National Transportation Safety Board
Washington, DC 20594

Response to Petition for Reconsideration

April 21, 2021

Mr. Antonio Perez, Petitioner
President and CEO
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In accordance with its rules (Title 49 *Code of Federal Regulations* [*CFR*] Part 845), the National Transportation Safety Board (NTSB) has reviewed the October 29, 2019, petition for reconsideration and modification of the railroad accident report *Amtrak Passenger Train 501 Derailment, DuPont, Washington, December 18, 2017*, RAR-19/01. The petitioner has met the requirements for the NTSB's review of his petition; specifically, as the president and chief executive officer of Talgo Inc. (Talgo), the manufacturer of the Talgo Series VI trainset involved in the accident and a party to the investigation, he has a direct interest in the investigation and has offered claims that our report was erroneous. Based on this review, the NTSB hereby denies the petition in its entirety.

DuPont, Washington, Accident

On December 18, 2017, at 7:34 a.m. Pacific standard time, southbound Amtrak (National Railroad Passenger Corporation) passenger train 501, consisting of 10 passenger railcars, a power railcar, a baggage railcar, and a locomotive at either end, derailed from a bridge near DuPont, Washington. When the train derailed, it was on its first revenue service run on a single main track (Lakewood Subdivision) at milepost 19.86. There was one run for special guests the week before the accident. Several passenger railcars fell onto Interstate 5 (I-5) and hit multiple highway vehicles. At the time of the accident, 77 passengers, 5 Amtrak employees, and a Talgo technician were on the train. Of these individuals, 3 passengers were killed, and 57 passengers and crewmembers were injured. Additionally, eight individuals in highway vehicles were injured. The damage was estimated to be more than $25.8 million.[1]

Parties to the investigation included the Federal Railroad Administration (FRA), the Washington Utilities and Transportation Commission, Amtrak, the Central Puget Sound Regional Transit Authority, the Washington State Department of Transportation (WSDOT), Talgo, Siemens Industry Inc., the Brotherhood of Locomotive Engineers and Trainmen (BLET), and the International Association of Sheet Metal, Air, Rail and Transportation Workers.

[1] Background information about the accident provided in this response is derived from the NTSB DuPont accident report, RAR-19/01; the DuPont accident investigation docket, Accident ID RRD18MR001, which is available via the NTSB Accident Docket Search system; the 2018 NTSB investigative hearing, *Managing Safety on Passenger Railroads*, and its associated docket, Accident ID DCA18HR001, which is also available via the NTSB Accident Docket Search system; and related safety recommendation information, which is accessible via the CAROL Query Tool.

On May 21, 2019, the NTSB adopted the probable cause for this crash as follows:

> The National Transportation Safety Board determines that the probable cause of the Amtrak 501 derailment was Central Puget Sound Regional Transit Authority's failure to provide an effective mitigation for the hazardous curve without positive train control in place, which allowed the Amtrak engineer to enter the 30-mph curve at too high of a speed due to his inadequate training on the territory and inadequate training on the newer equipment. Contributing to the accident was the Washington State Department of Transportation's decision to start revenue service without being assured that safety certification and verification had been completed to the level determined in the preliminary hazard assessment. Contributing to the severity of the accident was the Federal Railroad Administration's decision to permit railcars that did not meet regulatory strength requirements to be used in revenue passenger service, resulting in (1) the loss of survivable space and (2) the failed articulated railcar-to-railcar connections that enabled secondary collisions with the surrounding environment causing severe damage to railcar-body structures which then failed to provide occupant protection resulting in passenger ejections, injuries, and fatalities.

Figure 1 shows an aerial view of the DuPont accident site, the order of the railcars in the train consist, and the direction of travel of each railcar.[2]

Figure 1. Overhead view of the DuPont accident site showing railcar numbers, their position in the consist, and their direction of travel. Railcar 7424 was under the overpass.

[2] This figure is taken from the NTSB DuPont accident report; see figure 10 on page 27. For simplicity, in this response, railcars are referred to by their four-digit number. Additional descriptors or location indicators are sometimes used when referencing or quoting the petitioner's materials or the NTSB report, but the four-digit railcar numbers remain consistent.

Talgo Series VI Trainset

The passenger railcars involved in the DuPont, Washington, accident were manufactured by Talgo and designated as Series VI railcars. The railcars were semipermanently coupled together into trainsets. Before the accident, there were five Talgo Series VI trainsets operating in the United States.

Manufacturing and Service

Talgo manufactured the Series VI trainsets for Amtrak and the WSDOT between 1996 and 1998. The accident trainset was built in 1998. One 12-unit trainset and four 13-unit trainsets were produced, four of which were put into service on the Cascades line between Vancouver, British Columbia, and Eugene, Oregon, with major stops in Seattle, Washington, and Portland, Oregon, starting in 1998. A fifth trainset was originally slated for Amtrak service between Los Angeles, California, and Las Vegas, Nevada, but was eventually purchased by the WSDOT, and that trainset was the accident train.

The semipermanently coupled configuration of the trainset requires a long facility to be able to effectively service the railcars without uncoupling them. A special facility owned by Amtrak was built in Seattle to maintain the Talgo Series VI trainsets, with maintenance work completed by Amtrak agreement labor under Talgo supervision.

Rolling Assemblies and Articulated Connections

The Talgo Series VI railcars are designed to have one rolling assembly located between each pair of railcars, except for the baggage railcar located in the rear and the power railcar in the lead, each of which is equipped with an additional rolling assembly.[3] Each rolling assembly situated between railcars is permanently attached at the *supported* end of a railcar, and the opposite end of the railcar is called the *suspended* end, because it is suspended from the supported end of the adjacent railcar through weight bearing bars. The accident train was configured with the supported end of each railcar leading in the direction of travel, so the supported end will also be referred to as the front or the leading end of the railcar, and the suspended end will also be referred to as the rear or trailing end.

Each rolling assembly consists of two independently rolling wheels mounted on an axle, with two large tower assemblies that extend from the axle to the top of the railcar. The supported end of the railcar is mounted on air springs at the top of the tower assemblies. The suspended end of the adjacent railcar hangs on weight bearer bars bolted to the supported railcar above the tower assemblies. Attaching the railcars at the tops of the tower assemblies allows the railcars to swing like a pendulum when the train goes through a curve, reducing side forces on passengers. This arrangement also means that the railcars are not sitting above the wheels, which lowers the center of gravity of the railcars.

In addition to the permanent connections through the air springs at the top of the rolling assembly, each rolling assembly is attached to the two adjacent railcars through guide bars attached to the wheels, steel retention cables, polyester tower straps, and polyester lower retention straps.

[3] Different terms are used to describe the structures holding the wheels for different types of railcars. When discussing the Talgo Series VI railcars, the term *rolling assembly* is used. When discussing conventional railcars, the term *truck* is used. The term *bogie* might also be used in some references.

Adjacent railcars are also attached at the bottoms of the railcars by an articulated connection that consists of two fixtures, one attached to each railcar's structure, with a shank that joins them together, some stops (buffers) which are mounted on lateral supports to transmit lateral forces, and a rubber plate that provides some elasticity when it transmits compressive forces.

Because each passenger railcar has only one rolling assembly permanently attached to it (at the supported end), the process of attaching or detaching railcars is complicated, which is why the railcars are semipermanently coupled into a trainset. The Talgo Series VI trainset involved in the accident included a power railcar in the front that supplied electrical power to the passenger railcars, 10 passenger railcars, and a baggage railcar at the back that had an additional rolling assembly at the rear. The power railcar and the baggage railcar were not occupied when the train was moving.

Design Standards

Talgo's parent company, Patentes Talgo S.L., is based in Spain, and the Talgo passenger trainset was originally designed to meet the International Union of Railways (UIC) design codes. The codes include several design standards much like the Association of American Railroads design standards in the United States. Specific to the construction of the railcar body, the Talgo Series VI passenger railcars were designed to meet UIC-566, "Loadings of Coach Bodies and Their Components," revision January 1990. One specific requirement of UIC-566 is that the railcar body shall be designed to withstand a 2,000 kilonewton (kN) (449,617 pound) static compressive load at the buffer or coupler level without permanent deformation; the FRA requires a passenger railcar to resist a static compressive load of 800,000 pounds. The FRA also has requirements regarding the forces that must be resisted by the structures attaching the trucks to the railcars, which will be discussed more below. According to Talgo, no specific requirements are prescribed in UIC-566 for retention of rolling assemblies.

1999 Passenger Equipment Safety Standards

On May 12, 1999, the FRA published a final rule to add a new 49 *CFR* Part 238, "Passenger Equipment Safety Standards," which was effective on July 12, 1999. Subpart C, "Specific Requirements for Tier I Passenger Equipment," of 49 *CFR* 238.203, states that, with some specific exceptions, "on or after November 8, 1999, all passenger equipment shall resist a minimum static end load of 800,000 pounds applied on the line of draft without permanent deformation of the body structure."[4] This section would have applied retroactively to all passenger railcars, thereby requiring the Talgo Series VI railcars to be able to withstand a compressive load (without deformation) nearly twice what they were designed to resist. One of the provisions in 49 *CFR* 238.203(d) allowed a railroad to petition the FRA to permit the use of rail equipment not meeting the then-newly published requirement(s) for the static end load requirement of 800,000 pounds. The allowance for the use of equipment not meeting the new requirement is referred to as grandfathering. The other requirements for Tier I passenger equipment applied only to equipment ordered on or after September 8, 2000, or placed in service for the first time on, or after, September 9, 2002.

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[4] *Tier I* refers to railroad passenger equipment operated at speeds not exceeding 125 mph.

Petition to Grandfather and Approval

On October 18, 1999, Amtrak petitioned the FRA to grandfather the Talgo Series VI trainsets to allow their continued use even though they did not meet the requirement of 49 *CFR* 238.203.[5] The FRA tentatively granted the petition in an initial decision issued September 8, 2000. The initial decision included a number of conditions that were required to be met, including requirements to modify the Talgo Series VI railcars to strengthen the attachments between the rolling assemblies and the railcars, which was accomplished by installing polyester straps. The FRA issued a final decision to grant the petition on March 27, 2009. The final decision stated that the modifications required in the initial decision had been completed and that those modifications were assumed to be present in a crashworthiness study of the Talgo Series VI trainset performed by the Volpe National Transportation Systems Center, which was part of the evidence used to grant the petition in the final decision.

A total of 67 Talgo Series VI railcars in 5 trainsets were included in the FRA's grandfathering approval. The approval was specifically limited to the 67 railcars already in use, and no additional railcars were permitted to be imported to the United States. The FRA has not grandfathered approval for any other railcars.

2019 Passenger Equipment Safety Standards

On November 21, 2018, the FRA published a final rule amending its passenger equipment safety standards, adding a performance-based approach to new or modified requirements governing the construction of conventional- and high-speed passenger railroad equipment. The rule added a new tier of passenger equipment safety standards, Tier III, to facilitate the safe implementation of nationwide, interoperable high-speed passenger rail service at speeds up to 220 mph.[6] The new rule was effective on January 22, 2019. The 1999 requirements can still be used to design Tier I trainsets, but the 2019 rule provided an alternative means of compliance whereby Tier III requirements could be substituted for some Tier I requirements. The 2019 rule affected a number of sections related to the Tier I passenger equipment discussed in 49 *CFR* Part 238, "Passenger Equipment Safety Standards." Specifically, the new rule altered the following 49 *CFR* Tier I safety standard sections to allow for compliance through the use of Tier III requirements:

- 238.201, "Scope/Alternative Compliance."
- 238.203, "Static End Strength."
- 238.205, "Anti-climbing Mechanism."
- 238.207, "Link Between Coupling Mechanism and Car Body."
- 238.209, "Forward-Facing End Structure of Locomotives."
- 238.211, "Collision Posts."
- 238.213, "Corner Posts."
- 238.219, "Truck-to-Car-Body Attachment."

