National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials Washington, DC 20594

RRD23MR005

HUMAN PERFORMANCE AND SYSTEM SAFETY

Group Chair's Factual Report - Supplemental

November 10, 2023

A ACCIDENT

Location: East Palestine, Ohio
Date: February 3, 2023
Time: 8:54 p.m. EST
01:54 coordinated universal time (UTC) on February 4, 2023
Train: Norfolk Southern freight train derailment with hazardous materials

B HUMAN PERFORMANCE AND SYSTEM SAFETY INVESTIGATORS

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C SUMMARY

This supplemental report includes information from witnesses during NTSB's June 22-23, 2033, investigative hearing on the Norfolk Southern Railway train derailment with subsequent hazardous material release and fires.

D FACTUAL INFORMATION

During the NTSB hearing, the Human Performance and System Safety investigation focused on two main areas: Car inspections and the Advanced Train Control (ATC) Desk.

CAR INSPECTIONS

The following information, pertaining to car inspections, is based on statements made by a National Representative, Brotherhood of Railway Carmen during the NTSB Hearing.[1]

The National Representative, Brotherhood of Railway Carmen, stated that in 49 CFR Part 215 the carman is supposed to assess the total health of the freight car, whereas the Appendix D is just supposed to be a stop gap to get the freight car to an inspection point. He stated that "on a freight car, you're looking at anywhere from 90 to 105 points of inspection per side of a freight car, depending on what type of freight car we're talking about, whereas the Appendix D only hits on 12 points."[2] He added that "in today's rail structure, the railroads have gotten larger. There are less railroads and there are less interchange points, therefore, the Appendix D has become more and more the primary inspection on these cars instead of the detailed inspection under the 215 by the qualified mechanical inspector."

The National Representative, Brotherhood of Railway Carmen, discussed two important tools that are used during mechanical inspections: a flange gauge, and a high flange gauge and rim thickness. He stated that "if the flange is too thin, it could break off the wheel" and "potentially go down the wrong side of a switch." Conversely, a flange that is too high "could ride up on the frog of a switch and go on the ground," and "if the rim is too thick the wheel could . . . shatter." When asked whether train crews perform an Appendix D inspection using those tools or are trained to use them, he replied in the negative.

The National Representative, Brotherhood of Railway Carmen, stated that there was "potential" that a full mechanical safety inspection or an alternative maintenance schedule would have detected the failed bearing on the first car that derailed in East Palestine. He referenced the photographs of bearings in Exhibit E-1 and explained that certain indications of bearing failure are observable. He testified that if a "wheel seal is cocked and out of place" or "gets greasy, a carman will take [a] gauge and give a little pry to see if that seal will turn. If it does, that's loose, and it will leak lubricants . . . [A loose] wheel seal will also allow the intrusion of particulates and water, which will lead to eventual failure." He further stated that roll-by inspections are highly critical because a failing bearing will have telltales, including noises that could be detected by a human inspector.

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[1] This witness was identified in the hearing as the Transportation Communications Union / IAM representative.

[2] Regulations set out at Title 49 CFR Part 215, and in Appendix D to that part, do not enumerate visual "points of inspection." However, 49 C.F.R. §§ 215.103–129 lists defects that would require a railcar's removal from service, and Appendix D states that such inspections must cover "imminently hazardous conditions," including twelve enumerated items and "any other apparent safety hazard likely to cause an accident or casualty before the train arrives at its destination."

Two panelists (representatives from ESi and the AAR) testified that it is unlikely that a visual inspection could detect a failed bearing. The Senior Vice President, Safety and Operations, Association of American Railroads testified that "bearings are sealed components," so "a visual inspection … typically will not reveal a problem with a bearing." Similarly, The ESi representative explained that the indications of a failing bearing, such as "looseness of [bearing] components … can be detected through hand testing," however, this would only be observable during periodic "maintenance … where the wheelset would be out from underneath the car." The ESi representative clarified that this would not be apparent from a visual inspection.

The National Representative, Brotherhood of Railway Carmen, stated "Under the 215 regulation . . . there used to be more inspection points. There used to be more railroads. Because when those cars are placed into a train, they're supposed to receive a mechanical inspection by a qualified mechanical inspector to assess the total health of that freight car. And under today's railroad structure, that is done less and less."

