standard time reference for all wayside field and onboard event recorders. Feeder breaker 20 was the traction power feed for platform tracks 4, 5 and 6.

[1] Supervisory control and data acquisition (SCADA) is a computer system that networks and incorporates real-time databases to describe the current state of a system.

Table 3 ***Traction power SCADA data log summary***

Time	Event
8:18:01	Feeder breaker 20 indicates open
8:18:08	Feeder breaker 20 indicates closed (automatic reset)
9:56:27	Feeder breaker 20 indicates tripped open

D.6 Damages

The railroad signal and train control system did not sustain any damages as a result of the accident. Estimated costs of damages to the third rail, train propulsion system can be referenced in the Track and Engineering Group factual report.

D.7 Positive Train Control System

The Rail Safety Improvement Act of 2008 was enacted on October 16, 2008 (Public Law 110-432) and required implementation of a PTC system by December 31, 2015.

In October 2015, Congress extended the PTC deadline by at least 3 years to December 31, 2018 with the opportunity for an additional 2 years upon US DOT approval. DOT will not enforce PTC regulations during the additional 2-year extension.

On August 10, 2010, LIRR filed their PTC Implementation Plan (rev 2.1). FRA granted provisional approval on July 7, 2011 of the LIRR PTCIP (rev 2.2). According to the 2016 fourth quarter update report, LIRR reported to the FRA a planned timeline for full implementation of PTC technology by December 2018. The LIRR implementation plan is to supplement its Automatic Speed Control with a vital microprocessor based Automatic Civil Speed Enforcement System (ACSES II). ACSES will provide for enforcement of maximum authorized speeds, permanent and temporary speed restrictions, and positive stop enforcement on the approach to interlocking home signals and in non-automatic speed control territory for automatic block signals with an aspect of Stop and Proceed. Existing LIRR rules and procedures will remain in effect after PTC implementation. Additional rules and procedures will be added relevant to PTC.

Under the main line track exceptions section of the federal regulations, LIRR requested and FRA approved a Passenger Terminal Exception for trackage between Brook 1 Interlocking limits and the Atlantic Terminal station pursuant to Title 49 CFR 236.1019(b)(1) (2) and (3). In their request, LIRR established that the 5 mph maximum authorized speed for train movements through this area would remain. Furthermore, since no cab signal codes are transmitted on the rails west of Brook 1 interlocking home signals, a 15 mph maximum speed limit will still be enforced by the restricting aspect of the automatic cab signal system. In their request, LIRR also indicated that no freight trains operate in this area and train movements will remain under interlocking rules.

END OF SIGNAL & TRAIN CONTROL FACTUAL REPORT