National Transportation Safety Board

Washington, D.C. 20594

Response to Petition for Reconsideration

Date: August 28, 2017

Mr. Mark J. Mayr, Petitioner
[redacted]

In accordance with Title 49 *Code of Federal Regulations* (*CFR*) 845.32, the National Transportation Safety Board (NTSB) has reviewed the June 30, 2016, petition for reconsideration and modification of certain findings and the probable cause as adopted in our final report on the investigation of the August 20, 2012, freight train derailment and related fatalities that occurred on the property of CSX Transportation (CSX) in Ellicott City, Maryland.[1] The NTSB received no responses from any of the parties to this investigation regarding the petition. On the basis of the review of the petition for reconsideration, the NTSB agrees to revise the probable cause of the accident, but denies the remainder of the petition.

Background

On August 20, 2012, about 11:54 p.m. eastern daylight time, an eastbound CSX coal train, U81318, derailed the first 21 cars at milepost (MP) 12.9 while crossing the railroad bridge over Main Street on the Old Main Line (OML) Subdivision in Ellicott City, Maryland. The train consisted of two locomotives and 80 loaded coal cars; the train length was 4,227 feet and the weight was 9,873 trailing tons. Seven of the derailed cars fell into a public parking area that was below and north of the tracks. The remainder of the derailed cars overturned and spilled coal along the north side of the tracks.

Prior to the train crossing the bridge, two individuals entered the railroad right-of-way on the north side of the railroad bridge that crossed Main Street. They climbed over a short wooden fence and entered CSX property without authorization to access the railroad bridge. They were sitting on the bridge during the derailment. Both individuals were killed by the spilled coal. At the time of the accident, the sky was cloudy and dark, the wind was calm, and the temperature was 65°F.

[1] National Transportation Safety Board, *CSX Transportation Coal Train Derailment Killed Two Individuals, Ellicott City, Maryland, August 20, 2012*, RAB-14/07 (Washington, DC: National Transportation Safety Board, 2014).

The original accident brief issued the following as the probable cause of the accident. "The National Transportation Safety Board determines that the probable cause of the Ellicott City derailment was a broken rail with evidence of rolling contact fatigue."

The Petition

The petitioner asserts that the NTSB probable cause fails to address "the factors that caused the rapid growth of a defect from small and undetectable to catastrophic failure in less than 18 days" and contends that the probable cause statement is the equivalent of saying "the train derailed because the rail broke." According to the petitioner, the suggested probable cause is based primarily on new evidence, namely foot-by-foot track geometry vehicle data collected by the Federal Railroad Administration (FRA) Automated Track Inspection Program (ATIP) almost 6 weeks before the derailment, and less than 1 week after an earlier rail break was repaired with a joint bar. The petitioner states that the NTSB's probable cause should be reconsidered and modified as follows:

> *The derailment was caused by a broken rail stemming from an undetectable internal defect which grew to a catastrophic failure in 18 days due to a worn rail head that was approaching levels for scheduled replacement combined with poor ballast conditions and high axle loads.*

The petitioner further requests that the NTSB consider proposed recommendations provided in the petition, alleging that various safety issues related to this accident were not addressed. Those proposed recommendations are as follows:

> *Reopen NTSB Safety Recommendation R-08-10. The FRA Final Rule published in 2014 only partially addresses the recommendation. Reopening [Safety Recommendation] R-08-10 will motivate further research and ultimately [r]ule changes that can mitigate derailments caused by track degradations occurring over short length scales that might otherwise go unaddressed.*
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> *Quantitative criteria for poor track support. The FRA should develop quantitative defect criteria for poor track support via a measurement campaign with appropriate instrumentation and a study to correlate the measurements with track failures.*
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> *Quantitative criteria for combined effects. The FRA should develop quantitative criteria for [Title 49* Code of Federal Regulations] *49* CFR *§213.1, "Scope of part." A candidate framework for such criteria might consider (for example) fouled ballast and worn rail head as "accelerating factors" on an otherwise normal rate of growth of track geometry errors and normal rate of growth of fractures. In that framework, the presence of poor track support or worn rail head invokes a "derating factor" to reduce the threshold for geometry errors or fracture sizes to be classified as a defect.*
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> *Fracture repairs. When a rail fracture occurs in the midst of track conditions that can be considered "accelerating factors," e.g. poor track support (fouled ballast)*

or worn rail head, slow orders should be implemented after the repair is made until those track conditions can be corrected.