The National Representative, Brotherhood of Railway Carmen, discussed that many locations where inspections had previously been conducted have been vacated by human inspectors, and consequently, that this "firewall of safety has been severely compromised" that includes the opportunity to find additional issues that could prevent future problems.

The National Representative, Brotherhood of Railway Carmen, discussed that if a car is derailed, it is required to receive an in-depth inspection on the bearing by a qualified mechanical employee at the repair shop when the wheels are rolled out.

ADVANCED TRAIN CONTROL (ATC) DESK

The following information pertaining to Norfolk Southern's ATC operations is based on statements made by Norfolk Southern's Assistant Vice President, Communications and Signals, and the Senior Vice President, Safety and Operations, Association of American Railroads, during the NTSB Hearing.

The following is the opening statement from the Norfolk Southern Assistant Vice President, Communications and Signals:

> Thank you and good morning. My name is [*name removed in this report*]. I am the Assistant Vice President, Communications and Signals, at Norfolk Southern and have been with the company since 2005. At Norfolk Southern, safety is our top priority. For decades, we've deployed safety systems to monitor equipment performance and identify potential defects and irregularities as trains move across the system using a variety of wayside detectors, including hot bearing detectors or HBD's. We use HBD's to assess the temperature conditions of wheel bearings. In 2022 alone, HBD's scanned the temperatures of more than 2.2 billion bearings.

As we saw in East Palestine, when a hot bearing detector detects that a bearing is more than 170 degrees above ambient temperature, it emits a radio transmission that provides an audible real time alarm to the train crew, who are trained to respond to the alarm immediately. Hot bearing detectors announced 618 bearing-related alarms directly to the train crew in 2022. Approximately 43 percent of those resulted in the identification of an issue requiring attention, with 14 percent of the alarms resulting in a car being set out from the train. The detectors also relay temperature measurements on a near real-time basis to the wayside desk, where we monitor for potential developing issues. Those issues include heat trends across multiple locations during the course of travel of a railcar that have not risen to a level that would trigger an audible alarm to the crew. In 2022, based on this, the wayside desk performed 876 bearing-related "interventions" by instructing rail crews to stop trains for inspection. Nearly 65 percent (568) of those resulted in train crews identifying potential problems with the train that could be addressed before they became more severe.

In the last 30 miles before train 32N derailed in East Palestine, it had passed 3 HBD systems. The first two detectors did not trigger any alarms or alerts that would have required action by the on-shift Wayside Desk operator or by the train crew. As the train passed through the East Palestine HBD, however, the detector identified an elevated temperature from a wheel bearing on car 23 and announced a critical alarm to the crew to stop the train and inspect the axle. As the NTSB noted in its preliminary report, our trained crew responded to the alarm in accordance with applicable policies and procedures and acted appropriately to bring the train to a safe stop. Unfortunately, the train derailed before it was able to come to a complete stop.

While safety mechanisms were not able to prevent this accident in this instance, we are committed to learning from it and we have worked every day since the derailment with industry partners, regulators, and the NTSB to continue to improve railroad safety. Norfolk Southern has already taken steps to enhance our wayside detector system and has been participating in an industry wide initiative to reevaluate alarm thresholds. In addition to expanding our use of existing technologies, we are making plans to install new kinds of detectors that will provide us with additional data points that we can use to identify potential issues before they result in an accident. And we are working to deploy inspection portals that use machine vision and ultra-high-resolution cameras to provide a 360-degree health check on rail cars. We are committed to improving the safety of our railway operations at Norfolk Southern and intend to lead efforts to make industry-wide safety improvements.

Norfolk Southern's Assistant Vice President, Communications and Signals, later clarified that the 618 figure "represent[ed] the number of times that a bearing-related alarm was generated by the detector. The inspection findings of those results may or may not . . . have resulted in an actual bearing failure. There are other potential issues with braking that creates heat that sometimes generate bearing alarms. So that number shouldn't be taken as a direct correlation to bearing failures per se."

