SAFETY ALERT 083

NTSB National Transportation Safety Board

November 2021

AVIATION
HIGHWAY
MARINE
RAILROAD
PIPELINE

Passenger Railcar Wheelset Alert

The problem

- Wheels on certain railcars operating within the Washington Metropolitan Area Transit Authority (WMATA) transit system moved outward from their mounted position on the axle, which caused multiple derailments of that wheelset.
- When the wheels move outward, they are no longer properly positioned on an axle.
- Because an out-of-specification wheelset is not easily identifiable with a routine visual inspection, this condition could exist on wheel and axle assemblies of other transit or commuter railcars.
- A derailment due to wheel movement could be catastrophic.

What can rail transit agencies and commuter railroads do?

- Assess your fleets for wheelsets not meeting your gage specifications and take immediate action to correct the problem.

Related accident

On October 12, 2021, about 4:51 p.m. local time, WMATA train 407, consisting of eight 7000-series railcars, was traveling southbound on track 2 of the blue line between the Rosslyn and Arlington Cemetery stations in Arlington, Virginia, when one wheelset on railcar 7200 derailed. Of the 187 passengers onboard, 1 passenger was transported to the hospital for treatment; no other injuries were reported. The evacuation, coordinated by WMATA and the Arlington County Fire Department, began about 6:20 p.m. and concluded about 7:16 p.m. Passengers were safely evacuated onto the track bed through the end railcar door and escorted south to the Arlington Cemetery station.

The train had departed the Rosslyn station when one wheelset on the fourth car of the train, car 7200, derailed. After it derailed, the train traveled about 1,800 feet before stopping in the tunnel. All railcars remained upright and inline. Initially unaware of car 7200's wheelset derailment, the train operator reported to the rail operations control center that he believed there was a stuck brake on car 7200. The rail controller instructed the train operator to try to move the train. The attempt was unsuccessful, and when a WMATA supervisor arrived on-scene, they determined that the lead axle on car 7200 derailed. Power to the third rail (an additional rail supplying electric current) was disconnected at 5:03 p.m.

The National Transportation Safety Board (NTSB) identified that the point of derailment was in the frog of a turnout about 166 feet south of the Rosslyn station.[1] The maximum authorized speed through the area is 59 mph. A preliminary review of data from an onboard event recorder revealed the train speed was about 33 mph at the time of the derailment.

Based on physical evidence and station video review, between the Arlington Cemetery and Rosslyn stations, one of car 7200's wheelsets derailed and rerailed while moving through a pair of switches, and the train continued traveling toward the Largo Town Center station. As the train departed the Largo Town Center station on track 2, the same wheelset on car 7200 derailed and rerailed again while moving through a pair of switches, and the train continued inbound through Washington, DC, toward Arlington, Virginia, where the accident occurred. Broken sections of brake discs were recovered at the crossover location north of the Arlington Cemetery station and at the turnout near the Largo Town Center station.[2]

The 7000-series cars were manufactured by Kawasaki Rail Car Inc. (Kawasaki). For their contract with WMATA, Kawasaki subcontracted with Sumitomo Metals to supply the wheels and axles and with ORX to assemble the wheelset by pressing the wheels onto the axles.[3] WMATA's design specification specified the linear distance between the wheels on the axle (the gage) is 53-5/16 inches ±1/16 inch. (See figure.)

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1 *Turnouts* are track configurations that allow a train to be guided from one track to another. A *frog* is a track component within a turnout that allows the train wheels on one rail of track to cross another rail of an intersecting track

2 The broken sections of brake disc recovered from near the Arlington Cemetery and Largo Town Center stations were transported to NTSB's materials lab for further examination.

3 On October 1, 2012, Sumitomo Metals formed a partnership as Nippon Metals & Sumitomo Metal Group, which became Nippon Steel in 2019. The wheels were forged in Osaka, Japan.