The FRA should review the water drainage conditions for the derailment curve in Ellicott City and, if necessary, direct CSX to improve it.

Rotary couplers. Investigate the merits of rotary couplers as a relatively inexpensive way to reduce the number of derailed cars and the scope of damage of a derailment, especially important when transporting dangerous liquid or gaseous payloads.

Response

The NTSB's responses to each of the petitioner's requests are presented below. Although 49 *CFR* 845.41 offers no provision for petitions for reconsideration based on the issuance of safety recommendations, the NTSB evaluated each of the petitioner's requests.

Assertion that the Probable Cause is Incorrect

On August 21 and 22, 2012, investigators took track measurements beginning at MP 12.9 (near the last portion of undisturbed track at the west end of the derailment footprint) and extending westward for 232 feet. No track FRA geometry defects were noted.[2] During the initial NTSB investigation, investigators considered the geometry data provided by both the July 2012 FRA ATIP geometry survey and the August 2012 CSX geometry survey, which was conducted only 2 weeks before the accident.

On October 23, 2013, the members of the Track and Engineering group for the Ellicott City, Maryland, accident investigation—consisting of representatives from CSX, the FRA, and the Brotherhood of Maintenance of Way Employes Division, as well as the NTSB—offered their concurrence with and offered no exceptions to the group's factual report. That factual report contained the following: "FRA operated their Automated Track Inspection Program (ATIP) geometry vehicle, T-217, over the OML Subdivision on July 17, 2012. The FRA data showed no defect recorded for that test and none in the vicinity of the derailment. The Track Group did not take exception to the data."

On August 23, 2016, NTSB investigators met with a representative from the FRA to review the foot-by-foot geometry data that was collected by the FRA ATIP vehicle. This review verified that although there were geometry conditions found during the July 2012 ATIP geometry survey, there were no identified FRA geometry defects.[3] While the foot-by-foot data presented the information contained in the ATIP geometry survey in a different way, it did not constitute new evidence.

[2] Track and Engineering Group Factual Report in NTSB docket DCA12MR009.

[3] The FRA guidance documents define a *geometry condition* as a track surface, gage, or alinement [*sic*] irregularity that does not exceed the allowable threshold for the designated class of track. It exists due to the reduced or nonexistent capability of one or more track structural components to hold the track to its preferred geometric position.

However, the NTSB agrees that the probable cause should be revised to address the factors that caused the rapid growth of the defect. To support a new probable cause, the NTSB will replace "The high stresses likely resulted from a worn rail head that was approaching levels for scheduled replacement combined with poor ballast conditions and high axle loads." in the accident brief with the following: "The high stresses mainly resulted from a worn rail head that was approaching levels for scheduled replacement. There was also an increase in tonnage over this CSX subdivision in previous years, resulting in high axle loads."

Based on the information above, the NTSB revises the probable cause as follows: "The National Transportation Safety Board determines that the probable cause of the Ellicott City derailment was a broken rail stemming from an undetected internal defect which grew to a catastrophic failure due to the combination of a worn rail head that was approaching levels for scheduled replacement and high axle loads."

Recommendation to Reopen NTSB Safety Recommendation R-08-10

Background Discussion

On October 20, 2006, Norfolk Southern Railway Company (NS) train 68QB119 derailed while crossing the Beaver River railroad bridge in New Brighton, Pennsylvania. The train consisted of three locomotives pulling three empty freight cars followed by 83 tank cars loaded with denatured ethanol, a flammable liquid.[4] Of the 83 tank cars, 23 of them derailed near the east end of the bridge, with several of the cars falling into the Beaver River. Of the 23 derailed tank cars, about 20 released ethanol, which subsequently ignited and burned for about 48 hours. Some of the unburned ethanol liquid was released into the river and the surrounding soil. Homes and businesses within a seven-block area of New Brighton and in an area adjacent to the accident site were evacuated for 2 days. No injuries or fatalities resulted from the accident. NS estimated damages to be $5.8 million.

The NTSB determined that the probable cause of the accident was:

> … the Norfolk Southern Railway Company's inadequate rail inspection and maintenance program that resulted in a rail fracture from an undetected internal defect. Contributing to the accident was the Federal Railroad Administration's inadequate oversight of the internal rail inspection process and its insufficient requirements for internal rail inspection.