[5] The FRA gave Amtrak permission to continue using the Talgo Series VI railcars while the FRA evaluated the petition and its supporting documents.

[6] *Tier III* refers to railroad passenger equipment operating in a shared right-of-way at speeds not exceeding 125 mph and in an exclusive right-of-way without grade crossings at speeds exceeding 125 mph but not exceeding 220 mph.

The revised regulations are intended to provide flexible, performance-based crashworthiness and occupant protection criteria for passenger railroad equipment. Manufacturers can petition for waivers from strict compliance with the FRA's Tier I passenger equipment crashworthiness standards if they can demonstrate compliance with the new Tier III standards. The 2019 rule provides a set of technical criteria and procedures by which the FRA will evaluate such petitions. In particular, 49 *CFR* 238.201 now includes language stating that Tier I passenger trainsets may comply with alternative crashworthiness and occupant protection requirements in a new appendix G to 49 *CFR* Part 238, instead of the Tier I requirements in the 49 *CFR* Part 238 sections in the itemized list above of elements originally introduced in 1999. In appendix G, alternative means of compliance are specified using provisions from the new Subpart H, "Specific Requirements for Tier III Passenger Equipment," which includes 49 *CFR* 238.701 through 238.753. Use of this alternative means of compliance for Tier I passenger equipment is subject to review and approval by the FRA. To assess compliance with the alternative requirements, the railroad must submit the following documents to the FRA for review:

(A) Test plans, and supporting documentation for all tests intended to demonstrate compliance with the alternative requirements and to validate any computer modeling and analysis used, including notice of such tests, 30 days before commencing the tests; and

(B) A carbody crashworthiness and occupant protection compliance report based on the analysis, calculations, and test data necessary to demonstrate compliance.

Various aspects of the 2019 safety standards will be discussed as necessary throughout the remainder of this response.

Petitioner's Claims

The petitioner claims that "the NTSB investigation and final accident report that followed are replete with injustices toward Talgo and errors regarding its Series VI railcars and their role in the derailment." Some of the petitioner's arguments were also presented in Talgo's April 12, 2019, party submission.[7] The petitioner puts forward as new information an argument that the Talgo Series VI railcars meet the FRA crashworthiness requirements under the alternative means of complying with 49 *CFR* Part 238, using the new rules that became effective in January 2019. This argument is based on a report by the consulting engineering firm Simpson, Gumpertz, and Heger Inc. (SGH), which is included as appendix A of the petition. This argument was not presented in Talgo's party submission.

[7] See the "Talgo Party Submission," which is available via the NTSB Accident Docket Search system; search for Accident ID RRD18MR001.

The NTSB has numbered and summarized the petitioner's specific arguments as follows:

1. Talgo was excluded from participating in the July 10-11, 2018, NTSB investigative hearing on *Managing Safety on Passenger Railroads*, which examined the derailment in DuPont and the head-on collision of an Amtrak passenger train with a standing CSX Transportation Corporation (CSX) freight train in Cayce, South Carolina, on February 4, 2018.

2. In the investigative hearing, the crashworthiness of the Talgo Series VI railcars and the grandfathering of the Talgo Series VI trainsets by the FRA were topics of questioning, without any Talgo representative available to contribute.

3. Talgo provided a party submission on April 12, 2019, which the NTSB did not address in its final report.

4. The Board Members were not provided an opportunity to review the Talgo party submission before the Board meeting.

5. NTSB staff and the Board Members declined to meet with Talgo representatives before the Board meeting.

6. The static end strength of the Talgo Series VI railcars, which was the structural deficiency requiring grandfathering approval by the FRA, was not a factor in the derailment. No other aspects of the Talgo Series VI trainset required grandfathering to meet federal requirements, so the NTSB has thus misunderstood the scope and applicability of the grandfathering provision.

7. The Talgo truck-to-carbody attachment strength was in compliance with federal regulations at the time of the derailment and can be modified to provide twice the FRA-required strength.

8. The NTSB's testing protocol for the retaining straps used to amplify the truck-to-carbody attachment strength was erroneous and reduced the load-bearing capabilities of the straps by 50 percent. This error was pointed out to the NTSB in an August 2018 response to an NTSB request for information regarding the process for inspecting and replacing the retaining straps.

9. Even assuming that the straps attaching the trucks that became detached in the accident had deteriorated equally to those tested, Talgo's party submission explains that there would still have been sufficient attachment strength to meet the FRA requirement of 250,000 pounds.

10. Deteriorated truck-to-carbody attachment straps are not a basis to recommend retirement of the entire Talgo Series VI fleet because the condition of retaining straps is a maintenance issue, not a design issue. All four remaining Talgo Series VI trainsets have been equipped with new straps that will be replaced periodically, and Talgo has proposed an even more robust attachment system patterned after that employed on the Talgo Series 8 trainset.

11. The lead locomotive was a contributing cause of the accident, as it was the first vehicle to derail, and it dragged the Talgo Series VI railcars off the track. The speed required to derail the Talgo Series VI railcars is significantly higher than the speed required to derail the Siemens locomotive, because the Talgo Series VI railcars have a lower center of gravity. These facts contravene the NTSB's finding that the "Talgo Series VI trainset . . . poses unnecessary risk to railroad passenger safety when involved in a derailment or collision."

12. Car C3, Amtrak 7504, was extensively damaged by impacting the end of the bridge while moving sideways, a completely different cause than that identified by the NTSB.

13. New evidence contained in a report by the petitioner's consultants, SGH, which is included in the petition, substantiates the fact that the NTSB made erroneous findings about the damage to and crashworthiness of the Talgo Series VI trainsets.

14. The NTSB's findings about the Talgo Series VI railcars based on their failure to meet FRA standards were wrong because the Talgo Series VI railcars meet FRA crashworthiness and truck-to-carbody retention standards.

15. The Talgo Series VI railcars performed as well as, or better than, conventional railcars would have in high-speed railroad accidents.

16. In other high-speed accidents involving conventional railcars in which trucks separated or in which crashworthiness or occupant-protection designs were found inadequate, the NTSB did not recommend removing those railcars from service.

17. Safety Recommendation R-19-17 to the WSDOT to discontinue the use of the Talgo Series VI trainsets is unprecedented and unwarranted.

Based on these arguments, the petitioner requested that the NTSB modify the DuPont, Washington, accident report by deleting or revising findings 30, 31, 34, 35, 36, and 37; classifying Safety Recommendations R-19-12 and R-19-17 "Closed—Reconsidered"; and revising the probable cause by striking the last sentence concerning the factor contributing to the severity of the accident. The petitioner's specific modification requests are addressed in this response.

NTSB's Response

The NTSB's factual and analytical investigative information—observations, inspections, examinations, interviews, and testing—will be used to address the petitioner's claims.

Assessing the Petitioner's Claims

The petitioner's claims are substantively grouped together, restated from the numbered list above, and addressed in order, as follows.

Investigative Hearing

1. Talgo was excluded from participating in the July 10-11, 2018, NTSB investigative hearing on *Managing Safety on Passenger Railroads*, which examined the derailment in DuPont and the head-on collision of an Amtrak passenger train with a standing CSX freight train in Cayce, South Carolina, on February 4, 2018. (Petitioner's Claim)

2. In the investigative hearing, the crashworthiness of the Talgo Series VI railcars and the grandfathering of the Talgo Series VI trainsets by the FRA were topics of questioning, without any Talgo representative available to contribute. (Petitioner's Claim)

The accidents in DuPont, Washington, and Cayce, South Carolina, were both primarily caused by errors in the operation of the trains involved. Both accidents also involved Amtrak operations on track owned by another entity, a host railroad. As a result, the primary focus of the hearing was on Amtrak's operations on host railroads, including planning, training, interagency communication, and risk assessments, and on the FRA's oversight. Implementation of safety management systems by Amtrak and the host railroads involved was also a major topic of discussion, including examples of safety management systems implemented for railroads in France and the United Kingdom and for the pipeline industry in the United States.

Participants in the hearing included the FRA, the BLET, the Brotherhood of Railroad Signalmen, CSX, the Central Puget Sound Regional Transit Authority, Amtrak, the WSDOT, the Washington State Utilities and Transportation Commission, and the International Association of Sheet Metal, Air, Rail and Transportation Workers.

Because the Talgo Series VI railcars are unique, in that they are the only railcars in the United States that have been granted grandfathering approval by the FRA under 49 *CFR* 238.203, some questions during the hearing were directed to the FRA and to Amtrak about the Talgo Series VI railcars. A witness from the FRA was asked about the grandfathering approval process, which was a decision-making process carried out by the FRA. The Board of Inquiry was interested in the FRA's internal deliberations and decisions related to the approval process. Witnesses from Amtrak and the FRA were also asked if they had any concerns about the performance of the Talgo Series VI railcars in the crash when compared with and considering the predictions from studies that had been used to support the grandfathering approval. The FRA witness stated that the items that were covered in the grandfathering petition performed adequately, and the Amtrak witness requested time to assess the question and respond in writing after the hearing. Amtrak had petitioned the FRA for grandfathering approval of the Talgo Series VI railcars, and the FRA granted that approval, so its assessment of the performance of the railcars in the accident was of interest. Talgo's opinion on that matter would not have added to the discussion. Witnesses from

Amtrak, the WSDOT, and the FRA were also questioned about the expected life of railcars. The witnesses stated that expected lifetimes were in the range of 20 to 30 years. These questions covered railcars in general, and they concerned railroad operators' planning regarding their fleets. Again, Talgo would not have been in a position to substantially add to that discussion.

The petitioner does not provide any specific objection to what was said, or not said, at the investigative hearing. Rather, the petitioner's objection is that Talgo was not included in the proceedings. Talgo was a party to the NTSB DuPont, Washington, accident investigation. However, the NTSB is not obligated to include every party to an investigation in a hearing related to that investigation. Instead, the participants in the investigative hearing were the entities best able to address Amtrak operations on host railroads.

Party Submission and Meeting Request

3. Talgo provided a party submission on April 12, 2019, which the NTSB did not address in its final report. (Petitioner's Claim)

4. The Board Members were not provided an opportunity to review the Talgo party submission before the Board meeting. (Petitioner's Claim)

5. NTSB staff and the Board Members declined to meet with Talgo representatives before the Board meeting. (Petitioner's Claim)

On October 4, 2018, the investigator-in-charge for the DuPont accident investigation sent an email to the Talgo party representative, attaching factual reports for review. The email included a notification that party submissions were due by November 30, 2018. Talgo provided feedback on the factual reports but did not provide a submission by the date indicated.[8] On February 28, 2019, the investigator-in-charge sent a reminder email to Talgo and offered to accept a party submission as late as April 12, 2019; Talgo provided a submission on that date.[9] The Board meeting for the DuPont accident investigation took place on May 21, 2019. The Board Members were informed of the submission in a memorandum accompanying the draft of the report they received on April 19, 2019; however, the submission was not provided directly to the Board Members, and it was not available in the docket until May 18, 2019. As the petition stated, at least one of the Board Members was not aware of the submission until the day of the Board meeting. Because of this, the vote on the final report was held open for 1 week to allow the Board Members to review the submission. No changes to the final report were made by the Board Members following this review. Thus, the Board Members did have the opportunity to consider Talgo's submission before the report was adopted.

