National Transportation Safety Board
Office of Railroad, Pipeline and Hazardous Materials
Washington, DC 20594

RRD23FR011

OPERATIONS GROUP

Group Chair's Factual Report

May 14, 2023

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A. ACCIDENT DATA

Accident No: RRD23FR011
Type: Derailment- Main Track
Location: New Castle, Pennsylvania
Date: 10-May-2023
Time: 11:24 (EDT)
Carrier: Norfolk Southern
Train type/Designation: Mixed Freight Train/NS 14M
Fatalities: 0
Injuries: 0

B. OPERATIONS GROUP

Don (Joey) Rhine
NTSB Group Chair / IIC
Washington, DC

Richard Skolnekovich
NTSB-Investigator
Washington, DC

Larry Ross
FRA, Operations Inspector
Pittsburgh, PA

Don Craine
Norfolk Southern, Superintendent
Enola, PA

Brian Fransen
BLET
Casper, WY

Jared Cassity
SMART-TD
Ironton, Ohio

C. ACCIDENT SUMMARY

On May 10, 2023, about 10:57 p.m., northbound Norfolk Southern Railway (NS) general merchandise freight train 14M derailed nine mixed-freight railcars on the Youngstown Line at milepost (MP) 76.56 in New Castle, Pennsylvania. The derailed equipment included one hazardous material tank car, which was not breached, that contained paraffin. There were no reported fatalities or injuries. NS estimated damages to equipment and track infrastructure to be about $6.1 million. At the time of the accident, visibility conditions were dark and clear; the weather was 52°F with no precipitation.

The crew of train 14M consisted of one engineer and one conductor. Their train was composed of 1 head-end locomotive, 144 loaded railcars, 69 empty railcars, and 2 distributed power locomotives positioned mid-train. The train weighed 19,993 tons and was 12,724 feet long. Train 14M was traveling about 28 mph at the time of the derailment, less than the maximum authorized timetable speed of 40 mph. Train movements near the derailment site were authorized by wayside signal indications and coordinated by the NS Youngstown Line train dispatcher in Atlanta, Georgia.

D. DETAILS OF THE INVESTIGATION

1.0 Description of the NS Youngstown line.

The NS Youngstown Line is part of the NS Keystone Division and extends from Ashtabula Ohio (NS milepost YG 0.0) to Rochester, Pennsylvania (NS milepost YG 97.20) in a timetable north-south direction. This line consists of both single and double main signaled track with a maximum authorized timetable speed of 50 mph for freight trains unless otherwise restricted.

This subdivision has sixteen control points and three controlled interlocks which are controlled by the Conway Terminal dispatcher located at the Norfolk Southern Network Operations Center in Atlanta, Georgia.

There are nine defect detectors on the Youngstown Line consisting of dragging equipment detectors (DED) and hot bearing detectors (HBD). These detectors are located at the following timetable locations:

- YG 91.9 HBD-DED (Vale)
- YG 81.2 DED (Wampum)
- YG 74.5 HBD-DED (Castle)
- YG 65.2 DED (Lowellville)
- YG 54.5 HBD-DED (Doughton)
- YG 41.7 HBD-DED (Fowler)
- YG 31.7 DED (Gustavus)
- YG 21.1 HBD-DED (Cherry Valley)
- YG 10.5 DED (March)

2.0 Events prior to the accident

Train 14M is a Norfolk Southern train that operates daily between Conway Pennsylvania and Buffalo New York with work at Youngstown, Ohio before receiving a crew change at Conneaut Ohio.

Train 14M consisted of 144 loads with 69 empties with a length of 12,724 feet at 19,993 tons. This was not a key train. Train 14M had three locomotives in the consist. NS-4342 was the lead locomotive. This train had two locomotives set up for distributed power located at the 126th and 127th line position in the consist. These locomotives were NS-3642 and NS-4689 respectively.

Train 14M was scheduled to travel north on the Youngstown line to Youngstown, Ohio (Milepost: YG 58) to set out 70 loads and 17 empties. The train was then to proceed to Sanborn Ohio before traveling to Conneaut Yard (Milepost B116) for its scheduled crew change.

On May 10, 2023, the crew of 14M went on duty at Conway Terminal in Conway, Pennsylvania at 3:50 pm. After receiving their paperwork and bulletin orders the crew held a job briefing where they stated in interviews that they discussed in detail the length of their train, and the set-off work that they would be doing in Youngstown Ohio.

After their job brief was completed, the crew rode a NS contracted service (Hallcon) vehicle to the 906/701 track in Conway Yard where their lead locomotive (NS 4342) was coupled to the two distributed power units (DPU'S), (NS-3642 and NS-4689) and a set of cars. A relief crew (yard crew) was on the locomotive when they arrived, and after a job briefing with the relief crew, the crew of 14M boarded the locomotive and began inspecting their equipment and initializing the positive train control (PTC) system.

The crew stated in interviews that they found that the locomotives had been pre-set up for distributed power[1] and that the two-way end of train device (EOTD) was linked.[2]

Once the crew's inspection was complete, they detached the lead locomotive (NS 4342) from the DPU's and traveled light power from 906/701 track to 904 track to couple on to the cut of cars that would precede the DPU's and cars left on 906/701track. During this switching move, the crew stated that they began having communication (radio) issues while pulling up to the interlocking at West Conway.