On May 22, 2008, the NTSB issued the following safety recommendations to the FRA:

> Review all railroads' internal rail defect detection procedures and require changes to those procedures as necessary to eliminate exceptions to the requirement for an uninterrupted, continuous search for rail defects. (R-08-9)

[4] National Transportation Safety Board, *Derailment of Norfolk Southern Railway Company Train 68QB119 with Release of Hazardous Materials and Fire, New Brighton, Pennsylvania, October 20, 2006*, RAR-08/02 (Washington, DC: National Transportation Safety Board, 2008).

Require railroads to develop rail inspection and maintenance programs based on damage-tolerance principles, and approve those programs. Include in the requirement that railroads demonstrate how their programs will identify and remove internal defects before they reach critical size and result in catastrophic rail failures. Each program should take into account, at a minimum, accumulated tonnage, track geometry, rail surface conditions, rail head wear, rail steel specifications, track support, residual stresses in the rail, rail defect growth rates, and temperature differentials. (R-08-10)

Require that railroads use methods that accurately measure rail head wear to ensure that deformation of the head does not affect the accuracy of the measurements. (R-08-11)

FRA Action

In a letter dated April 23, 2014, the FRA responded to the NTSB stating that they had established the Rail and Infrastructure Integrity division to review internal rail defect detection procedures for all railroads and recommend changes, as needed, to ensure that railroads conduct an uninterrupted, continuous search for rail flaws. Additionally, the FRA implemented a rail flaw detection vehicle inspection process as part of its National Safety Program Plan. Moreover, the FRA charged the Railroad Safety Advisory Committee (RSAC) Rail Integrity Task Force of the Track Safety Standards (TSS) Working Group with examining internal rail flaw inspection procedures and systems within the regulated community, identifying any deficiencies in the procedures or systems, and making necessary recommendations to address them.[5] The task force found that new technologies have been developed for improving rail flaw detection associated with rail surface conditions.

The FRA formed the RSAC's Rail Integrity Task Force in 2007 to help provide a common understanding of the requirements for internal rail flaw inspections within the regulated community. Through this task force, the FRA is gaining a more thorough understanding of rail inspection and maintenance programs. The task force reached consensus on a model recommended by the John A. Volpe National Transportation Systems Center for performance-based testing intervals using failure and defect rates, annual tonnage, performance targets, and crack growth. The task force also examined issues concerning submission of internal flaw detection programs for FRA approval, annual updates to the program, and access to defect and failure data.

The task force reached consensus on a number of changes to the FRA's rail inspection requirements, and, in October 2012, the FRA published a Notice of Proposed Rulemaking (NPRM) based on these recommendations.[6] The final rule, Title 49 *Code of Federal Regulations* (*CFR*) Part 213, including section 213.237, *Inspection of Rail*, was published on January 24, 2014.[7]

[5] The FRA established the RSAC in March 1996 pursuant to Section 10(a)(2) of the Federal Advisory Committee Act (Pub. L. 92-463) to provide advice and recommendations to the FRA on railroad safety matters. For more information on RSAC, see: https://rsac.fra.dot.gov/home.php.

[6] *Federal Register* (*FR*) 77, no. 203 (October 19, 2012): 64249.

[7] *FR* 79, no. 16 (January 24, 2014): 4234.

In a letter dated June 24, 2014, the NTSB stated that the issuance of that final rule helped satisfy Safety Recommendations R-08-9 and R-08-10 and classified them "Closed—Acceptable Action". The implementation of a process by the FRA to inspect rail flaw detection vehicles as part of its national safety program plan, as well as the examination of internal rail flaw inspection procedures and systems, and the identification of new technologies for improving rail flaw detection associated with rail surface conditions by the RSAC Rail Integrity Task Force contributed to the satisfactory closing of Safety Recommendation R-08-9. The requirements in this rule that railroads use damage-tolerance principles to develop rail inspection and maintenance programs and that the FRA approve these programs led to the satisfactory closing of Safety Recommendation R-08-10. Based on the discussion above, the NTSB declines to reissue NTSB Safety Recommendation R-08-10 and considers it to be classified "Closed—Acceptable Action."

