New Jersey Transit
Supplemental Party Submission
December 21, 2017

NTSB Investigation DCA16MR017

Train 1614 Collision with Bumping Post
Hoboken Terminal, New Jersey
September 29, 2016

1. Basis for NJT Supplemental Party Submission

The NTSB and the Parties to this investigation completed 11 Group Factual Reports during the spring of 2017.[1] New Jersey Transit (NJT) signed on to all of them. NJT then provided its Party Submission on June 20, 2017.

On October 17, 2017, four months after providing its Party Submission, NJT was surprised to receive an additional draft NTSB factual report with a request for review and comment. That report was in the area of "System Safety." NJT provided recommended changes to that draft factual report on October 24, 2017. Many were not incorporated, so NJT provided additional comments on November 16, 2017. NJT has not received a revised version. NJT has not signed the System Safety Factual Report.

If the System Safety Factual Report is finalized and docketed, it will introduce factual issues into the investigation that did not exist when NJT provided its original Party Submission. For that reason, NJT has accepted the Chairman of the System Safety Group's invitation to provide this Supplemental Party Submission.

Given that this investigation is scheduled to be discussed at an NTSB Meeting on February 6, 2018 (**in less than seven weeks**), NJT is providing this Supplemental Party Submission now, based upon the draft System Safety Factual Report, rather than wait to see which of NJT's suggested changes to the draft System Safety Factual Report are accepted and which are not.

2. Scope of NJT Supplemental Party Submission

The draft NTSB System Safety Factual Report that was provided for NJT review includes a hazard analysis discussion that focusses on prior instances in which NJT trains impacted stopping blocks.[2] It suggests that stopping blocks themselves are hazards. This Supplemental Submission explains NJT's view that the hazard at issue is actually trains that fail to stop, rather than the stopping blocks that the trains impact. This Submission also notes that NJT is in the process of replacing all of the stopping blocks at Hoboken terminal with stopping blocks intended to reduce impact decelerations at speeds up to 10 mph. The speed at impact with the stopping bock in this accident was 21 mph. Unfortunately, given that the energy in a collision varies with the square of the speed, even the new 10 mph energy-absorbing stopping blocks would not have safely absorbed the energy of the subject 21 mph impact.

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[1] These 11 NTSB Factual Reports were: 3D Scanning; Event Recorder; Human Performance; Mechanical; Medical; On-Board Images; Operations; Personal Electronic Devices, Signal & Train Control; Survival; and Track & Engineering.

[2] "Stopping blocks" are also referred to in the industry as "bumping blocks," "bumping posts" and "end blocks." For the purposes of this submission, these terms are synonymous.

The draft NTSB System Safety Factual Report that was provided for NJT review also includes extensive excerpts from NTSB interviews with NJT safety personnel and provides a detailed summary and discussion of the NJT Rail *System Safety Program Plan* (SSPP) that was in effect at the time of the accident. Because the prior NTSB factual reports in this investigation did not have this focus, NJT's prior Party Submission did not comment upon its Rail System Safety Program Plan. This Supplemental Submission does.

3. Previous New Jersey Transit Bumping Post Collisions

NJT operates the third largest commuter rail operations in the Unites States: nearly 700 trains in three states on weekdays serving more than 150 passenger stations and traveling 2 billion passenger miles per year over 11 lines and into 12 storage yards.

From January 1, 2007, until this September 29, 2016 accident[3], NJT trains failed to stop and collided with bumping posts seven times:

Date of Accident	Location	Description	Disciplinary Action Against Engineer	FRA Reportable	Total Injuries Injury Severity	Total Damage
06/02/15	Hoboken Terminal, Track #2	Passed the stop signal	Second Decertification 180 days OOS	Yes	1 employee: bruised head, lost 15 days	$23,802
05/31/15	Princeton Station	Failure to comply with restricted speed. Engineer reported rain and wheel slip.	C3RS No disciplinary action	No	0	$1,471
05/14/14	NY Penn Station Track #2	Struck while reversing	5 days OOS	No	0	0
06/08/11	Princeton Station	Failure to comply with restricted speed.	45 days OOS	Yes	2 passengers: 1 Sprained neck 1 Cut/bruised leg	$53,500
01/04/10	Hoboken Terminal, Track #8	Failure to comply with restricted speed	5 days OOS	Yes	0	$16,000
07/08/07	NY Penn Station Track #2	Failure to use proper methods to stop train	No records available	Yes	2 passengers: 1 Sprained arm & neck 1 Bruised leg	$80,600
05/05/07	Hoboken Terminal Hill Yard	Failure to secure engine. Engine rolled while attempting to couple.	No records available	Yes	0	$28,942