During interviews, the crew stated that radio communications between the locomotive radio and the conductors portable radio became "fuzzy" and that they had to have the "Five Yard yardmaster" relay the car count and other information to complete the switch move back onto the DPU's and cars they had left on the 906/701 track.

Once the crew coupled up to the DPU's and cars on 906/701 track, they stated that they conducted the required air brake tests (DPU brake pipe/Class III tests) and contacted the yardmaster to request permission to depart Conway Yard. The yardmaster gave 14M permission to depart and directed the crew of 14M to contact the main line dispatcher on channel 89-89. The engineer of 14M contacted the dispatcher and requested to pull up to control point (CP) Rochester to pick up his conductor before proceeding to CP Bright.

[1] One or more locomotive consists that are remotely controlled from the lead locomotive.

[2] A two-way end of train device (EOTD) is a portable telemetry device attached to the rear of a train that transmits air pressure and motion information to the operating crew via radio signals to a receiving unit on the leading locomotive of the same train.

Train 14M departed Conway Terminal at approximately 6:36 pm and proceeded timetable west to CP Bright where the train was held for approximately three hours waiting for another scheduled train to clear (NS C36).

During this time, the crew stated that they heard radio transmissions from other crews and had heard the automated message from the detector at milepost 30.5 on the Fort Wayne Line.

On receiving a clear signal at CP Bright, the crew stated that they received a front-rear (FR) communications loss message from their EOTD.[3] The engineer stated that he attempted to do a soft key comm test on the locomotive to get communications established with the EOTD but was unsuccessful.

The crew then proceeded timetable north at 30 mph as per the Norfolk Southern rule for EOT failure. The crew stated during interviews that there was no PTC from CP Bright to the Vale HBD-DED at YG 91.9 and therefore they could not use the locomotive's Trip Optimizer (TO) system.[4] The engineer stated that he did not have a lot of experience running long trains and was very anxious to get the TO system up and running to operate the train.

As train 14M arrived at the YG 91.9 HBD-DED, the engineer stated that he started the on-board trip counter, but that his attention was primarily focused on the correcting the FR Communication loss, contacting the Conway Terminal dispatcher, and getting the on-board TO system engaged. He also stated that at some point after his train had passed the 91.9 HBD-DED, that he looked at the on-board trip counter and that it was "way up there".

Both the engineer and conductor stated in interviews that they believed they heard a "No Defects" message from the 91.9 HBD-DED.

3.0 The Accident

Train 14M began to cross over the Vale HBD-DED at 21 mph on main track 1 at approximately 10:13:11 pm and cleared the detector at 10:19:54 pm.

At 10:18:20 pm, the Vale detector at 91.9 transmitted the first critical alarm over the radio on channel 89-89. During this alarm, it identified the 671st axle on the

[3] A front-rear (FR) communications loss message indicates that the receiver at the front of the train is no longer receiving information from the end of train device (EOTD) located at the rear of the train.

[4] "Trip Optimizer ("TO") is a smart cruise control system for trains that takes into account terrain, train make-up, speed restrictions and operating condition to calculate an optimum speed profile. It then automatically controls locomotive throttle and dynamic brakes to reduce fuel burn and provide efficient train handling." Source: Wabtec product description.

east rail as hot. This message was repeated at 10:20:06 pm and again at 10:20:38 pm.

The train continued operating in a timetable north direction for another 40 minutes and 27 seconds (15.334 miles) after the suspect axle passed the Vale DED-HBD, when it suffered a derailment on main track 2 at MP YG 76.56 near New Castle Pennsylvania.

The train derailment began at NS milepost YG 76.56 with the bulk of the derailed cars coming to a rest across a rail bridge located in the vicinity of YG 75.9 (Figure 1). Of the nine cars that derailed, only one car contained hazardous material (UTLX 685634). This car contained paraffin wax (petroleum) and was located in the 169th position of the consist. It was determined on the scene that none of its contents were released during the derailment.

Figure 1. Aerial photograph of derailment site. (Source: WPXI Pittsburgh.)

4.0 Post accident site description

The train derailment began at NS milepost YG 76.56 with the bulk of the derailed cars coming to a rest across a rail bridge located at NS milepost YG75.9.

On arrival, NTSB investigators and Norfolk Southern officials conducted a site walk to begin collecting information and evidence required for the NTSB investigation.

During this site walk, NS officials and NTSB investigators found mechanical debris primarily on the eastern side of main track 2 in the vicinity of MP YG 75.5, consisting of rail journal components (Figure 2) and a rail truck frame with heat marks identified as having belonged to CRDX00317 which had occupied the 167th position of the train consist. NS and NTSB investigators identified this car as having been the leading car in the derailment.