The NTSB relies on the parties to the investigation to provide technical expertise to ensure that the necessary facts are gathered and agreed upon. As a party to the investigation, Talgo employees participated in the investigation and reviewed factual reports. Per 49 *CFR* 831.14, parties to the investigation "may submit to the NTSB written proposed findings to be drawn from the evidence produced during the course of the investigation, a proposed probable cause, and/or proposed safety recommendation(s) designed to prevent future accidents." Talgo did provide a

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[8] The federal government, including the NTSB, was shut down from December 22, 2018, until January 25, 2019.

[9] The "Talgo Party Submission" is available via the NTSB Accident Docket Search system; search for Accident ID RRD18MR001.

submission as indicated in its petition for reconsideration and contacted Board Member offices to set up meetings; however, as the petition indicated, no meetings were scheduled. During their review of this petition for reconsideration, several Board Members did meet with Talgo representatives to allow for them to present Talgo's case.

Grandfathering Agreement

6. The static end strength of the Talgo Series VI railcars, which was the structural deficiency requiring grandfathering approval by the FRA, was not a factor in the derailment. No other aspects of the Talgo Series VI trainset required grandfathering to meet federal requirements, so the NTSB has thus misunderstood the scope and applicability of the grandfathering provision. (Petitioner's Claim)

Although the grandfathering provision in 49 *CFR* Part 238 applied only to the static end strength requirement in 49 *CFR* 238.203, the FRA's decision to grant approval to Amtrak to continue using the Talgo Series VI railcars was predicated on a series of modifications to the railcars. Specifically, the required structural modifications were spelled out in the FRA's initial decision to grant temporary approval in September 2000, as follows:

a. The rail cars must be modified to increase the strength of the weight bearing bars (two per car) and their related supports to the car structure, to withstand, at a minimum, a 100,000 pound vertical load, applied either up or down.

b. The rail cars must be modified by applying safety cables between the cars and bogies [rolling assembly structures] to resist a minimum total longitudinal force of 77,162 pounds to resist separation of the carbodies and bogies.

c. The rail cars must be modified by applying safety cables around the top of each suspension column, affixed to the upper structure of the cars to resist the application of a nominal 250,000 pound force, applied at the center of gravity of the bogie.[10]

These modifications were completed and were assumed to be present when the FRA issued its final decision in March 2009 to approve grandfathering the Talgo Series VI trainsets. Modifications b and c refer to cables to strengthen the attachments between the railcars and the rolling assemblies; however, the modifications actually employed polyester straps. Postaccident examinations of 12 straps from the accident trainset and from another Talgo Series VI trainset found that they were degraded from use and environmental exposure. When tested, the straps failed at between 10 percent and 50 percent of their rated strength. As a result, the grandfathered Talgo Series VI railcar modifications explicitly required in the FRA's initial decision and assumed to be in place in the FRA's final decision were not present on the day of the DuPont accident. Therefore, the NTSB concluded that the accident trainset "was not in compliance with the terms and conditions of the FRA's grandfathering agreement."[11]

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[10] See page 23 of "Group D - Exhibit 15 FRA Grandfathering of Non-compliant Equipment Specified Lines," which is available via the NTSB Accident Docket Search system; search for Accident ID DCA18HR001. See also page 38 of the NTSB DuPont accident report.

[11] See page 106 and finding 35 on page 122 of the NTSB DuPont accident report.

Truck-to-Carbody Attachment Strength

7. The Talgo truck-to-carbody attachment strength was in compliance with federal regulations at the time of the derailment and can be modified to provide twice the FRA-required strength. (Petitioner's Claim)

8. The NTSB's testing protocol for the retaining straps used to amplify the truck-to-carbody attachment strength was erroneous and reduced the load-bearing capabilities of the straps by 50 percent. This error was pointed out to the NTSB in an August 2018 response to an NTSB request for information regarding the process for inspecting and replacing the retaining straps. (Petitioner's Claim)

9. Even assuming that the straps attaching the trucks that became detached in the accident had deteriorated equally to those tested, Talgo's party submission explains that there would still have been sufficient attachment strength to meet the FRA requirement of 250,000 pounds. (Petitioner's Claim)

10. Deteriorated truck-to-carbody attachment straps are not a basis to recommend retirement of the entire Talgo Series VI fleet because the condition of retaining straps is a maintenance issue, not a design issue. All four remaining Talgo Series VI trainsets have been equipped with new straps that will be replaced periodically, and Talgo has proposed an even more robust attachment system patterned after that employed on the Talgo Series 8 trainset. (Petitioner's Claim)

In the DuPont accident, out of the 11 rolling assemblies between passenger railcars, 5 rolling assemblies fully detached and 1 partially detached. The rolling assemblies each weighed 5,900 pounds, and many of them were involved in secondary impacts that caused a substantial amount of damage. The NTSB concluded that one rolling assembly breached the side wall of railcar 7504 and struck a passenger, causing a fatal injury; two other passengers were fatally injured when they were ejected through the breach in the railcar's side wall.

Each Talgo Series VI rolling assembly is attached to the two adjacent railcars by a number of different components, as shown in figure 2.[12] The primary connections are the four upper and lower guide bars (two on each side), shown in yellow in figure 2. The guide bars are attached to the rolling assembly through a pivot mechanism that allows the railcars to track around curves. The image on the right in figure 2 shows that the rolling assemblies are also attached to the railcars by two steel retention cables shown in green, two polyester tower straps shown in red, and four polyester lower retention straps shown in orange. The petition indicates that each guide bar has a tensile strength of 74,700 pounds, and each steel retention cable has a tensile strength of 20,000 pounds. The nominal (not worn or degraded) strength of each tower strap and lower retention strap (in the basket configuration) is 77,000 pounds.

[12] See figure 8 in the NTSB DuPont accident report.

In the image on the left in figure 2, the weight of the suspended end of the transparent railcar is carried by the two weight bearer bars shown in red. Fore and aft forces between railcars are carried by the articulated connection at the base of the railcars (not shown), which has flexible elements to allow the railcars to track around curves.

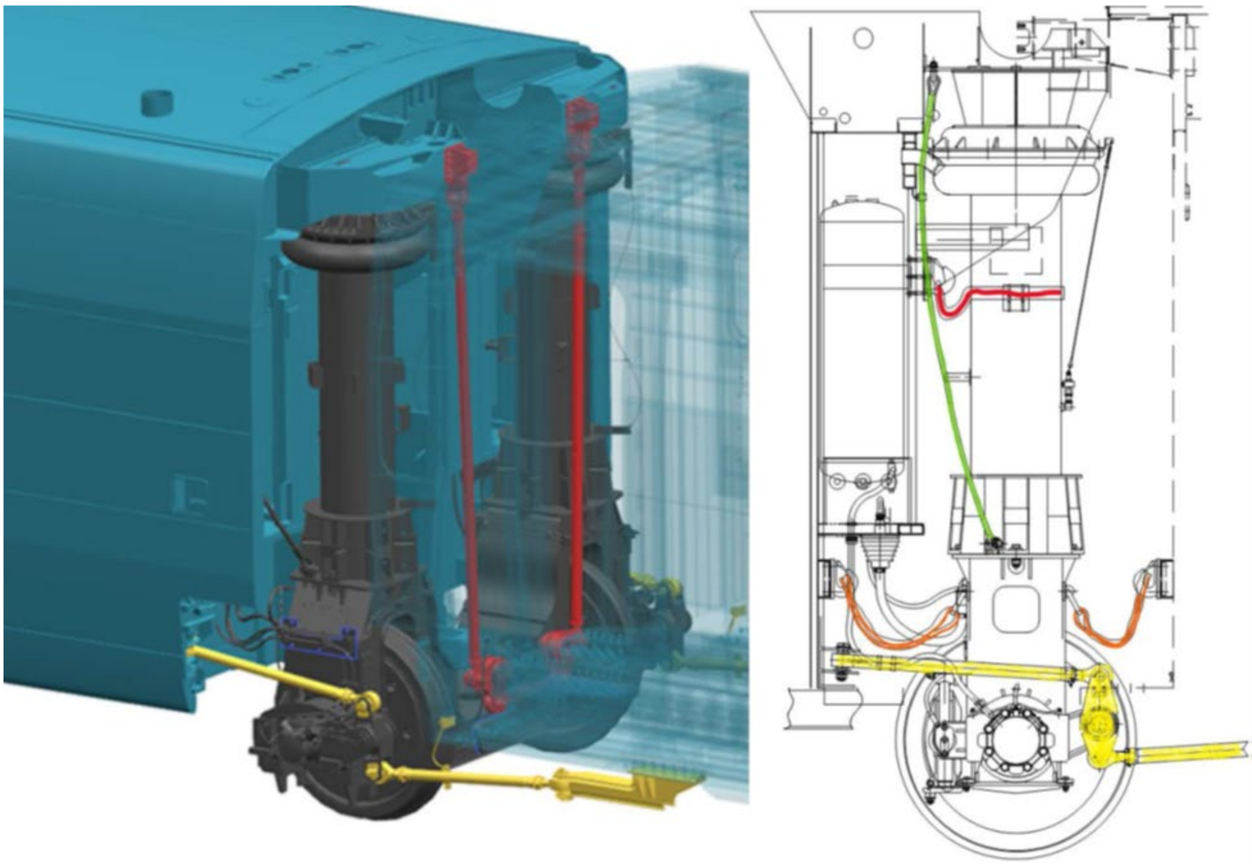

Figure 2. Rolling assembly cutaway and its side view.

The petitioner accepts that the polyester straps used to increase the truck-to-carbody attachment strength were degraded by some amount but argues that the straps were not necessary for the truck-to-carbody attachment strength to be in compliance with the FRA's rules. The petitioner also argues that more straps can be added to further increase the truck-to-carbody attachment strength.

The evaluation in appendix A of the petition, by the petitioner's consultants, SGH, considers the requirements for the truck-to-carbody attachment for 49 *CFR* 238.219, which was effective in 1999, and for the alternative means of compliance in 49 *CFR* 238.717, which was effective in 2019. Both are included here for reference.

The requirements effective in 1999 were as follows:

49 *CFR* 238.219 Truck-to-car-body attachment. Passenger equipment shall have a truck-to-carbody attachment with an ultimate strength sufficient to resist without failure the following individually applied loads: 2g vertically on the mass of the truck; and 250,000 pounds in any horizontal direction on the truck, along with the resulting vertical reaction to this load. For purposes of this section, the mass of the truck includes axles, wheels, bearings, the truck-mounted brake system, suspension system components, and any other component attached to the truck by design.

The requirements for alternative means of compliance effective in 2019 were as follows:

49 *CFR* 238.717 Truck-to-car-body attachment. To demonstrate the integrity of truck-to-carbody attachments, each unit in a Tier III trainset shall:

(a) Comply with the requirements in § 238.219; or

(b) Have a truck-to-carbody attachment with strength sufficient to resist, without yielding, the following individually applied, quasi-static loads on the mass of the truck at its [center of gravity]:

(1) 3g vertically downward;

(2) 1g laterally, along with the resulting vertical reaction to this load; and

(3) Except as provided in paragraph (c) of this section, 5g longitudinally, along with the resulting vertical reaction to this load, provided that for the conditions in the dynamic collision scenario described in § 238.705(a):

(i) The average longitudinal deceleration at the [center of gravity] of the equipment during the impact does not exceed 5g; and

(ii) The peak longitudinal deceleration of the truck during the impact does not exceed 10g.

