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End-of-Track Collisions at Terminal Stations

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New Jersey Transit Strikes Wall in Hoboken Terminal
Hoboken, New Jersey

September 29, 2016

Jim Southworth

Train No.1614 Information

- Four cars, one locomotive
- Engineer, Conductor, and Brakeman
- Departed Spring Valley, NY at 7:23 a.m.
- Estimated 250-300 passengers on board

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Recorded Information

- Captured the sound of the train horn and bell
- Throttle increased idle to #4 position 38 seconds before collision
- Speed increased from 8 mph to 21 mph
- Throttle down to idle
- Emergency braking <1 second before collision

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Parties to the Investigation

- Federal Railroad Administration (FRA)
- New Jersey Transit (NJT)
- Brotherhood of Locomotive Engineers and Trainmen
- International Association of Sheet Metal, Air, Rail and Transportation Workers
- Brotherhood of Railroad Signalmen

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Long Island Rail Road Train Strikes Platform Atlantic Terminal

Ted Turpin

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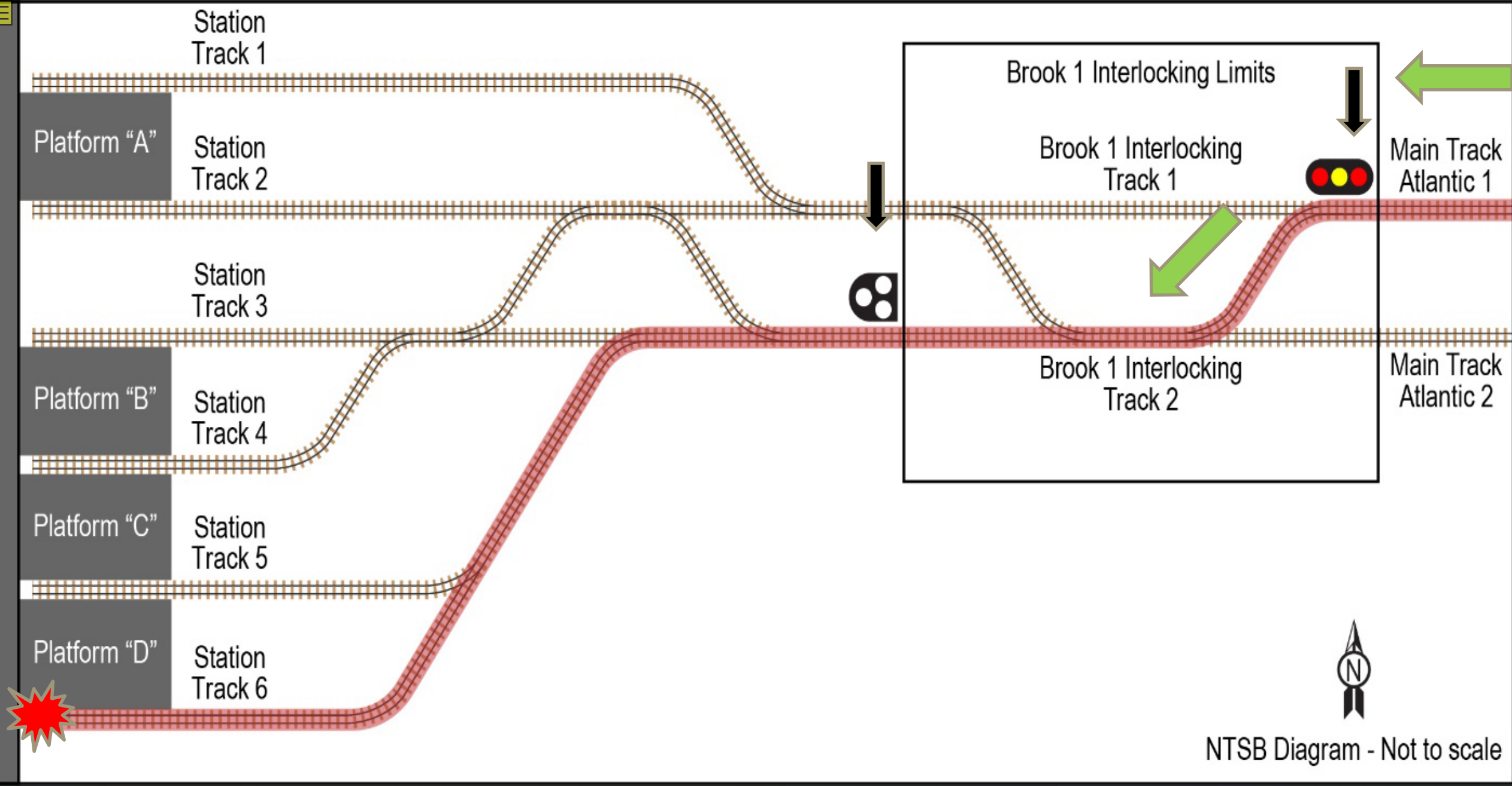