During this 9.75-year timeframe, NJT operated more than 1.7 million individual trains (700 trains per weekday x ~250 weekdays/year x 9.75 years = 1,706,250). The frequency of these incidents is very small: once in every 240,000 train trips. While there is obvious potential for serious injury, that potential is a function of the speed (and energy) with which a train impacts a stopping block. Four of these seven incidents involved very low speeds and no injuries at all. The remaining three involved only sprains, bruises and one possible cut – all relatively minor injuries to four passengers and one NJT employee.

- Three of the seven incidents occurred at the Hoboken terminal. Two of these three involved no injuries (in one of these two the engine was rolling during a coupling maneuver). In the one Hoboken incident with an injury, an employee

[3] The NTSB asked NJT to search its records for train impacts with bumping posts for the ten years prior to this accident.

bruised his head.

- Two of the remaining four incidents occurred at the Princeton Station. One involved no injuries. The other resulted in one passenger's strained neck and another passenger's cut or bruised leg.
- The final two incidents occurred at Penn Station in New York. One involved no injuries. The other resulted in one passenger's strained arm and neck and another passenger's bruised leg.

NJT investigations of the most recent five of the seven instances resulted in the three of the engineers responsible for the trains' collisions with the bumping posts receiving disciplinary action (NJT has no disciplinary records for the oldest two of the seven). In those two instances involving injuries, that disciplinary action was substantial (180 days and 45 days Out-of-Service (OOS)).

The September 29, 2016 accident at issue, in which an NJT engineer had slowed his train down to 8 mph as he entered the terminal, but then accelerated to a 21 mph impact with the bumping post,[4] is in a category by itself. NJT has no records of any similar incident.

4. The NJT System Safety Program Plan

NJT's 2011 *Rail System Safety Program Plan* (SSPP) was in effect at the time of this September 29, 2016 accident.[5] NJT's SSPP followed the guidelines of the American Public Transportation Association (APTA) *Manual for the Development of System Safety Program Plans for Commuter Railroads* (manual). [6] That manual was developed by the commuter rail industry jointly with the Federal Railroad Administration (FRA) and the U.S. Department of Transportation, to improve overall safety on commuter railroads. The manual was last revised in 2006 to provide adjustments needed to better align the practice of system safety with the modal characteristics of the industry, and the unique operational context of each commuter rail system.

NJT generally also has APTA conduct audits every three years. The last audit occurred on April 16 and 17, 2012.[7] In that audit, APTA commended NJ TRANSIT for its continuing efforts to improve system safety. The audit report explicitly noted: "The effort of NJ TRANSIT to achieve a strong degree of program implementation in all areas of system operation is due to the effectiveness of its management, and a strong commitment to voluntarily comply with all safety recommendations."
The 2012 APTA audit report did not identify any risk or hazard associated with trains that fail to stop on stub-end tracks. At that time, NJT had had four such instances in the preceding five

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4 See NTSB 10/03/16 Preliminary Report DCA16MR011 for this accident.

5 New Jersey Transit Rail System Safety Program Plan, October 2011, SAF-997, Rail Safety Department, effective October 31, 2011. There were six prior NJT Rail System Safety Plans: 1997, 1999, 2000, 2001, 2003 & 2008.

6 American Public Transportation Association (APTA) Manual for the Development of System Safety Program Plans for Commuter Railroads, Revision 2.4, May 15, 2006. (APTA, Washington, D.C.).

7 There was no APTA audit of NJT in 2015 because the year before NJT commissioned an extensive external audit by TUVRheinland/RSC Rail Safety Consulting. The next APTA audit of NJT is scheduled for 2018.

years; two with no injuries and two with minor injuries.

When NJT adopted the SSPP in 2011, the intent was to update the plan annually. In 2012, however, the FRA issued a Notice of Proposed Rulemaking (NPRM) that announced its intent to require all commuter and intercity passenger railroads to develop and implement System Safety Programs (SSP). The proposed FRA rules envisioned a structured program with proactive processes and procedures. Once adopted, the rules would require each railroad to submit a written SSP plan to FRA for review and approval before implementation. The final rules were not published until August 12, 2016.[8] They have been stayed four times since then and currently have an effective date of December 4, 2018.[9]

If and when the SSP rules go into effect, they would require extensive changes to both the SSPP and the process used to develop it. For example, the SSP rules will require railroads to consult not just with the FRA during the development (or in NJT's case, update) of their SSP, but also with employees to ensure that all employees directly affected have an opportunity to provide input on the development, implementation, and evaluation of the railroad's SSP.