(c) As an alternative to demonstrating compliance with paragraph (b)(3) of this section, the truck shall be shown to remain attached after a dynamic impact under the conditions in the collision scenario described in § 238.705(a).

(d) For purposes of paragraph (b) of this section, the mass of the truck includes axles, wheels, bearings, truck-mounted brake system, suspension system components, and any other component attached to the truck by design.

(e) Truck attachment shall be demonstrated using a validated model.

In the evaluation in appendix A of the petition, SGH chose to use 49 *CFR* 238.717(c) with the acceleration calculated from the collision scenario being 21g.[13] The horizontal forces required to be resisted are much larger than the vertical forces required to be resisted. The rolling assemblies (trucks) weigh 5,900 pounds, so a 2g vertical acceleration provides a force of 11,800 pounds; a 3g vertical acceleration provides a force of 17,700 pounds; but a 21g horizontal acceleration provides a force of 123,900 pounds. The evaluation in appendix A of the petition sums the strength

[13] The collision scenario of 49 *CFR* 238.705 is also evaluated in appendix A of the petition. The collision assessed is a Talgo Series VI trainset colliding with a stationary conventional train at 25 mph.

of the components attaching the rolling assemblies to the supported end of one railcar (the trailing railcar in the accident), which includes two guide bars, two steel cables, and four polyester straps. Assuming all of these components act in concert to retain the rolling assembly to the supported end of the railcar, the two guide bars resist 149,000 pounds; the two steel cables resist 40,000 pounds; and the four polyester straps resist 308,000 pounds, also assuming they achieve their rated strength. The total strength of those components would be 497,000 pounds, as compared to the requirement of 250,000 pounds in 49 *CFR* 238.219 or 123,900 pounds in 49 *CFR* 238.717. Assuming the straps were degraded and only carried 50 percent of their rated strength, the total strength of the components would be 343,000 pounds. Assuming the straps were degraded to 10 percent of their rated strength, which was the minimum strength measured in the postaccident testing, the total strength of the components would be 219,800 pounds. Consequently, in the worst-case scenario, following the methodology employed in appendix A of the petition, the truck-to-carbody strength would not have met the requirement in 49 *CFR* 238.219.

This simple approach to evaluating the truck-to-carbody attachment strength is not appropriate for a high-speed derailment like the DuPont accident. In the DuPont accident, the railcars did not remain in a line but displaced laterally leading to an accordion pattern of railcars derailing in opposite directions. This result was to be expected; such behavior was predicted in the studies completed for the FRA's evaluation of Amtrak's petition to grandfather the Talgo Series VI trainsets. The public docket for the grandfathering petition includes a report prepared for the Volpe National Transportation Systems Center, "Crashworthiness Evaluation of Amtrak's Talgo VI Train," dated February 2002. The report noted that large lateral displacements, which could cause impacts with wayside objects or foul an adjacent track, will occur more easily with the Talgo Series VI railcars than with conventional railcars. This conclusion was reached after having studied accident scenarios in which a train impacted an obstacle at speeds of 20 mph and 25 mph, substantially less than the 78-mph speed of the DuPont train when it derailed. The results of the study also predicted that the articulated connectors joining adjacent Talgo Series VI railcars were prone to failure in accidents. When the railcars begin to undergo large lateral displacements, the ends of adjacent railcars are rotating in opposite directions, with the railcars pulling apart on one side and compressing together on the other side. In that situation, the components discussed above that maintain the truck-to-carbody attachments do not all work together in concert in a single plane of direction to retain the rolling assembly. On the side where the railcars are pulling apart, the structure on the lead railcar is working against the structure on the trailing railcar, with the guide bars and the polyester lower retention straps attaching the rolling assembly to the suspended end of the leading railcar actually acting to separate the rolling assembly from the supported end of the trailing railcar. On the side where the railcars are compressing together, the components are doing very little, except possibly buckling or bending the guide bars. As a result, the guide bars and retention straps work against each other, and they then fail sequentially in tension as the railcars separate, causing the rolling assembly to detach. Because the rolling assemblies are attached to two railcars, they are prone to being pulled loose and ejected when the railcars separate.

Conventional railcars have a truck at each end, both of which are attached to the bottom of the railcar. The forces on each truck therefore only have to be counteracted by the attachment to a single railcar, and the requirements in 49 *CFR* 238.219 and 49 *CFR* 238.717 were developed with that design in mind. Also, it is easier to demonstrate compliance when each truck is attached to a single railcar. Forces only act between a truck and a single railcar, and this situation does not change in a high-speed derailment where the railcars displace laterally and derail in an accordion arrangement, although the directions of the forces applied will change.

The petitioner argues that the tests of the straps did not replicate the basket configuration of the retaining straps on the Talgo Series VI trainset, which are wrapped around the towers that are the rolling assembly support structures. This claim is baseless. These straps are elements of the system used to attach the rolling assemblies to the railcars. The purpose of the testing was to evaluate the condition of the straps themselves, as they appeared worn and degraded postaccident. The simplest test method for this purpose is direct tension, and the results were compared with the manufacturer's specification for straps when used in direct tension. Using the straps in a basket configuration does not make an individual strap any stronger, it just effectively doubles the number of straps involved. Figure 3 illustrates the two configurations. The strap on the left is under direct tension carrying a force, F. On the right, in a basket configuration, the strap itself carries the same force, F; however, because the strap is wrapped around the object, the two legs of the strap together can counteract a force of 2F applied to the object. In both cases, the force in the strap is F; the force of 2F being resisted in the basket configuration is only a result of geometry, not an increase in the capacity of the strap. The test results showed that the straps were degraded by use and environmental exposure. The 12 straps tested failed at between 10 percent and 50 percent of their rated strength.

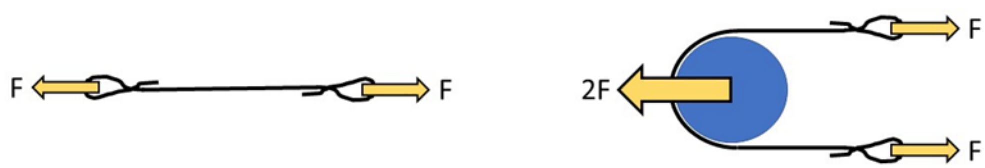

Figure 3. Strap configurations showing direct tension on the left and a basket configuration on the right.

Finding that 5 of 11 rolling assemblies detached in the DuPont accident was of great concern to the NTSB. The petitioner argues that even with degraded straps, the truck-to-carbody attachment strength was sufficient to meet the FRA's requirements. The calculations the petitioner presents would appear to support this claim, but such a claim is not consistent with the high percentage of detached rolling assemblies observed in the accident. Although the derailment occurred at a relatively high speed, there were few obstacles or solid structures in the path of the railcars that would have caused such damage. The detachment of the rolling assemblies appears to be primarily a result of the large lateral displacement of the Talgo Series VI railcars, which derailed in an accordion arrangement. Talgo's party submission describes the more robust attachment system it proposes, which adds additional straps connecting the rolling assembly to the supported end of the trailing railcar and to the suspended end of the leading railcar. It does not appear that the petitioner has considered that in a high-speed collision or derailment, the Talgo Series VI railcars will undergo large lateral displacements, and the different connections among the railcars and the rolling assemblies will be working against each other.

Lead Locomotive

11. The lead locomotive was a contributing cause of the accident, as it was the first vehicle to derail, and it dragged the Talgo Series VI railcars off the track. The speed required to derail the Talgo Series VI railcars is significantly higher than the speed required to derail the Siemens locomotive, because the Talgo Series VI railcars have a lower center of gravity. These facts contravene the NTSB's finding that the "Talgo Series VI trainset . . . poses unnecessary risk to railroad passenger safety when involved in a derailment or collision." (Petitioner's Claim)

The operational factors that led to the DuPont accident are clearly stated in the NTSB's probable cause, with the physical derailment resulting from the train entering a curve restricted to 30 mph at a speed of 78 mph. It is possible that the Talgo Series VI railcars could have stayed on the rails, but the railcars require a locomotive for propulsion; therefore, their center of gravity or ability to navigate the curve without a locomotive is a moot point. The derailment of the locomotive and the rest of the train could have been prevented by slowing the train. The NTSB finding is not a conclusion that the Talgo Series VI railcars initiated the derailment; rather, the NTSB finding is related to the safety of the Talgo Series VI railcars once a derailment or collision has occurred.

Damage to Railcar 7504

12. Car C3, Amtrak 7504, was extensively damaged by impacting the end of the bridge while moving sideways, a completely different cause than that identified by the NTSB. (Petitioner's Claim)

The petitioner reiterates an argument made in Talgo's party submission that the damage to the third passenger railcar, Amtrak 7504, resulted from an impact with the end of the railroad bridge over I-5, after the railcar slid sideways into the bridge structure. This alternative hypothesis offered by Talgo, and again by the petitioner, is inconsistent with the physical evidence.

As railcar 7303 and the other railcars in front of railcar 7504 were stopping (after following the locomotive along the right side of the tracks), railcar 7504 was being pushed by railcar 7424 and the rest of the consist behind it. Figure 4 indicates the approximate positions of railcars 7504 and 7424 partway through the derailment sequence. Railcar 7424 traveled down the left side of the tracks and came to rest under the overpass. Figure 4 indicates the final resting position of railcar 7504, on its left side on top of railcars 7554 and 7804, with the front end of the railcar pointing back in the direction from which it came. The end of the concrete bridge is indicated where it caused an indentation on the left side of railcar 7422. Railcar 7423, in front of railcar 7422, slid farther onto the bridge and was damaged by impact with a parapet and railing.