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- Federal Railroad Administration
- New York Public Transportation Safety Board
- Long Island Rail Road
- Metropolitan Transportation Authority
- Brotherhood of Locomotive Engineers and Trainmen
- International Association of Sheet Metal, Air, Rail, and Transportation Workers

Hoboken vs. Atlantic Terminal

- Both engineers failed to control their trains
- Both had Obstructive Sleep Apnea issues
- Both trains overran the end of the track
- Both railroads granted exemption from positive train control on terminal tracks

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Special Investigation Report Issues

- Ensure that engineers are fit for duty
- Installing positive train control at terminal tracks
- Developing and implementing safety management systems

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Medical Issue - Obstructive Sleep Apnea

Nicholas Webster, MD

Obstructive Sleep Apnea (OSA)

- Airway obstruction while sleeping
- Oxygen ↓ and carbon dioxide ↑ - awaken to breathe
- Fragmented sleep - fatigue / increases accident risk

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Risk Factors for OSA

- Male
- Obesity
- Snoring
- Daytime sleepiness
- High blood pressure
- Age
- Large neck circumference
- Large hip circumference

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Evaluation and Treatment

- Simple screening
  - Questionnaire and measurements
- Definitive testing
  - Sleep study
- Effective treatment
  - Reduces fatigue and accident risk

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New Jersey Transit OSA Screening

- Operating crews - OSA screening during periodic exams
- Engineer met criteria but not referred for sleep study
- Conductor and brakeman met criteria but not referred for sleep study