The FRA reviewed railroad programs concerning head wear through the RSAC Rail Failure Working Group Task 12-01. The working group concluded that the FRA did not have sufficient data to determine the fracture strength of all rail currently installed in track throughout the general railroad system. The working group did not develop recommended regulatory language; however, it recommended that an industry rail failure prevention program include rail head wear guidelines that took into consideration the class of track, tonnage, rail section, rail wear, visible rolling contact fatigue (RCF) damage, defect development, rail failure history, and other factors, as determined by the track owner. The working group also recommended that railroads put in place the corrective actions to take when the railroad engineering standard for rail head wear limitations are exceeded. As a result of the RSAC Rail Failure Working Group, on October 2, 2012, the FRA issued Safety Advisory 2012-04 to remind track owners, railroads, and track inspectors of the importance of complying with applicable rail-management programs and engineering procedures that address rail with severe head wear and RCF conditions.[8] Accordingly, Safety Recommendation R-08-11 was classified "Closed—Acceptable Alternate Action" on March 17, 2015.

The RSAC Rail Failure Working Group has discussed rail failure data and the proper methods to mitigate such failures, and has established a task force to collect data for driving future regulatory changes. In addition, the working group continues to consider future rail head wear regulations and rail failure mitigation programs.

CSX Action

The NTSB investigated the April 30, 2014, derailment of a CSX petroleum crude oil unit train in Lynchburg, Virginia. Seventeen tank cars derailed, three of which partially submerged in the James River. One car breached and released about 29,868 gallons of crude oil into the river, some of which caught fire. There were no reported injuries to the crew or the public. CSX estimated the damages to be about $1.2 million, not including environmental remediation.

[8] *FR* 77, no. 191 (October 2, 2012): 60169.

The NTSB determined that the probable cause of this accident was "a broken rail caused by a reverse detail fracture with evidence of rolling contact fatigue."[9]

Prior to this accident, any time a transverse detail fracture affected at least 20 percent of the cross-section of the rail head, CSX engineering standards required that the defective rail be replaced or that joint bars be installed to the rail at the site of the defect within 5 days of discovery.[10] Ultrasonic testing data indicated a transverse detail fracture near the location of the derailment the day before this accident, and CSX planned to replace that section of rail on May 1, 2014. The rail defect did not require a speed restriction under FRA regulations or CSX maintenance procedures because the maximum operating speed for that area was 25 miles per hour (mph). On July 1, 2014, CSX modified its maintenance-of-way instructions to require a speed restriction of 10 mph when a transverse defect is identified—such as the reverse detail fracture found in this accident—until corrective action, such as replacing the rail or applying rail joint bars at the defect site, is taken.

Recommendation to Develop Quantitative Criteria for Poor Track Support

Railroads use ballast, most commonly crushed stone, to support track structure. Current federal TSS address ballast requirements and require track to be supported by a material which will:

- Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;
- Restrain the track laterally, longitudinally, and vertically under the dynamic loads imposed by railroad rolling equipment and thermal stresses exerted by the rails;
- Provide adequate drainage for the track; and
- Maintain proper track crosslevel, surface, and alinement [*sic*].[11]

Current TSS guidance states that ballast may consist of crushed slag, crushed stone, screened gravel, pit-run gravel, chat, cinders, scoria, pumice, sand, mine waste, or other native material, and is an integral part of the track structure. Ballast, regardless of the material, must satisfy the requirements of the TSS. The guidance further states that inspectors should consider the overall condition of a track when citing fouled ballast. Because inspectors' evaluation of ballast conditions can be subjective in nature, inspectors should also look to other indicators of poor track support such as a geometry condition. For example, a fouled ballast violation might be appropriate if the track has poor drainage and there is a geometry condition or if there is a series of fouled ballast locations with geometry conditions.

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[9] National Transportation Safety Board, *CSXT Petroleum Crude Oil Train Derailment and Hazardous Materials Release, Lynchburg, Virginia, April 30, 2014*, RAB-16/01 (Washington, DC: National Transportation Safety Board, 2016).

[10] A *transverse detail fracture* is a progressive fracture originating at or near the rail head, that extends across or in a cross direction.

[11] Title 49 *CFR* 213.103.

The FRA regulations clearly define the need for proper support of track structure, and the FRA *Track and Rail and Infrastructure Integrity Compliance Manual* provides guidance to track inspectors when citing fouled ballast.[12]

Based on the information above, and in light of the factual information gathered in this accident investigation, the NTSB believes it is not necessary for the FRA to develop additional criteria for quantifying poor track support.

Recommendation to Develop Quantitative Criteria for Combined Defects

Title 49 *CFR* 213.1, *Scope of part* states that the collective overall condition of a track is not evaluated, rather the individual components of the track are evaluated independently. As stated in the regulation:[13]

> This part prescribes minimum safety requirements for railroad track that is part of the general railroad system of transportation. In general, the requirements prescribed in this part apply to specific track conditions existing in isolation. Therefore, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track. This part does not restrict the railroad from adopting and enforcing additional or more stringent requirements not inconsistent with this part.