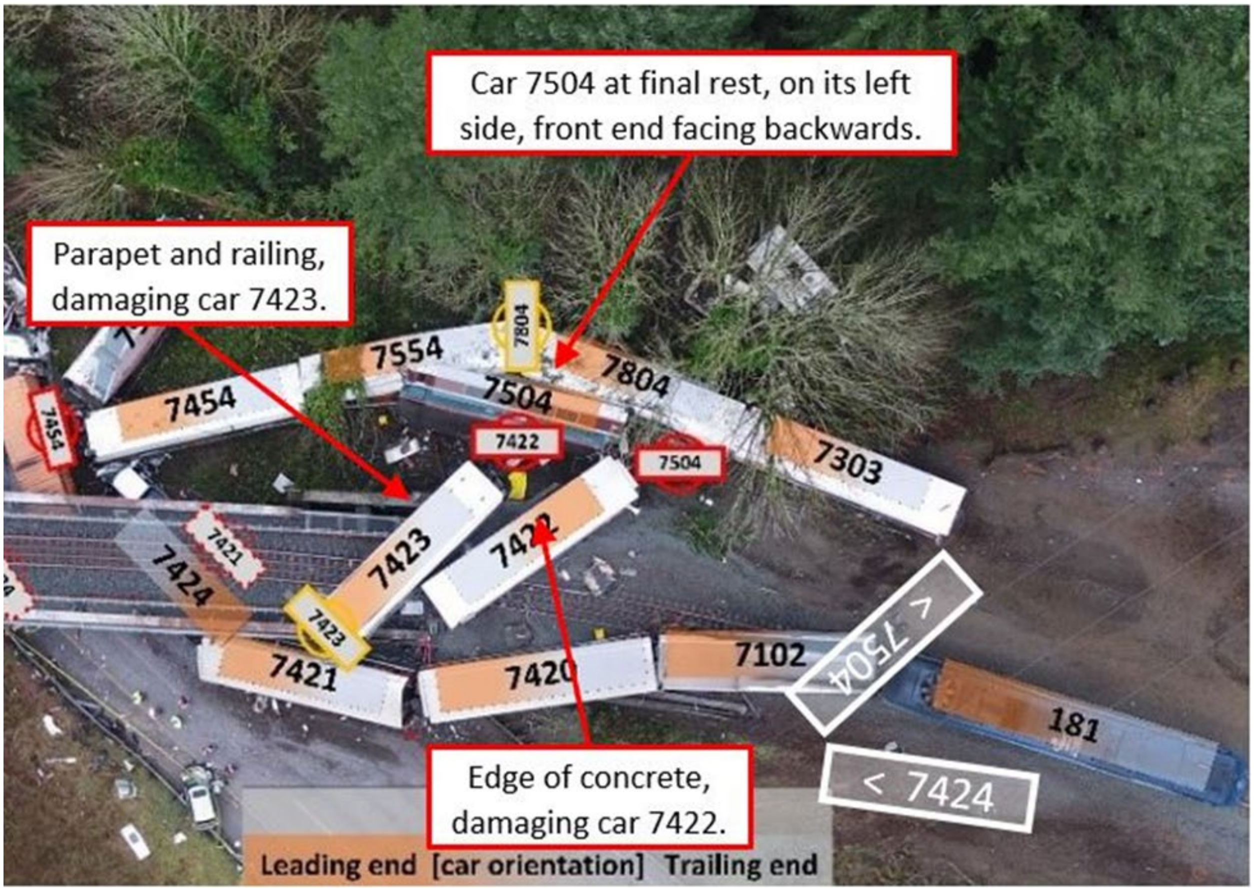

Figure 4. Approximate positions of railcar 7504 and railcar 7424 during the derailment sequence, as indicated by white rectangles on the right side of the image. The < symbols indicate the direction of travel before the derailment. The small red boxes with circles indicate the positions of rolling assemblies; see figure 1 for the complete legend.

As railcar 7504 was separating from the stopped railcar 7303, it was being pushed from behind by railcar 7424. As a result, railcar 7504 acquired angular momentum that would tend to keep it rotating, as well as linear momentum carrying it toward the front of the train. Talgo's explanation for the damage to railcar 7504 would have required it to stop rotating and then slide sideways about 65 feet to a point where it contacted the bridge, after which it would have had to rotate an additional 90° and turn onto its left side.

Photographs illustrate that the petitioner's proposed scenario is incorrect. Figure 5 reproduces figure 31A from the NTSB DuPont accident report. The subject of the photograph was the penetration of railcar 7423 by the bridge railing; the displaced concrete parapet can be seen just in front of the railcar door. However, the bottom of railcar 7504 is clearly seen on the left of the photograph. There are no scrape marks on the bottom of the railcar. There is no evidence that the railcar slid sideways for 65 feet. An impact at floor level on the left side of the railcar (at the bottom in the photograph) would have pushed the floor structure toward the right (upward in the photograph).

Figure 5. The bottom of railcar 7504 on the left shows no evidence of the railcar sliding sideways.

Figure 6 also shows the bottom of railcar 7504 but looking from the opposite direction. Again, there are no scrape marks to indicate the railcar slid sideways, and the bottom of the railcar remains generally intact except for the tear in the railcar floor. Figure 6 reproduces figure 56 from Talgo's party submission.

Figure 6. The bottom of railcar 7504 is on the right, looking in the opposite direction from figure 5. There are no marks to indicate the railcar slid sideways, and the bottom structure is not deformed. The detached rolling assembly from railcar 7422 is underneath railcar 7504.

It is most likely that railcar 7504 continued rotating in the direction that it was being pushed by railcar 7424. Having rotated until it was pointing back in the direction from which it came, it then slid along the sides of railcars 7303 and 7804, stopping on top of railcar 7554.

Figure 7 shows the right side of railcar 7504 after coming to rest on top of railcar 7554 and alongside railcar 7804.[14] The right side of railcar 7504 is generally clean and shows little damage. The indentation along the left side of the roof of railcar 7804 that was caused by railcar 7504 begins just above the last window, and there are scrape marks along railcar 7804 and the trailing railcar 7303 (to the right in the photograph), again indicating that railcar 7504 slid backward alongside these railcars to its final resting position.

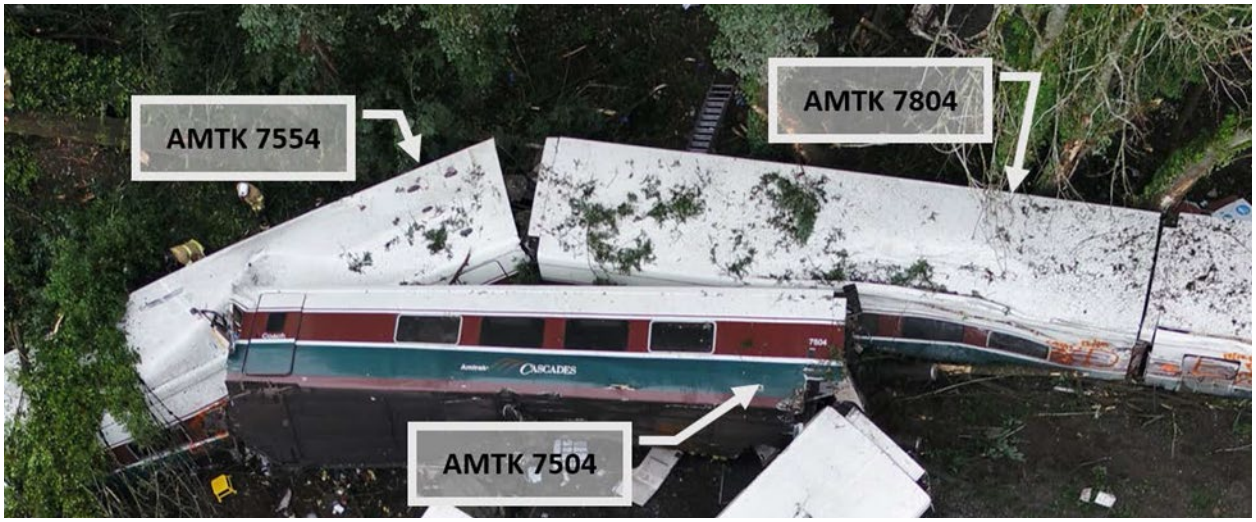

Figure 7. The right side of railcar 7504, at rest on top of railcar 7554 and alongside railcar 7804. The indentation of the roof of railcar 7804 begins just above the last window, and there are scrape marks along railcar 7804 and the trailing railcar 7303, again indicating that railcar 7504 slid backward alongside these railcars to its final resting position.

SGH Report

13. New evidence contained in a report by the petitioner's consultants, SGH, which is included in the petition, substantiates the fact that the NTSB made erroneous findings about the damage to and crashworthiness of the Talgo Series VI trainsets. (Petitioner's Claim)

14. The NTSB's findings about the Talgo Series VI railcars based on their failure to meet FRA standards were wrong because the Talgo Series VI railcars meet FRA crashworthiness and truck-to-carbody retention standards. (Petitioner's Claim)

During the investigation and development of the DuPont accident report, NTSB staff considered the performance of the Talgo Series VI trainset in light of the rules for Tier I passenger equipment that were in effect at the time of the accident, which were the rules in 49 *CFR* Part 238 that became effective in 1999. Except for the compressive strength requirement in 49 *CFR* 238.203, the Talgo Series VI trainsets were not required to comply with any of those rules because the Talgo Series VI trainsets had been in service before the rules came into effect. Only the compressive strength requirement applied retroactively, thus requiring the FRA grandfathering approval to keep the Talgo Series VI trainsets in service. There were other areas where the design of the Talgo Series VI railcars did not comply with 49 *CFR* Part 238 in addition to 49 *CFR* 238.203,

[14] See figure 8 in the NTSB's "Survival Factors / Crashworthiness Group Factual Report – DuPont, WA."

such as the lack of full height corner posts. Therefore, it was reasonable to conclude that the Talgo Series VI trainsets did not meet the safety standards that were in place at the time of the accident, even though the compressive strength deficiency had received grandfathering approval and the trainsets were not required to meet the other specifications.

The traveling public has a right to expect a uniform level of safety across the transportation network. A transition period when new rules are implemented allows for older equipment to be phased out gradually and replaced with equipment that meets more stringent safety requirements. Yet, there should be a time when all passenger railroad equipment is required to meet new standards. This idea is the basis for the NTSB's recommendation that the grandfathering provision be removed from 49 *CFR* 238.203(d) (R-19-12) and for the recommendation to remove the outmoded Talgo Series VI trainsets from service (R-19-17). As noted in the final NTSB report, the Talgo Series VI trainsets are at, or near, the end of their expected service lives and due for replacement. Safety Recommendation R-19-12 to the FRA is classified "Open—Unacceptable Response." Safety Recommendation R-19-17 to the WSDOT is classified "Open—Acceptable Response."

The petitioner now argues that the Talgo Series VI trainsets meet the current FRA crashworthiness and occupant protection requirements in 49 *CFR* Part 238, by appealing to the alternative means of compliance that became effective in January 2019. (Talgo's April 12, 2019, party submission did not propose applying the new alternative means of compliance for Tier I passenger equipment to the Talgo Series VI trainsets.) Part of the SGH report in appendix A of the petition steps through the process of applying the alternative means of compliance laid out in appendix G of 49 *CFR* Part 238 to assess the Talgo Series VI railcars. The first issue is that neither Talgo nor the NTSB determine whether the Talgo Series VI trainsets comply with the new rules. The FRA decides whether to approve a waiver from strict compliance with the Tier I passenger equipment crashworthiness standards as previously set forth in 1999. Several other issues also would still need to be addressed, such as the following:

- The 2019 rule requires that "each type of vehicle shall be subjected to an end compression load (buff) test with an end load magnitude no less than 337,000 lbf (1500 kN)." The petition refers to a 1998 Talgo document submitted for Amtrak's petition grandfathering approval of the Talgo Series VI trainsets, which notes that one of the baggage railcars was tested statically to a load of 441,000 pounds. The baggage railcar and the power railcar differ from the passenger railcars in that they have collision posts, and the baggage railcar also includes a second rolling assembly at the rear of the railcar.

- The 2019 rule requires that any models used to demonstrate compliance must be validated by comparison with test data. The SGH report in appendix A of the petition presents finite element models and other types of models without any information to show the validity of the models. The SGH report does cite an FRA report that generally describes the rationale behind the development of the alternative means of complying with the Tier I passenger safety requirements and also provides guidance on the methodology for evaluating trainsets using the alternative rules.[15] The FRA report specifically states

[15] *Technical Criteria and Procedures for Evaluating the Crashworthiness and Occupant Protection Performance of Alternatively Designed Passenger Rail Equipment for Use in Tier I Service*, DOT/FRA/ORD-11/22, Final Report, US Department of Transportation, Federal Railroad Administration, Washington, DC, October 2011.