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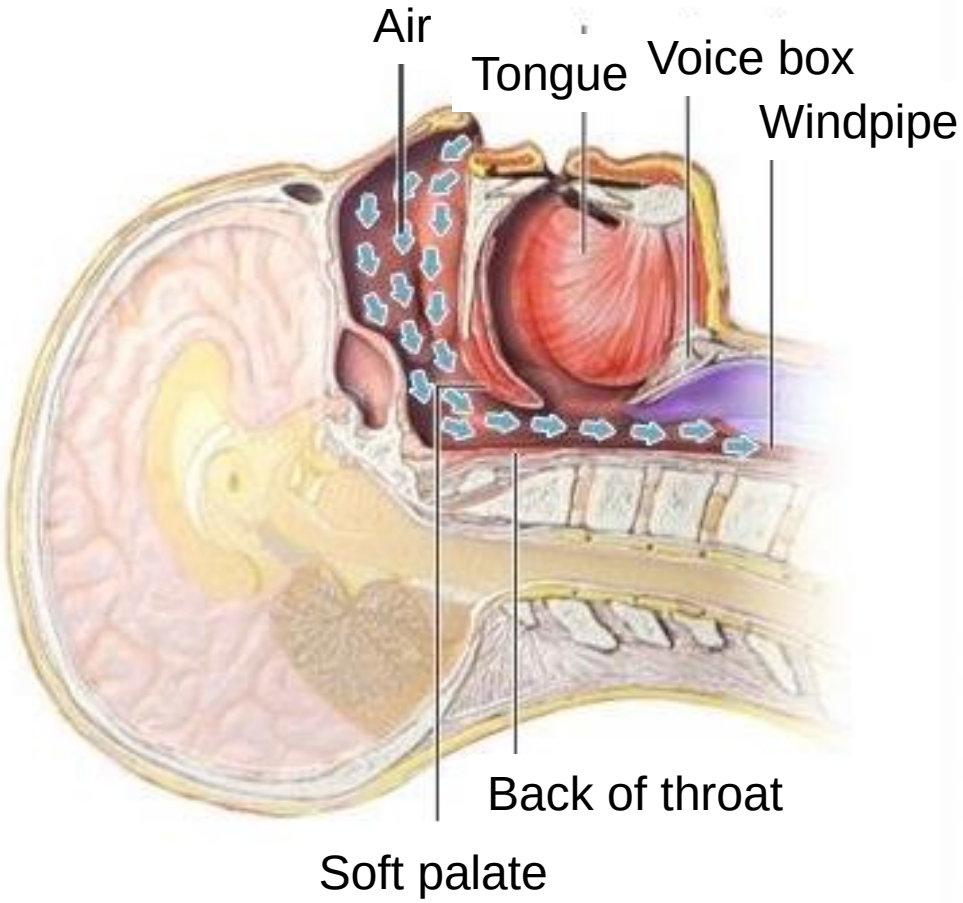
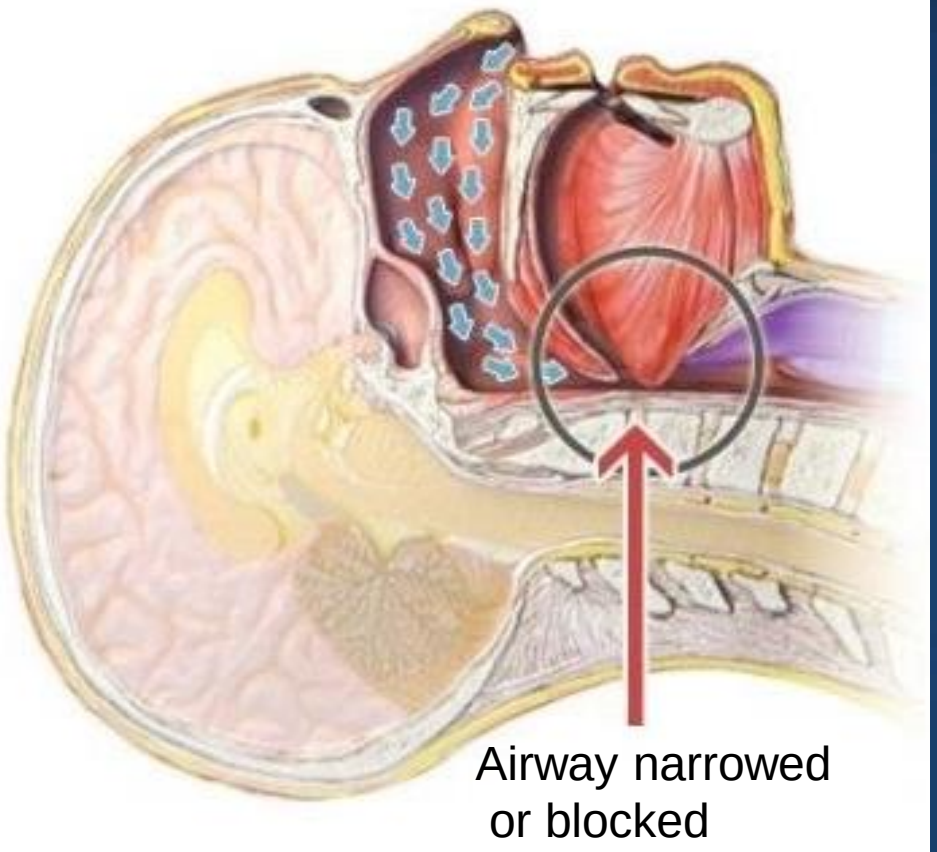
OSA - Airway Obstruction

Normal Breathing



Obstructive Sleep Apnea



https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0072458/

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NJT Engineer's Postaccident Sleep Study

- 6 ft, 322 pounds, BMI 43.67 kg/m^2
  - Obesity - BMI > 30; extreme obesity - BMI > 40
- AHI = 89.6 episodes per hour
- Oxygen saturation dropped as low as 53%
- Diagnosis - severe OSA – prescribed continuous positive airway pressure (CPAP)

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Long Island Rail Road OSA Screening

- LIRR had planned but not implemented OSA screening
- Engineer not screened for OSA

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LIRR Engineer Postaccident Sleep Study

- 5 ft 10 in, 275 pounds, BMI 39.5 kg/m^2
- AHI = 101.3 episodes per hour
- Oxygen saturation dropped as low as 73%
- Diagnosis - severe OSA - prescribed CPAP

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Chaffee, Missouri - 2013
2 injured

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Hoxie, Arkansas - 2014

2 dead, 2 injured

Hoboken, New Jersey - 2016
1 dead, 110 injured

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Brooklyn, New York - 2017
108 injured

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Railroad Safety Recommendations for Sleep Apnea since 2001

- Eight NTSB Safety Recommendations
  - Screen
  - Diagnose
  - Ensure adequate treatment

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FRA FMCSA - Recent OSA Actions

- March 2016 - Advanced Notice of Proposed Rulemaking (ANPRM) for OSA
- August 2017 - ANPRM withdrawn - no further rulemaking actions for OSA