Current TSS guidance states that when an FRA inspector encounters a combination of track conditions (none of which individually amounts to a deviation of TSS), the inspector should immediately bring the condition to the attention of the accompanying railroad official, explain the hazard of such a condition, and encourage its rapid removal. The guidance adds that if the inspector is unable to convince the railroad to initiate corrective action, he or she should contact the FRA regional track specialist for assistance.

On July 18, 2013, at 8:29 p.m. eastern daylight time, northbound CSX train Q70419 derailed in Bronx, New York, on the Metro-North Railroad (Metro-North) Hudson Line at MP 9.99 on main track 2.[14] The train consisted of two locomotives and 24 modified flat cars. Each flat car was loaded with four containers filled with municipal refuse. The 11th through 20th cars from the head end derailed. At the point of derailment (POD), the NTSB identified a number of track conditions that could contribute to a wide gage including center-bound concrete ties, fouled ballast, profile deviations, and displaced insulators.[15]

Metro-North used visual track inspections and automated track geometry inspection vehicles to inspect the track prior to the accident. No track exceptions were noted at the POD from any of these inspections. However, a review of the data from the June 4, 2013, inspection showed the POD had a gage measurement slightly above the FRA limit in combination with a substantial

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[12] Federal Railroad Administration, *Track and Rail and Infrastructure Integrity Compliance Manual,* Volume II, Chapter 1 (Washington, DC: US Department of Transportation, Federal Railroad Administration, 2014).

[13] Title 49 *CFR* 213.1(a).

[14] National Transportation Safety Board, *Metro-North Railroad Derailment, Bronx, New York, July 18, 2013*, RAB-14/11 (Washington, DC: National Transportation Safety Board, 2014).

[15] A *profile deviation* is a dip or hump in the track due to the elevation of either rail along the track.

(but allowable) profile deviation. The combined geometry deviations presented a risk of derailment, but the track condition was not flagged as an exception for either further inspection or remedial action. The geometry vehicle program analyzing the measurements did not consider combinations of measurements that could comprise a defective condition.

In a letter to the FRA, the NTSB said, "Defining allowable parameters for combined track conditions will give (1) clear guidance on what combinations of conditions can lead to higher risk of derailment and require remediation, (2) consistent and actionable values for inspectors determining combinations of track conditions that comprise a track exception, and (3) specific parameters that can be coded into track geometry vehicles to identify areas with higher potential risk to safe operation."[16]

The NTSB determined that the probable cause of the accident was "… excessive track gage due to a combination of fouled ballast, deteriorated concrete ties, and profile deviations resulting from Metro-North's decision to defer scheduled track maintenance." Based on the findings from this accident investigation, the NTSB made the following safety recommendations to the FRA:

> Revise Title 49 *Code of Federal Regulations* Part 213 to define specific allowable limits for combinations of track conditions, none of which individually amounts to a deviation from Federal Railroad Administration regulations that requires remedial action, but, which when combined, require remedial action. (R-14-75)
>
> Once you have completed the actions specified in Safety Recommendation R-14-75, program your geometry inspection vehicles to detect combinations of conditions that require remedial action. (R-14-76)

The FRA responded to these recommendations stating that they had reviewed various track conditions to determine which combinations are unsafe and require remedial action to ensure safe operation of trains.[17] Following their review, the FRA published a final rule on vehicle/track interaction (VTI) safety standards that established new requirements to address unsafe combinations of track alignment and surface conditions.[18] In developing the VTI safety standards, the FRA sought to include revisions that would "serve as practical standards with sound physical and mathematical bases," and arrived at its NPRM "through the results of computer simulations of vehicle/track dynamics, consideration of international practices, and thorough reviews of qualification and revenue service test data." The proposals were subject to public comment and modified, as appropriate, in the final rule. As a result of FRA's action, the NTSB classified Safety Recommendations R-14-75 and R-14-76 "Open—Acceptable Response" on January 8, 2016.

Based on the information above, and the acceptable responses to Safety Recommendations R-14-75 and R-14-76, the NTSB believes that current rules address combination track conditions and that this proposed recommendation would be duplicative and, therefore, unnecessary.