> If analysis is used to demonstrate compliance with any of the three options, the model used must be validated with test data. The model should be validated with data from a compressive strength test of the occupied volume. The load may be applied to the vehicle in a manner consistent with the governing design standard, with an end load magnitude no less than 1,500 kN (337,000 lb) regardless of the load magnitude required by the design standard.

- The SGH report argues that the Talgo Series VI trainsets meet the new alternative means of compliance. However, the SGH report also states that the passenger carbody does not meet the applicable 49 *CFR* Part 238 structural crashworthiness requirements for the "case of a longitudinal corner post load at 18 in. above the underframe at one side of the supported end, in which the strength is 70% of the [49] *CFR* 238.213 requirement."

- Of most concern, other than the fact that the dynamic collision requirement is limited to a speed of 25 mph, is that the model SGH used to demonstrate compliance with the dynamic collision requirement is a one-dimensional lumped mass model. Such a model only captures motion in the direction that the train is traveling and, by definition, cannot capture any lateral motion of the railcars. As noted earlier, studies completed for the FRA's evaluation of Amtrak's petition to grandfather the Talgo Series VI trainsets found that large lateral displacements will occur more easily with the Talgo Series VI railcars than with conventional railcars. Use of a three-dimensional model that can capture lateral motions would be more appropriate.

Whether the FRA would accept a Talgo petition for approval under the alternative means of compliance with the regulations is unknown.

Other NTSB Accident Investigations

15. The Talgo Series VI railcars performed as well as, or better than, conventional railcars would have in high-speed railroad accidents. (Petitioner's Claim)

16. In other high-speed accidents involving conventional railcars in which trucks separated or in which crashworthiness or occupant-protection designs were found inadequate, the NTSB did not recommend removing those railcars from service. (Petitioner's Claim)

17. Safety Recommendation R-19-17 to the WSDOT to discontinue the use of the Talgo Series VI trainsets is unprecedented and unwarranted. (Petitioner's Claim)

The petition highlights four other railroad accidents involving conventional passenger railcars, arguing that the performance of the Talgo Series VI trainset in the DuPont derailment was equal to, or better than, the performance of the railcars in the other accidents. The information in the petition is supplemented by the SGH report in appendix A. The four accidents cited are as follows:

- **Metrolink collision in Glendale, California, on January 26, 2005.**[16] About 6:00 a.m., a southbound Metrolink train (a locomotive pushing three railcars) struck an SUV that had been left on the tracks. The train had been traveling 80 mph, but emergency brakes were applied, and the train struck the SUV at 63 mph. The leading cab car derailed and struck the lead locomotive of a standing freight train on a side track at 47 mph. (The freight locomotive was pushed off the tracks and onto its side in the collision.) The cab car and the second car jackknifed across the adjacent track and struck the rear two railcars of a northbound Metrolink train (a locomotive pulling three railcars) that was traveling 50 mph. The last car of the northbound train separated from the consist and rolled on its side; its front truck appears separated in photographs. There were 11 fatalities, and about 180 people were injured. The Glendale police department determined that the SUV had been placed on the tracks intentionally, and it pursued criminal charges. As a result, the NTSB closed its investigation in September 2005.

- **Amtrak derailment in Philadelphia, Pennsylvania, on May 12, 2015.**[17] At 9:21 p.m., an eastbound Amtrak train (a locomotive pulling seven railcars) traveling 106 mph derailed on a curve restricted to 50 mph. The first car behind the locomotive struck two wayside steel catenary supports, and it was severely damaged. Photographs show at least four trucks separated from railcars. The train carried 245 passengers and 8 Amtrak employees; there were 8 fatalities, and 185 others were transported to hospitals.

- **Amtrak derailment in Northfield, Vermont, on October 5, 2015.**[18] At 10:22 a.m., a southbound Amtrak train (a locomotive pulling five railcars) traveling 59 mph struck a rockslide and derailed. The locomotive and the first coach car slid down a steep embankment. Photographs show a truck separated from a passenger car. The train carried 98 passengers and 4 crew; there were 7 injuries.

- **Amtrak collision in Cayce, South Carolina, on February 4, 2018.**[19] About 2:27 a.m., a southbound Amtrak train (a locomotive pulling seven railcars) diverted from the main track through a reversed hand-throw switch and at a speed of 53 mph collided head-on with a stationary freight train. Photographs show one truck separated from a passenger railcar. The train carried 141 passengers and 8 crewmembers. The Amtrak engineer and conductor were fatally injured, and 91 passengers and crew from the Amtrak train were transported to hospitals.

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[16] (a) See the "Closeout Memorandum" available in the NTSB Accident Docket Search system under Accident ID DCA05MR009, which closed the NTSB investigation. (b) For additional information, see Volpe National Transportation Systems Center, "Crashworthiness Analysis of the January 26, 2005, Glendale, California, Rail Collision" in *Proceedings of the ASME/ASCE/IEEE 2011 Joint Rail Conference, JRC2011, March 16-18, 2011, Pueblo, Colorado*.

[17] National Transportation Safety Board, *Derailment of Amtrak Passenger Train 188 Philadelphia, Pennsylvania, May 12, 2015*, RAR-16/02 (Washington, DC: National Transportation Safety Board, 2016).

[18] National Transportation Safety Board, *National Passenger Railroad Corporation (Amtrak) Passenger Train 55 Collision with Rocks and Subsequent Derailment on the New England Central Railroad, Northfield, Vermont, October 5, 2015*, RAB-17/03 (Washington, DC: National Transportation Safety Board, 2017).

[19] National Transportation Safety Board, *Amtrak Passenger Train Head-on Collision With Stationary CSX Freight Train, Cayce, South Carolina, February 4, 2018*, RAR-19/02 (Washington, DC: National Transportation Safety Board, 2019).

Talgo's party submission highlighted the following two other accidents:

- **Amtrak collision in Bourbonnais, Illinois, on March 15, 1999.**[20] About 9:47 p.m., a southbound Amtrak train (2 locomotives pulling 14 railcars) traveling 79 mph struck a tractor-semitrailer at a grade crossing and derailed. Derailed Amtrak railcars struck two stationary freight railcars on an adjacent track. The train carried 207 passengers and 21 railroad employees. There were 11 fatalities, and 122 others were transported to hospitals.

- **Metro-North derailment in Bronx, New York, on December 1, 2013.**[21] At 7:19 a.m., a southbound Metro-North train (a locomotive pushing seven railcars) traveling 82 mph derailed on a curve restricted to 30 mph. Metro-North estimated there were 115 passengers on the train. The Talgo party submission indicated that one truck separated from a passenger railcar (in an annotation on a photograph), but that was not correct. No trucks separated from any of the railcars or the locomotive in that accident. There were 4 fatalities, and 61 were injured.

For discussion purposes, the DuPont accident is summarized in a similar format as follows:

- **Amtrak derailment in DuPont, Washington, on December 18, 2017.** At 7:34 a.m., a southbound Amtrak train (a locomotive pulling 12 railcars and a trailing locomotive) traveling 78 mph derailed on a curve restricted to 30 mph, with the lead locomotive and other railcars coming to rest on I-5. Photographs show 5 out of 11 rolling assemblies separated from passenger railcars. The train carried 77 passengers, 5 Amtrak employees, and 1 Talgo employee. There were 3 fatalities, and 57 train occupants and 8 highway vehicle occupants were injured.

All the accidents referenced in the petition or the party submission were severe, and direct comparison of the accident circumstances or the performance of the railcars in the accidents is not straightforward. However, the accidents referenced in the petition are all different from the DuPont accident in that they involved high-speed impacts. In the 2005 Glendale collision, the leading Metrolink cab car struck a stationary freight train locomotive, and then it and the second car jackknifed into another Metrolink train. In the 2015 Philadelphia derailment, which occurred at a speed nearly 30 mph higher than the DuPont derailment, the first car behind the locomotive struck one and possibly two steel catenary supports. In the 2015 Northfield derailment, the train struck a rockslide. In the 2018 Cayce collision, the Amtrak train ran head-on into a stationary freight train. These high-speed impacts with wayside structures, rockslides, or other trains caused severe damage to the railcars involved, including separation of some trucks. Yet, the most severe damage was typically confined to the forwardmost railcars in the consist.

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[20] National Transportation Safety Board, *Collision of National Railroad Passenger Corporation (Amtrak) Train 59 With a Loaded Truck-Semitrailer Combination at a Highway/Rail Grade Crossing in Bourbonnais, Illinois, March 15, 1999*, RAR-02/01 (Washington, DC: National Transportation Safety Board, 2002).

[21] National Transportation Safety Board, *Metro-North Railroad Derailment, Bronx, New York, December 1, 2013*, RAB-14/12 (Washington, DC: National Transportation Safety Board, 2014).

In contrast, the DuPont accident did not involve the train colliding with a large highway vehicle at a grade crossing or another train. Instead, the DuPont accident train derailed in an area with few large obstacles to encounter. The forwardmost four passenger railcars in the consist followed the locomotive and power car off the rails and slowed to a stop. The unique aspect of the DuPont accident is that it was the next two railcars in the consist, 7504 and 7424, that experienced the most damage. The Talgo Series VI railcars are susceptible to lateral motion, and railcars 7504 and 7424 deviated from following the locomotive and the lead railcars, and they were subsequently substantially damaged by secondary impacts. As noted in the NTSB DuPont accident report and in this response, when granting grandfathering approval of the Talgo Series VI railcars, the FRA was concerned that "greater lateral displacement of the passenger units would create a greater hazard of secondary collisions."[22]

In addition to the hazard of secondary collisions with wayside structures or trains on adjacent tracks, the DuPont accident also demonstrates that the lateral displacement of the Talgo Series VI railcars leads to separation of the rolling assemblies, which each weigh 5,900 pounds. The derailment led to 5 of the 11 rolling assemblies between passenger railcars fully separating, as a result of the railcars undergoing large lateral displacements in different directions. The separated rolling assemblies caused substantial damage to vehicles on the interstate and to railcars that were struck. The separation of rolling assemblies (or trucks) in the other accidents cited were caused by severe impacts on, or near, the rolling assemblies themselves. In the DuPont accident, the separation of the rolling assemblies was only a result of the railcars separating as they derailed in different directions, which led to a much higher proportion of separated rolling assemblies.

Railcar 7504 came to rest on its left side against the left upper side/roof of railcar 7554 and against the left side of railcar 7804. The resting position of railcar 7504 indicates that during the collision, it rotated 180° from its direction of travel. The wheels of the rolling assembly from railcar 7422 lay immediately outside of the deformed left side of railcar 7504. One of the towers of the rolling assembly was partially resting within the passenger compartment against occupied areas within the car. Postaccident observations showed that two of the three deceased passengers in railcar 7504 came in contact with the rolling assembly at its point of rest.

Railcar 7424 traveled down the left side of the railroad bridge, sideswiping the bridge structure, which tore open the right side of the railcar along the trailing 30 percent of its length. The railcar then flipped end over end and landed on its roof on I-5, after which it was struck by a tractor-trailer. The damage to railcar 7424 was severe. In addition to removing 30 percent of the right sidewall, four of five right-side passenger windows were missing, and the end wall structure of the suspended end of the railcar was completely separated. Four of five left-side passenger windows were also missing. There were 11 passengers traveling in this railcar; of these, 5 were ejected and found lying on the interstate, and a total of 10 were injured, with 4 of the injuries deemed severe. In addition, the rolling assembly separated from the leading (supported) end of railcar 7424 and struck a Kia Soul and a Jeep Grand Cherokee traveling on the interstate. Both highway vehicles were extensively damaged, and all three occupants received minor injuries.