Moreover, in its NPRM, the FRA advised "shortly after publication of the final rule, FRA would publish a guidance manual to assist a railroad in the development, implementation, and evaluation of its SSP."[10] It elaborated:

> FRA plans on providing the railroads with a guidance manual that will assist in the development, implementation, and evaluation of their SSPs. This guidance manual (''Guide'') will provide the railroads with the most efficient and effective methods to implement their SSPs. Regarding most aspects of an SSP, a railroad will be able to refer to this Guide for assistance in implementing its SSP. FRA expects to publish the Guide shortly after the publication of the final rule in this proceeding.

That Guidance Manual has not yet been published.

In the meantime, NJT has continued to utilize its 2011 SSPP. That document followed the guidelines of APTA's ***2006*** Manual for the Development of System Safety Program Plans for Commuter Railroads. That 2006 Manual remains in effect; APTA has made no subsequent revisions that would require revisions to NJT's 2011 SSPP.

This does not mean that NJT has not updated its safety programs since 2011. To the contrary, significant changes have been made (as summarized in NJT's June, 2017 Party Submission). The SSPP has served its intended purpose of guiding the identification and resolution of safety concerns; the NJT SSPP is an umbrella document that provides the framework for the drafting

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8 49 C.F.R. Part 270, System Safety Program.

9 Due to petitions submitted by Labor organizations and various states, the effective date was recently revised by FRA.

10 2012 FRA NPRM, 77 FR 55372 (Sept. 7, 2012).

and adoption of specific NJT rules to address individual hazards. Examples of such rules include the Northeast Operating Rules Advisory Committee (NORAC) Operating Rules, System Timetable and Special Instructions, Electrical Operating Instructions TRO-3, Air Brake and Train Handling Instructions TR0-4, and Rail Employee Safety Rules and On-Track Safety Procedures Manual.

SSPP Section 3, *Hazard Management Process,* describes the hazard resolution matrix and the hazard analysis procedure.[11] It is the practice of the NJT to use safety committees to identify safety hazards. NJT also identifies hazards through scheduled inspections, code compliance, and adherence to various governmental regulations.

The NJT SSPP describes the mechanism used to formally identify, analyze, and resolve hazards as a critical element in its SSPP. Section 3 of the NJT SSPP states that following identification of a hazard; an analysis determines the potential severity and the probability of its occurrence.

The NJT SSPP defines hazard severity as a, "subjective measure of the worst result possible from an event that can result from personal error, environmental conditions, design inadequacies and/or procedure inefficiencies of the system." The SSPP categorizes hazards in one of four categories:

1. Catastrophic – may cause death or system loss
2. Critical – may cause severe injury or illness or major system damage
3. Marginal – may cause minor injury or illness or minor system damage
4. Negligible – will result in less than minor injury, illness or system damage

The seven prior instances in which an engineer failed to fully stop a train gave rise to either no injuries or minor injuries. That said the September 29, 2016, accident in which the engineer had slowed his train to 8 mph, but then accelerated up to 21 mph, gave rise to one fatality and many serious injuries. If the hazard is defined as an engineer failing to fully stop his or her train and impacting the bumper block, then the hazard severity could be categorized as "marginal." If, on the other hand, the hazard is defined as an engineer losing control, for whatever reason, and operating his train at higher speeds into a bumping block, the severity is clearly "catastrophic."

The NJT SSPP defines hazard probability as "the probability that a specific hazard will occur during the life expectancy of the system." Five levels of hazard probability are provided:

11 The U.S. Department of Defense Military Standard 882C, dated January 1993 serves as the reference document for this section. Note that the current standard version is Military Standard 882E, effective May 11, 2012.

DESCRIPTION	LEVEL	INDIVIDUAL ITEM	FLEET OR INVENTORY
Frequent	A	Likely to occur frequently	Continuously experienced
Probable	B	Will occur several times in the life of an item	Will occur eventually
Occasional	C	Likely to occur sometime in the life of an item	Will occur occasionally
Remote	D	Unlikely but possible to occur in the life of an item	Unlikely, but may occur
Improbable	E	So unlikely it can be assumed the occurrence may not be experienced	Unlikely to occur

There were seven instances in a 9.75 year period of time in which an engineer failed to fully stop a train and impact a bumping block. The probability that this will happen at NJT is 1 in 240,000 train operations. This suggests a likelihood of "remote."