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[16] *Safety Recommendation Letter* from the NTSB to the FRA regarding Safety Recommendations R-14-75 and R-14-76, December 30, 2014.

[17] Letter from the former FRA Administrator to the NTSB, April 13, 2015.

[18] Title 49 *CFR* 213.65, 49 *CFR* 213.332, and *FR* 78, no. 49 (March 13, 2013): 16052.

Recommendation Regarding Implementation of Slow Orders Following Rail Fracture Repair

FRA TSS outlines "Responsibility for Compliance" and requires:[19]

> … any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall—
>
> (1) Bring the track into compliance;
>
> (2) Halt operations over that track; or
>
> (3) Operate under authority of a person designated under 213.7(a), who has at least one year of supervisory experience in railroad track maintenance, subject to conditions set forth in this part.

Title 49 *CFR* 213.9(b) states, "[i]f a segment of track does not meet all of the requirements for its intended class, it is reclassified to the next lowest class of track for which it does meet all of the requirements of this part." The process of reclassifying track to the next lowest class of track is referred to as initiating speed restrictions or slow ordering the track.

Based on the information above, the NTSB maintains that current federal regulations provide protections to ensure restrictions on tracks that do not meet all the safety standards of their class.

Recommendation Regarding the FRA Review of Water Drainage Conditions for the Derailment Curve

On September 28, 2016, representatives from the NTSB, the FRA, and CSX assessed the water drainage condition at the derailment curve. The representatives noted that the drainage ditch running beside the track had been improved and there was no standing water. The accompanying FRA inspector completed an inspection report showing "no defects noted for units observed."[20]

CSX is conducting routine inspections of the main track in the accident area and addressing concerns with noncompliant conditions, including drainage conditions, with oversight by the FRA, in accordance with federal regulations. Based on the information above, the NTSB believes that a new safety recommendation is not warranted.

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[19] Title 49 *CFR* 213.5.

[20] The documentation of the NTSB investigation into the August 20, 2012, accident was written and formatted as a railroad accident brief. Railroad accident briefs can be used to support safety recommendations, a safety study, or a special investigation report, and usually consist of a short narrative of the accident, followed by a probable cause, and possibly safety recommendations. The narrative is normally limited to information, but may contain some analytical statements so that the reader can understand the probable cause. As such, not all safety improvements or corrective actions made by the railroad are included in the accident brief.

Recommendation Regarding Investigating the Merits of Rotary Couplers to Reduce the Scope of Damage by a Derailment

The NTSB reviewed two investigative reports provided by Transport Canada.[21] The NTSB believes that further testing and analysis are needed to fully understand the effects of rotary couplers on derailment mitigation. Based on analysis of FRA statistics for multiple car derailments or accidents involving shelf couplers as presented in Transport Canada's *Investigation of Multiple Tank Car Rollover Derailments Related to Double Shelf Couplers and its Solutions*, accidents occurred on main lines and sidings at one-half the frequency of accidents in yards or unidentified locations, which could indicate that multiple car rollovers tend to occur at lower speeds. Lower train speeds reduce the risk of railcar failure due to a rollover. However, the NTSB is concerned that the use of rotary couplers could unintentionally increase the risk of catastrophic train derailments in accidents with higher train speeds.

Based on the information above, the NTSB maintains that current data indicate rotary couplers are not a guarantee against railcar rollover, and data supporting the use of rotary couplers to mitigate risk to the public are not established.

Summary

After review of the evidence submitted by the Petitioner, the NTSB found no basis to issue new safety recommendations or to reiterate existing safety recommendations. However, the NTSB has taken action for revising the probable cause statement:

> **Probable Cause**
>
> Replaced "with evidence of rolling contact fatigue" with "stemming from an undetected internal defect which grew to a catastrophic failure due to the combination of a worn rail head that was approaching levels for scheduled replacement and high axle loads.

Chairman SUMWALT and Members HART, WEENER, and DINH-ZARR concurred in the disposition of this petition for reconsideration.

Enclosures:

1. Original final report
2. Revised final report

[21] Transport Canada, *Investigation of Multiple Tank Car Rollover Derailments Related to Double Shelf Couplers and its Solutions* (Ottawa, Ontario, Canada: Transport Canada, 2009) and Transport Canada, *Investigation of Multiple Tank Car Rollover Derailments – Standard Type E Double-shelf Coupler, and Modified Rotary Coupler, Phase 2* (Ottawa, Ontario, Canada: Transport Canada, 2012).