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NTSB Recommendations to FRA

January 18, 2018 - Open - Unacceptable Response

1. Require railroads to medically screen employees in safety-sensitive positions for sleep apnea and other sleep disorders (R-12-16)
2. Develop and enforce medical standards that railroad employees in safety sensitive positions diagnosed with sleep disorders must meet to be considered fit for duty (R-16-044)

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Positive Train Control

Ruben Payan

PTC Protection

- Train-to-train collisions
- Overspeed derailments
- Incursions into established work zones
- Movements through misaligned switches

- Other functions, as applicable

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PTC Statutory Timeline

Oct.16, 2008
Rail Safety Improvement Act PTC deadline Dec. 31, 2015

Oct. 29, 2015
Congress extends deadline to Dec. 31, 2018 with possible 2-year extension

Dec. 31, 2015
Original PTC implementation deadline expires

Feb. 6, 2018
NTSB Board Meeting

Dec. 31, 2018
PTC implementation deadline with possible 2-year extension

Dec. 31, 2020
Extended PTC implementation deadline

PTC Implementation Progress

Railroad Property	LOCOMOTIVES EQUIPPED & PTC OPERABLE	TRACK SEGMENTS COMPLETED	RADIO TOWERS INSTALLED	TRAINING COMPLETED	ROUTE MILES IN PTC OPERATION	PTC SAFETY PLAN ¥	SPECTRUM ±
LI LONG ISLAND RAIL ROAD	49%	7%	100%	38%	0%	–	✓
	287/580 LOCOMOTIVES	1/15 TRACK SEGMENTS	69/69 TOWERS	1,207/3,194 EMPLOYEES	0/321 MILES	NOT SUBMITTED	AVAILABLE
NJTR NEW JERSEY TRANSIT RAIL	6%	0%	19%	12%	0%	–	✓
	25/440 LOCOMOTIVES	0/11 TRACK SEGMENTS	24/124 TOWERS	137/1,100 EMPLOYEES	0/326 MILES	NOT SUBMITTED	AVAILABLE

Graph Courtesy of FRA

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PTC Exclusions

- FRA considers exemptions for yards and terminals
- Both NJT and LIRR requested exemption
- FRA granted exemptions for Hoboken and Atlantic Terminals

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End-of-Track Without Protection

- Will continue to rely on engineer actions
- Will not ensure train is sufficiently braking
- Will not ensure train will stop before end of track
- Will most likely continue to result in collisions

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System Safety

Georgetta Gregory

Commuter Rail System Safety

- System Safety
- Safety Management Systems
- System Safety Program Plans
- Risk Management
- Federal Railroad Administration

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System Safety

- Systematically identify, analyze, and control hazards
- Optimize safety throughout all phases of the system life cycle
- Identify then mitigate or eliminate hazards and the resulting risk

Safety Management Systems

- How an organization manages safety
- Four Components

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System Safety Program Plan

- Management and engineering discipline
- First element of a formal process for applying system safety principles
- Basis for identifying any and all hazards

Risk Management

- Risk-based hazard management program
- Risk-based hazard analysis to identify risks
- Mitigate or eliminate hazards

System Safety Program Plans – Hazard Management

- MIL-STD-882 for hazard analysis
- Reliance on rules compliance
- No hazard analysis for collision with end of track
- No hazard analysis for medical fitness for duty

New Jersey Transit and Long Island Rail Road

- Voluntary system safety program plans
- Ineffective in identifying operational hazards
- Ineffective in identifying hazards from fatigue cause by sleep disorders

FRA – System Safety Timeline

- 1994 Federal Railroad Safety Authorization Act
- 1996 FRA Emergency Order No. 20
- 2007 RSAC System Safety Task Group
- 2007 *Collision Hazard Analysis Guide: Commuter and Intercity Passenger Rail Service*
- 2008 Rail Safety Improvement Act
- 2012 NPRM 49 CFR Part 270: System Safety Program
- 2016 Final Rule 49 CFR Part 270: System Safety Program
- 2017 Stay of Regulation

Collision Hazard Analysis Guide: Commuter and Intercity Passenger Rail Service

- Published by the FRA in October 2007
- Application of MIL-STD-882 for hazard analysis
- Examples from commuter railroads

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FRA – System Safety Program

- NTSB Safety Recommendation R-17-17:
  - Enact Title 49 *Code of Federal Regulations* Part 270, System Safety Program, without further delay.
- *Collision Hazard Analysis Guide*

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