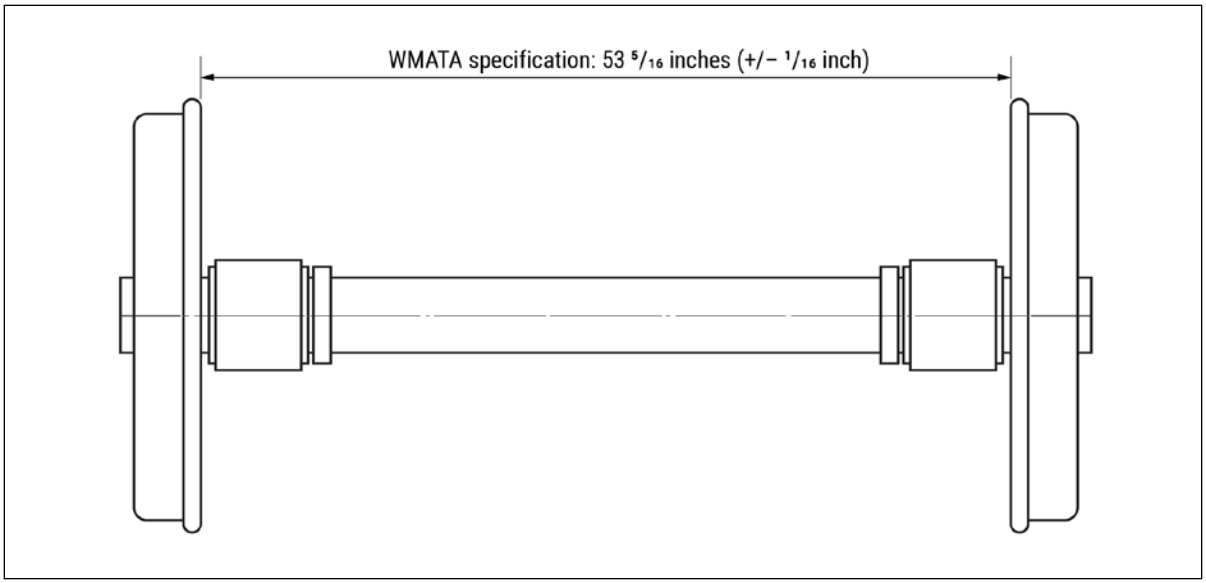

Figure 1: Illustration depicting WMATA's design specification showing the linear distance between the wheels on the axle.

The NTSB examined car 7200 and found that both wheels had moved outboard from their seats, increasing the gage 2-inches, which exceeded the design specifications. The NTSB also observed increased wear of the wheels.

Based on the track and accident wheelset examinations, WMATA began a fleet inspection of its 7000-series cars on October 15, 2021. The inspections focused on the wheel and axle assembly to identify other cars with wheelsets similar to car 7200 that did not meet specifications.

After WMATA began the 7000-series fleet inspections, the Washington Metrorail Safety Commission (WMSC), which is the state safety oversight agency for the WMATA rail system, reviewed the interim results.[4] On October 17, 2021, the WMSC ordered WMATA to remove the 7000-series railcars from revenue service, stating:

> The prevalence of this defect throughout the 7000 Series railcar fleet is unknown and an inspection interval that is adequate to detect this defect before a safety event occurs has not been determined.

On October 26, 2021, WMATA reported to NTSB that inspection of all 748 cars was complete. WMATA identified an additional 20 wheel and axle assemblies that are out of specification and exhibited outward movement of the wheel on the axle.

4 In accordance with 49 *Code of Federal Regulations* Part 674, a state safety oversight agency is responsible for "overseeing the safety of the rail fixed guideway public transportation systems within the State."

On November 1, 2021, the Federal Transit Administration (FTA) issued "Safety Advisory 21-1; Fleet-Wide Inspection of Wheel Gauging on Rail Rolling Stock" directing State Safety Oversight Agencies to report information to the FTA regarding out-of-tolerance wheel gages on all rail transit rolling stock in revenue service by December 1, 2021. The Safety Advisory also advises State Safety Oversight Agencies to require fleetwide inspections of wheel gages at rail fixed guideway public transportation systems in their jurisdiction by January 3, 2022.[5]

The NTSB is concerned that car 7200 operated with a wheelset that did not meet specifications for an undetermined time as the car derailed three times on the day of the accident (including the accident occurrence) without any noticeable indication of the problem to alert the train operator that derailmants had occurred.[6] The derailment likely occurred due to movement of the wheel on its axle, which should never happen.

The NTSB supports the FTA's Safety Advisory 21-1 issued on November 1, 2021, requiring State Safety Oversight Agencies to report out-of-tolerance wheel gages to FTA and require fleetwide inspections of wheel gages at rail fixed guideway public transportation systems in their jurisdiction. The NTSB encourages similar action from commuter railroads to assess your fleets, measure the wheelsets, and take appropriate action when necessary to ground or remove cars in accordance with Title 49 *Code of Federal Regulations* 229.75, which regulates the conditions wheels and tires may not have.

The NTSB encourages rail transit agencies and commuter railroads to assess your fleets for wheelsets not meeting your gage specifications and take immediate action to correct the problem.

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5 *Rail fixed guideway public transportation system* means any fixed guideway system that uses rail, is operated for public transportation, is within the jurisdiction of a State, and is not subject to the jurisdiction of the Federal Railroad Administration, or any such system in engineering or construction as defined in Title 49 *Code of Federal Regulations* 674.7.

6 To identify if wheel movement has occurred, a back-to-back measurement (a measurement of the distance between the inboard wheel rim faces mounted on the axle) is necessary. WMATA had inspected the 7000-series cars every 90 days.