Norfolk Southern's Assistant Vice President, Communications and Signals discussed NS's wayside desk and the trending analysis. He stated trending "is a more proactive and predictive element. Using the same data that those same detectors generate, we collect that and do a trending analysis on that data as trains travel across the system and we track those cars. So the development of that system started off as a multi-railroad effort in the late 2000s and has been taken from there. We have instituted -- those rules and those settings kind of baseline at some of what is set up in the AAR standards around those Why Made Codes. And we have additional ones that go above and beyond that that we've developed over time as that system has matured."[3]

Specific to the East Palestine derailment, Norfolk Southern's Assistant Vice President, Communications and Signals stated that, "in the last 30 miles before train 32N derailed in East Palestine, it had passed 3 HBD systems. The first two detectors did not trigger any alarms or alerts that would have required action by the on-shift wayside desk operator or by the train crew. As the train passed through the East Palestine HBD, however, the detector identified an elevated temperature from a wheel bearing on car 23 and announced a critical alarm to the crew to stop the train and inspect the axle."

Discussing the non-critical alert transmitted from the Salem hot box detector to the Wayside Help Desk, Norfolk Southern's Assistant Vice President, Communications and Signals stated: "The analyst working on the desk that evening was working through the alerts that were in his queue and did not get to that alert immediately . . . The nature of the alert that did arrive, based on our SOPs, would have been a monitor until [the] next detector-type event. It would not have been an event that we would have expected immediate action to be taken at that point in time."

Regarding the "three to four actionable-type alerts and alarms" that the ATC Wayside Desk receives per shift, Norfolk Southern's Assistant Vice President, Communications and Signals explained that "alerts may come in as an indicator of a bearing issue. The alert might be intended for bearings. Oftentimes, the alert itself might result in another issue being found, perhaps with braking. The analyst has the ability to see the details that come in and that data to look at all of the wheelsets on the car to determine if there might be a braking issue. So they might ask the crew to take action with regards to what -- has the signature of a braking issue or go back and inspect the bearing for heat."[4]

Norfolk Southern's Assistant Vice President, Communications and Signals discussed the number of alerts routed to the ATC on a typical eight-hour shift: "We looked at some data and we saw a number typically running -- if you -- as you average

[3] For example, Norfolk Southern's Assistant Vice President, Communications and Signals testified that "[t]he 953 alert goes above and beyond [the baseline specifications proposed by the AAR and Why Made codes] in terms of sensitivity. And it was actually originated in house, put into effect in late 2021 and it came about through our wayside desk analysts … getting with our engineers to develop that trending algorithm for that alert."

[4] Norfolk Southern's Assistant Vice President, Communications and Signals testimony referred to the "many types of alerts beyond bearing[-related alerts]" generated by the entire suite of Norfolk Southern's wayside defect detectors.

out days to 180 per day, that's amongst many types of alerts beyond bearings that might come into a desk. That kind of rounds down to three to four actionable alerts per shift in terms of that frequency and then the -- going by the 876 number I quoted in my opening statement, that comes to about two to three per day bearing-related desk interventions on average."

The Senior Vice President, Safety and Operations, Association of American Railroads, testified about "another Class I railroad" and its "average frequency in terms of how many times a day they have to analyze . . . these reports from the wayside detectors . . ." He testified that for the referenced railroad, "on an average day, you're going to be dealing with two to three analyses, trending analyses, that the back office has to analyze to see if further action is warranted. The 300 number that was referred to, whether it's accurate or not, was done in the context of all sorts of activities that were being dealt with at the back office. It was not a bearing analysis specific number. Where I think both again, the railroad I quoted and for NS, I think the numbers are very consistent. In any particular day, you would be analyzing two to three bearings under the trending analysis rules."

Norfolk Southern's Assistant Vice President, Communications and Signals also discussed post-accident modifications to Norfolk Southern's ATC operations. He indicated that NS has added some resources to the ATC desk. Whereas analysts were previously allowed to work remotely, now "at least one person will be in person in the control center at all times." He also indicated that NS has had "mechanisms in place where a lot of our people on adjoining control center desks that work in conjunction with the wayside desk are cross trained and have rotated through and are familiar with the work and how to do it. So, we have those folks aware and ready to step in as needed."

Submitted by:

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