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[22] See page 40 of the NTSB DuPont accident report.

The severe damage to railcar 7424 in the accident was of concern to the NTSB. Also of concern was damage in another derailment of Talgo Series VI railcars in Vancouver, British Columbia, on December 17, 2018.[23] The passenger train was moving 3 mph when it derailed over a switch in a railroad yard, and two Talgo Series VI railcars from the trainset struck a freight railcar parked on an adjacent track. There were no injuries reported by crew or passengers, but the two Talgo Series VI railcars were damaged. One of the railcars exhibited two tears in the sidewall near the side passenger door. The door was also damaged during the collision; the door's window was broken, and the exterior was torn and damaged. The other passenger railcar was abraded along its side wall. Two areas of the sidewall were torn and fractured, and one passenger window was broken. The damage to the train traveling only 3 mph when it derailed into an adjacent freight car indicates that a high-speed impact with wayside structures or other trains would be catastrophic.

Of the accidents cited, the one that is most similar to the DuPont derailment is the derailment of the Metro-North train in the Bronx, which is listed in Talgo's party submission but not in the petition for reconsideration. Both the Bronx and DuPont trains derailed while traveling about 80 mph on curves restricted to 30 mph, and neither train impacted any substantial wayside structures or trains on adjacent tracks. However, the derailment in the Bronx occurred in an area with multiple parallel tracks, and the derailing railcars were subject to impacts with adjacent tracks and the ballast supporting the tracks. The Bronx accident also had a greater potential for damage to railcars and injuries because the locomotive was at the rear of the consist, and the first railcar to derail was carrying passengers. Nevertheless, in the Bronx accident, none of the trucks separated from any of the railcars. From a crashworthiness perspective, the most significant problem in the Bronx accident was the loss of windows in the passenger railcars. During the derailment sequence, the railcars slid along the tracks and through the ballast on their right sides, and nearly all of the windows and surrounding gaskets were separated from the right sides of the first three railcars. The four fatally injured passengers were ejected from the train through window openings, and two of the seriously injured passengers were partially ejected. As a result of this accident, the NTSB recommended that the FRA

> Develop a performance standard to ensure that windows (e.g., glazing, gaskets, and any retention hardware) are retained in the window opening structure during an accident and incorporate the standard into 49 *Code of Federal Regulations* (*CFR*) 238.221 and 49 *CFR* 238.421 to require that passenger railcars meet this standard. (R-14-74)

Safety Recommendation R-14-74 was reiterated following the 2015 Amtrak derailment in Philadelphia, and it is classified "Open—Acceptable Response."

The Talgo Series VI trainsets in the United States were manufactured in 1999, and they are owned either by the WSDOT or Amtrak, and they operate in the Amtrak Cascades system, a joint program of the WSDOT and the Oregon Department of Transportation. The WSDOT provided a copy of its Amtrak Cascades Fleet Management Plan, which documents its expectation that the service life of a Talgo Series VI railcar is 25 years. The experience in the DuPont derailment and

[23] See section 1.11.8, "Vancouver Talgo Derailment," on page 41 of the NTSB DuPont accident report. See also the "Crashworthiness Follow-up Exam - December 2018" report, which is available via the NTSB Accident Docket Search system; search for Accident ID RRD18MR001.

the Vancouver derailment revealed that the Talgo Series VI trainsets are at serious risk for catastrophic results in the event of a high-speed accident where wayside structures or other trains are impacted. Recognizing that risk and that the Talgo Series VI trainset did not meet the US safety standards in place when the accident occurred, coupled with the fact that the WSDOT is operating a trainset near the end of its useful life, led to the recommendation that the WSDOT replace the Talgo Series VI trainsets as soon as possible (R-19-17). Safety Recommendation R-19-17 to the WSDOT is classified "Open—Acceptable Response."

The NTSB makes recommendations in order to improve safety. The NTSB is not bound by precedent regarding what recommendations can be made or to whom they can be made. Further, it is not correct to state that a recommendation to remove a model of railcar from service is unprecedented. Following the June 22, 2009, collision of two Washington Metropolitan Area Transit Authority (WMATA) trains near the Fort Totten station in Washington, DC, the NTSB issued Safety Recommendation R-10-20 to WMATA, recommending it "remove all 1000-series railcars as soon as possible and replace them with railcars that have crashworthiness collision protection at least comparable to the 6000-series railcars."[24] Safety Recommendation R-10-20 was classified "Closed—Acceptable Action" after WMATA removed all the 1000-series railcars from service. This recommendation affected a fleet of about 300 railcars.

Addressing the Petitioner's Specific Requests

The petitioner requested that the NTSB modify certain portions of the DuPont, Washington, accident report. Specifically, the petitioner requested that the NTSB delete or revise findings 30, 31, 34, 35, 36, and 37; classify Safety Recommendations R-19-12 and R-19-17 "Closed—Reconsidered"; and revise the probable cause by deleting the last sentence concerning the factor contributing to the severity of the accident. The NTSB addresses each specific request as follows.

Delete or Revise Findings 30, 31, 34, 35, 36, and 37

The petitioner requested that the NTSB delete findings 30, 31, 34, 35, 36, and 37, or alternatively, modify them as indicated by the struck text or the underlined alternate text provided.

> 30. The Talgo Series VI passenger railcar AMTK 7424 (8)'s ~~did not provide adequate occupant protection after its~~ articulated connections separated, resulting in complex uncontrolled movements and secondary collisions with the surrounding environment ~~which led to damage so severe to the railcar body structure, that it caused passenger ejections~~. (Petitioner's Request)

The petitioner does not provide any specific information regarding railcar 7424 to explain why this finding should be deleted or modified. As noted earlier, railcar 7424 traveled down the left side of the railroad bridge, sideswiping the bridge structure, which tore open the right side of the railcar along the trailing 30 percent of its length. The railcar then flipped end over end and landed on its roof on I-5, after which it was struck by a tractor-trailer. The damage to railcar 7424 was severe. In addition to removing 30 percent of the right sidewall, four of five right-side

[24] National Transportation Safety Board, *Collision of Two Washington Metropolitan Area Transit Authority Metrorail Trains Near Fort Totten Station, Washington, D.C., June 22, 2009*, RAR-10/02 (Washington, DC: National Transportation Safety Board, 2010).

passenger windows were missing, and the end wall structure of the suspended end of the railcar was completely separated. Four of five left-side passenger windows were also missing. There were 11 passengers traveling in this railcar; of these, 5 were ejected and found lying on the interstate, and a total of 10 were injured, with 4 of the injuries deemed severe.

Even though railcar 7424 was in the middle of the consist and had already slowed substantially before separating from the rest of the train, sliding impacts—that is, secondary collisions—with the side of the bridge and the side of the tractor-trailer tore open the structure and removed almost all of the windows, allowing 5 of the 11 occupants to be ejected, demonstrating a lack of occupant protection. Finding 30 remains accurate and correct as written.

> 31. ~~The failure of the articulated connections of both Talgo Series VI passenger railcars AMTK 7422 (10) and AMTK 7504 (7), the detached rolling assembly from AMTK 7422 (10) and its secondary collision with AMTK 7504 (7) directly resulted in three fatalities and two partially ejected passengers who had been traveling in AMTK 7504 (7).~~ The Talgo Series VI passenger railcars AMTK 7422 (10) and AMTK 7504 (7)'s articulated connections separated, and the detached rolling assembly from AMTK 7422 came to rest in AMTK 7504 after the bridge breached the side wall of AMTK 7504. (Petitioner's Request)

Following the accident, the railcars were thoroughly inspected and documented at the accident site and in a follow-up evaluation at a storage facility. Parties to the investigation, including Talgo employees, participated in these evaluations. Based on these evaluations, the NTSB concluded that the damage to railcar 7504 was a result of impact from the rolling assembly from railcar 7422, which also caused the fatal injures of two ejected passengers and one passenger still inside railcar 7504.

The NTSB DuPont accident report provides the following analysis supporting finding 31:

> Based on the examination of the postaccident damage, photographic documentation collected by the Federal Bureau of Investigation Evidence Response Team and the location of the human remains prior to the northeast bridge abutment that passed over the lanes of southbound I-5, AMTK 7504 (7) collided with the detached rolling assembly from AMTK 7422 (10) after the articulated connections failed on both railcars, thereby resulting in the rolling assembly physically penetrating AMTK 7504 (7). The three fatalities that occurred in AMTK 7504 (7) were all the result of blunt force trauma. Two of the fatally injured passengers were ejected from the compromised railcar-body structure of AMTK 7504 (7) when the side wall of the railcar was breached by the rolling assembly from AMTK 7422 (10). The rolling assembly tore a hole into the underside of the railcar as it flipped over onto its right side during the derailment. The rolling assembly was found partially inside of the railcar. In addition, two more passengers were partially ejected out of the opening created by the railcar's structural breach. Another passenger was fatally injured when he was struck by the rolling assembly inside of the railcar.[25]

[25] The analysis appears on pages 99 and 100 of the NTSB DuPont accident report.

The petitioner proposes to eliminate or completely replace finding 31. There is no argument regarding the failure and separation of the articulated connections of railcars 7422 and 7504 or the detachment of the rolling assembly of railcar 7422, which came to rest partially inside and underneath the breached left side of railcar 7504. The alternative hypothesis that railcar 7504 was damaged when sliding sideways into the bridge structure was evaluated in the assessment of number 12 of the petitioner's claims (see the section titled "Damage to Railcar 7504" in this response). The physical evidence is not consistent with this alternative hypothesis, which must be rejected. Finding 31 remains accurate and correct as written.

> 34. ~~The Talgo Series VI trainset is structurally vulnerable if it is involved in a high-energy derailment or collision due to its lack of crashworthiness protections and is at risk to severe and catastrophic loss of survivable space.~~ (Petitioner's Request)

Concerning finding 34, the petitioner fails to demonstrate that the Talgo Series VI railcars are not structurally vulnerable in a high energy derailment or collision. Rather, the petitioner argues that all railcars are at risk in a high-energy derailment or collision, and the Talgo Series VI railcars are not especially vulnerable. This argument was addressed in the assessment of number 15 of the petitioner's claims (see the section titled "Other NTSB Accident Investigations" in this response).

Other railcars might be at risk, and the other accidents referenced in the petition were severe. However, the other accidents referenced in the petition are all different from the DuPont accident in that they involved high-speed impacts with wayside structures, rockslides, or other trains, which caused severe damage to the railcars involved, including separation of some trucks. Also, the most severe damage was typically confined to the forwardmost railcars in the consist.

In contrast, the DuPont accident did not involve severe impacts with many wayside structures or other trains. Rather, the DuPont accident train derailed in an area with few large obstacles to encounter. The forwardmost four passenger railcars in the consist followed the locomotive and power car off the rails and slowed to a stop. The unique aspect of the DuPont accident is that it was the next two railcars in the consist, 7504 and 7424, that experienced the most damage. As Volpe predicted and the NTSB observed, the articulated connections between the Talgo Series VI railcars are prone to failure in a high energy event. Railcars in the trainset separated, such that passenger-occupied railcar structures with deficient end strength design and no corner or collision posts were fully exposed to all surrounding environmental risks. Had this accident occurred on double track territory and these railcars collided with another passenger train or fully loaded freight train, as in the 2005 Glendale, California, accident, the outcome would have been catastrophic. As a result of their lateral motions, railcars 7504 and 7424 deviated from following the locomotive and the lead railcars, and they were subsequently substantially damaged by secondary impacts. As noted in the NTSB DuPont accident report and in this response, when granting grandfathering approval of the Talgo Series VI railcars, the FRA was concerned that "greater lateral displacement of the passenger units would create a greater hazard of secondary collisions."[26] This concern was realized in the DuPont accident.