If, on the other hand, the hazard is defined as an engineer losing control, for whatever reason, and operating his or her train at higher speeds into a bumping block, there are no known NJT instances of this happening before September 29, 2016. NJT engineers are required to participate in operating rules training annually, and to recertify triennially, with a focus on avoiding such operational accidents.

5. Post-Accident Changes in Policy, Procedures & Equipment

NJT previously advised of the following post-accident changes in policy, procedures and equipment:

- The maximum authorized speed for trains operated into Hoboken Terminal (train shed) has been reduced by 50%, from 10 mph to 5 mph.

- Certified conductor required to, at a pre-designated point prior to arrival at terminals with bumping posts, accompany the engineer on the leading end of the train, and in the unlikely event the engineer becomes incapacitated, or other undesired issue arises, is responsible for activating the train's emergency brake system.

- Additional emphasis has been provided to train and engine service crews regarding the criticality of Northeast Operating Rules Advisory Committee or NORAC rule 4, Job Briefings.

- Engineering firm has been retained to evaluate all bumping posts, provide replacement and/or enhancement recommendation(s).

- The installation of inward and outward facing locomotive and cab car cameras has been accelerated: 69% of outward facing cameras have been installed, and 59% of inward facing cameras have been installed.

- After the Hoboken accident, NJ TRANSIT implemented a program to ensure OSA screening forms are completed, centrally reviewed, and safety sensitive employees meeting referral criteria are removed from service until appropriately tested and, if testing identifies OSA, successfully treated. This new Rail OSA procedure – including temporary removal from service – was implemented on October 1, 2016. Union employees affected by this new procedure objected and the union submitted a formal challenge. In the intervening months, NJ TRANSIT drafted a new Policy for Detection and Treatment of OSA, shared that policy with the impacted unions, and discussed with those unions acceptable terms upon which union employees could be removed from service pending completion of a sleep study and treatment, if necessary. NJ TRANSIT's Executive Director signed the new corporate-wide policy (CWP 3.34 Obstructive Sleep Apnea Policy-Rail Operations) on April 20, 2017. On May 1, 2017, employees were notified that the policy applies to all NJ TRANSIT Rail Operations Federal Railroad Administration (FRA) covered employees and Federal Motor Carrier-Safety Administration (FMCSA) safety sensitive employees and contractors.

- To provide improved engagement opportunities with train and engine service crews, ten additional Rail supervisors will be hired for FY '18.

NJT is pleased to advise of the following additional safety initiatives since forwarding its Party Submission in June:

- Following the accident, NJT commissioned an analysis of the existing terminal-track bumper blocks at Hoboken Terminal and, for any bumpers that are not rated to at least 10 mph, recommendations for new or rehabilitation options. This analysis resulted in a recommendation to replace all existing fixed bumpers with 10-mph sliding friction bumpers designed for a deceleration rate of 0.15 g. That recommendation has been accepted. The new friction bumpers will be placed at a distance from the end of the tracks before that required to stop a train to provide an additional factor of safety. The analysis notes that the use of a bumper with a lower design speed would not protect against trains operating at the normal timetable speed of 10 mph and the use of a higher design speed would result in a significant loss of platform capacity or require use of a deceleration rate above 0.15 g. The analysis further notes that at or below 0.15 g, it is expected that the typical standing passenger can remain standing without holding on to the train and that above 0.15 g, the likelihood of passenger injury increases. Given that the energy of a collision varies with the square of the speed, it is not feasible to fit bumpers that would safely absorb the energy of an impact at the 21 mph involved in the September 29, 2016 accident.

- To augment the human performance aspect of operating a train into a terminating track at its Hoboken Terminal, NJ TRANSIT is implementing Civil Speed Enforcement Technology, a system so arranged that its operation will automatically result in a full service application of the train brakes if the speed of the train exceeds the predetermined rate. The application will continue until the train is either brought to a stop or, under the control of the engineer, its speed is reduced to the predetermined rate.

6. Conclusions

NJT's Conclusions have not changed:

- The train did not have mechanical problems.
- The signal system operated as expected.
- The track upon which the train was being operated did not have defects.
- The Train's engineer failed to control the speed of the train while being operated into Hoboken Terminal.

7. Probable Cause

NJT's opinion as to the Probable Cause has also not changed:

- The train's engineer failed to control the speed of the train while being operated into Hoboken Terminal.