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[26] See page 40 of the NTSB DuPont accident report.

In addition to the hazard of secondary collisions with wayside structures or trains on adjacent tracks, the DuPont accident also demonstrates that the lateral displacement of the Talgo Series VI railcars leads to separation of the rolling assemblies, which each weigh 5,900 pounds. Because of the railcars separating while undergoing large lateral displacements in different directions, the derailment led to 5 of the 11 rolling assemblies between passenger railcars fully separating. The separated rolling assemblies caused substantial damage to vehicles on the interstate and to railcars that were struck. The separation of rolling assemblies (or trucks) in the other accidents cited in the petition were caused by severe impacts on, or near, the rolling assemblies themselves. In the DuPont accident, the separation of the rolling assemblies was only a result of the railcars separating as they derailed in different directions, which led to a much higher proportion of separated rolling assemblies.

The damage to railcars 7504 and 7424 was of concern to the NTSB, as was the damage to the Talgo Series VI railcars involved in a low-speed 3 mph derailment and collision in Vancouver, British Columbia, on December 17, 2018. The damage in the DuPont accident and the damage to railcars traveling only 3 mph when they derailed into an adjacent freight car indicate that a high-speed impact with wayside structures or other trains would be catastrophic. The Talgo Series VI trainset is particularly vulnerable in a high-energy derailment or collision. Finding 34 remains accurate and correct as written.

> 35. ~~The Talgo Series VI trainset designated as Amtrak train 501 was not in compliance with the terms and conditions of the Federal Railroad Administration's grandfathering agreement.~~ (Petitioner's Request)

As documented in the NTSB DuPont accident report and as discussed in this response, the grandfathering agreement specifically relied on the presence of a modification to add the safety securing straps to the rolling assemblies (see the "Grandfathering Agreement" section of this response). In the DuPont accident, the straps were worn and degraded by environmental exposure. Tests showed the straps retained only 10 percent to 50 percent of their rated strength. As a result, the straps did not meet the requirement in the grandfathering agreement, and the Talgo Series VI trainset was not in compliance with the grandfathering agreement. Finding 35 remains accurate and correct as written.

> 36. ~~Allowing the grandfathering provision to remain in Title 49 *Code of Federal Regulations* 238.203(d), "Grandfathering of noncompliant equipment for use on a specified rail line or lines," is an unnecessary risk that is not in the public interest nor consistent with railroad safety.~~ (Petitioner's Request)

As noted earlier in the "SGH Report" section of this response, the traveling public has a right to expect a uniform level of safety across the transportation network. A transition period when new rules are implemented allows for older equipment to be phased out gradually and replaced with equipment that meets more stringent safety requirements. Yet, there should be a time when all passenger railroad equipment is required to meet new standards. This idea is the basis for the NTSB's recommendation that the grandfathering provision be removed from 49 *CFR* 238.203(d) (R-19-12) and for the recommendation to remove the outmoded Talgo Series VI trainsets from service (R-19-17). As noted in the final NTSB report, the Talgo Series VI trainsets are at, or near, the end of their expected service lives and due for replacement. Finding 36 supports the recommendations and remains accurate and correct.

> 37. ~~The Talgo Series VI trainset does not meet current United States safety standards and poses unnecessary risk to railroad passenger safety when involved in a derailment or collision.~~ (Petitioner's Request)

During the investigation and development of the final NTSB report, NTSB staff considered the performance of the Talgo Series VI trainset in light of the rules for Tier I passenger equipment that were in effect at the time of the accident, which were the rules in 49 *CFR* Part 238 that became effective in 1999. The compressive strength requirement applied retroactively, thus requiring the FRA grandfathering approval to keep the Talgo Series VI trainsets in service. There were other areas where the design of the Talgo Series VI railcars did not comply with 49 *CFR* Part 238 in addition to 49 *CFR* 238.203, such as the lack of full height corner posts. Therefore, it is reasonable to conclude that the Talgo Series VI trainsets did not meet the safety standards that were in place at the time of the accident.

The petitioner now argues that the Talgo Series VI trainsets meet the current FRA crashworthiness and occupant protection requirements in 49 *CFR* Part 238, by appealing to the alternative means of compliance that became effective in January 2019. However, Talgo did not make this claim in its April 12, 2019, party submission, nor is the argument relevant because the alternative means of compliance were not in effect at the time of the accident. Further, it is not up to Talgo or the NTSB to determine that the Talgo Series VI trainsets comply with the new rules, it is up to the FRA to decide whether to approve a waiver from strict compliance with the Tier I passenger equipment crashworthiness standards, as previously set forth in 1999. The petition for reconsideration does not indicate that Talgo has received such a waiver from the FRA. Talgo can request such a waiver, but whether the FRA would accept a Talgo petition for approval under the alternative means of compliance with the regulations is unknown. At this time, therefore, finding 37 remains accurate and correct.

When the FRA published the final rule regarding passenger equipment safety standards on May 12, 1999, it noted that the railroad operating environment in the United States requires passenger equipment to operate commingled with very heavy and long freight trains, often over track with frequent grade crossings used by heavy highway equipment. The FRA also indicated there were serious concerns about the operation of passenger equipment not possessing a minimum compressive strength of 800,000 pounds in such an environment. Historically, the US industry requirement for a minimum compressive strength has reinforced a pattern of passenger car construction resulting in the use of stiff, quite substantial underframes that have served other practical purposes in derailments and collisions, such as preventing carbody buckling, preventing harm to passengers from failure of the floor structure and entry of debris, and resisting penetration of the car from the side when the primary impact was at the floor level. The purpose of the 1999 rule was to codify existing practice into regulation. In the discussion of the final rule, the FRA noted that it had solicited and received input from many stakeholders, including Talgo. The FRA expressed concern about the articulated connections of the Talgo Series VI trainsets and the construction of the body shells, including the absence of major structural members in the floor. The FRA was concerned that the structure would be at risk in a collision with freight railcars or other obstacles and would be vulnerable to penetration by the trainset's trucks, should the trucks separate from the train.[27]

The damage to the Talgo Series VI railcars in the DuPont accident and in the 3-mph derailment and collision in Vancouver, British Columbia, indicate that the FRA's concerns were well founded. The 1999 FRA rule on passenger equipment safety standards was intended to ensure a uniform level of safety throughout the railroad system in the United States. The Talgo Series VI trainset does not meet the requirements of that rule, and they do pose a higher risk to passenger safety than is warranted. Again, finding 37 remains accurate and correct.

Reconsider and Close Safety Recommendations R-19-12 and R-19-17

The petitioner requested that the NTSB classify the following two safety recommendations "Closed—Reconsidered."

To the Federal Railroad Administration

> Remove the grandfathering provision within Title 49 *Code of Federal Regulations* 238.20[3](d), and require all railcars comply with the applicable current safety standards. (R-19-12)

To the Washington State Department of Transportation

> Discontinue the use of the Talgo Series VI trainsets as soon as possible and replace them with passenger railroad equipment that meet all current United States safety requirements. (R-19-17)

As noted earlier in the "SGH Report" section of this response, the traveling public has a right to expect a uniform level of safety across the transportation network. A transition period during which new rules are implemented allows for older equipment to be phased out gradually and replaced with equipment that meets more stringent safety requirements. Yet, there should be a time when all passenger railroad equipment is required to meet new standards. This idea is the basis for the NTSB's recommendation that the grandfathering provision be removed from 49 *CFR* 238.203(d) (R-19-12) and for the recommendation to remove the outmoded Talgo Series VI trainsets from service (R-19-17). As noted in the final NTSB report, the Talgo Series VI trainsets are at, or near, the end of their expected service lives and are due for replacement. Safety Recommendation R-19-12 to the FRA is classified "Open—Unacceptable Response." Safety Recommendation R-19-17 to the WSDOT is classified "Open—Acceptable Response."

The petitioner's request that the NTSB classify Safety Recommendation R-19-12 to the FRA and Safety Recommendation R-19-17 to the WSDOT "Closed—Reconsidered" is not appropriate. As policy, once a recommendation has been issued, the only way to have it reconsidered is for the recipient to present information that convinces the NTSB that the recommendation should not have been issued. Because Talgo was not the recipient for either of these recommendations and this review confirms both are still warranted, there is no basis for the recommendations to be classified "Closed—Reconsidered."

[27] *Federal Register* 64, no. 91 (May 12, 1999): 25540.

Revise the Probable Cause

The petitioner requested that the NTSB delete the last sentence of the probable cause concerning the factor contributing to the severity of the accident, as indicated by the struck text.

> The National Transportation Safety Board determines that the probable cause of the Amtrak 501 derailment was Central Puget Sound Regional Transit Authority's failure to provide an effective mitigation for the hazardous curve without positive train control in place, which allowed the Amtrak engineer to enter the 30-mph curve at too high of a speed due to his inadequate training on the territory and inadequate training on the newer equipment. Contributing to the accident was the Washington State Department of Transportation's decision to start revenue service without being assured that safety certification and verification had been completed to the level determined in the preliminary hazard assessment. ~~Contributing to the severity of the accident was the Federal Railroad Administration's decision to permit railcars that did not meet regulatory strength requirements to be used in revenue passenger service, resulting in (1) the loss of survivable space and (2) the failed articulated railcar-to-railcar connections that enabled secondary collisions with the surrounding environment causing severe damage to railcar-body structures which then failed to provide occupant protection resulting in passenger ejections, injuries, and fatalities.~~ (Petitioner's Request)

As noted earlier, the FRA published a rule on passenger equipment safety standards on May 12, 1999, with a goal of ensuring a more uniform level of safety across the United States, where passenger equipment shares tracks with heavy freight trains and with frequent grade crossings used by heavy highway equipment. The FRA clearly recognized the deficiencies in the Talgo Series VI trainset structure, particularly the fact that the railcars could not achieve the requirement for a compressive strength of 800,000 pounds. Despite these concerns, the FRA approved a grandfathering agreement that allowed the Talgo Series VI trainsets to remain in service. The results of that decision are seen in the DuPont accident, where the railcars underwent complex uncontrolled movements, articulated connections between railcars failed and rolling assemblies separated, and there were secondary collisions with the surrounding environment. The resulting severe damage to the railcar body structures led to passenger ejections, injuries, and fatalities. These factors contributing to the severity of the accident are explained in the analysis section of the NTSB DuPont accident report, particularly in the discussions leading to findings 30, 31, and 37.[28] Thus, the probable cause stands as written.

[28] See sections 2.6 and 2.6.5 of the NTSB DuPont accident report.

Disposition

After review of the evidence, we have established sufficient and substantiated evidence to merit the findings, probable cause, and recommendations determined in the DuPont, Washington, accident report and adopted by the Board. Thus, the petition for reconsideration and modification of the findings and probable cause of the NTSB's DuPont, Washington, accident report is denied in its entirety.

Chairman SUMWALT, Vice Chairman LANDSBERG, and Members HOMENDY, GRAHAM, and CHAPMAN concurred in the disposition of this petition for reconsideration.