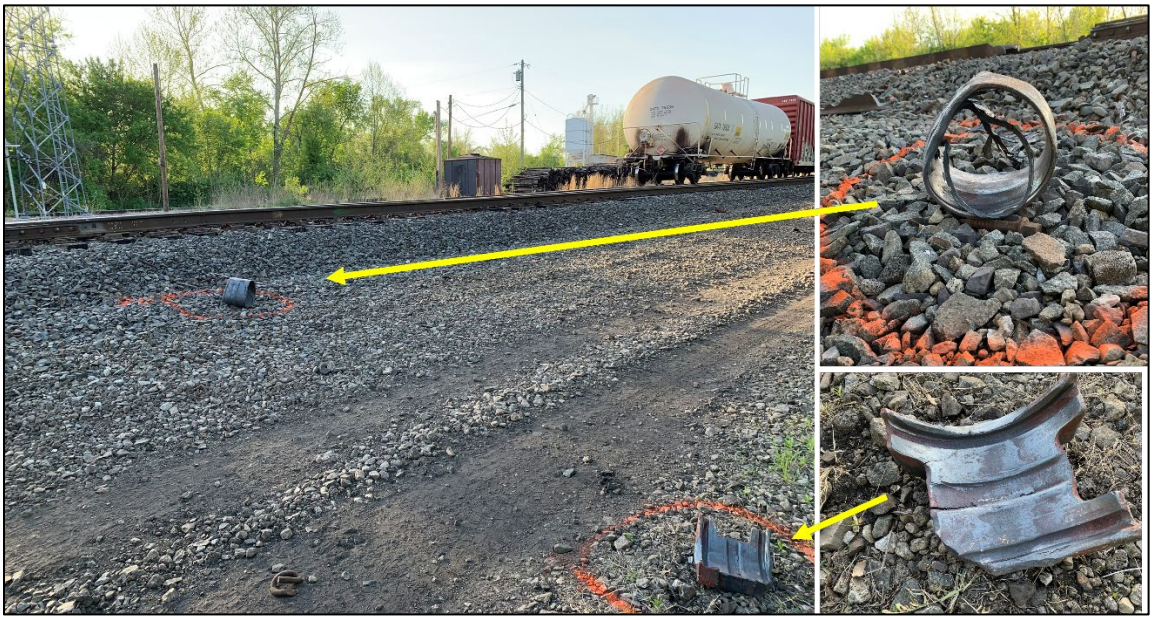


Figure 2. Journal components marked by Norfolk Southern. (Source NTSB).

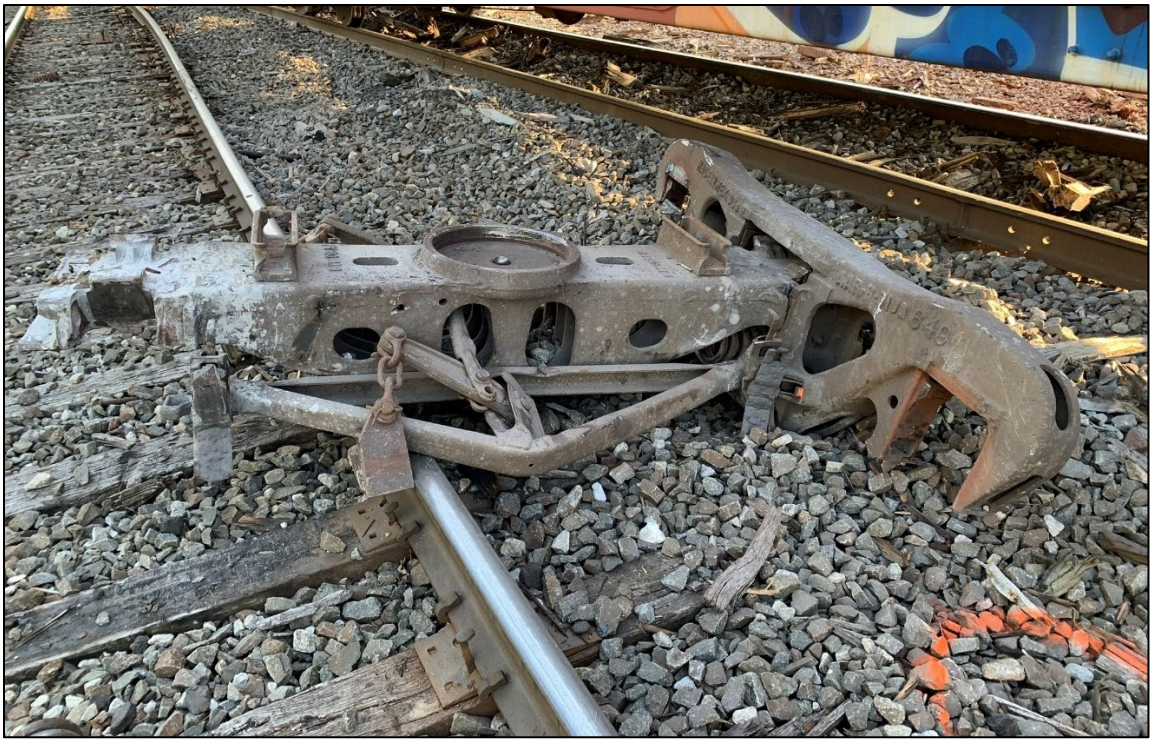
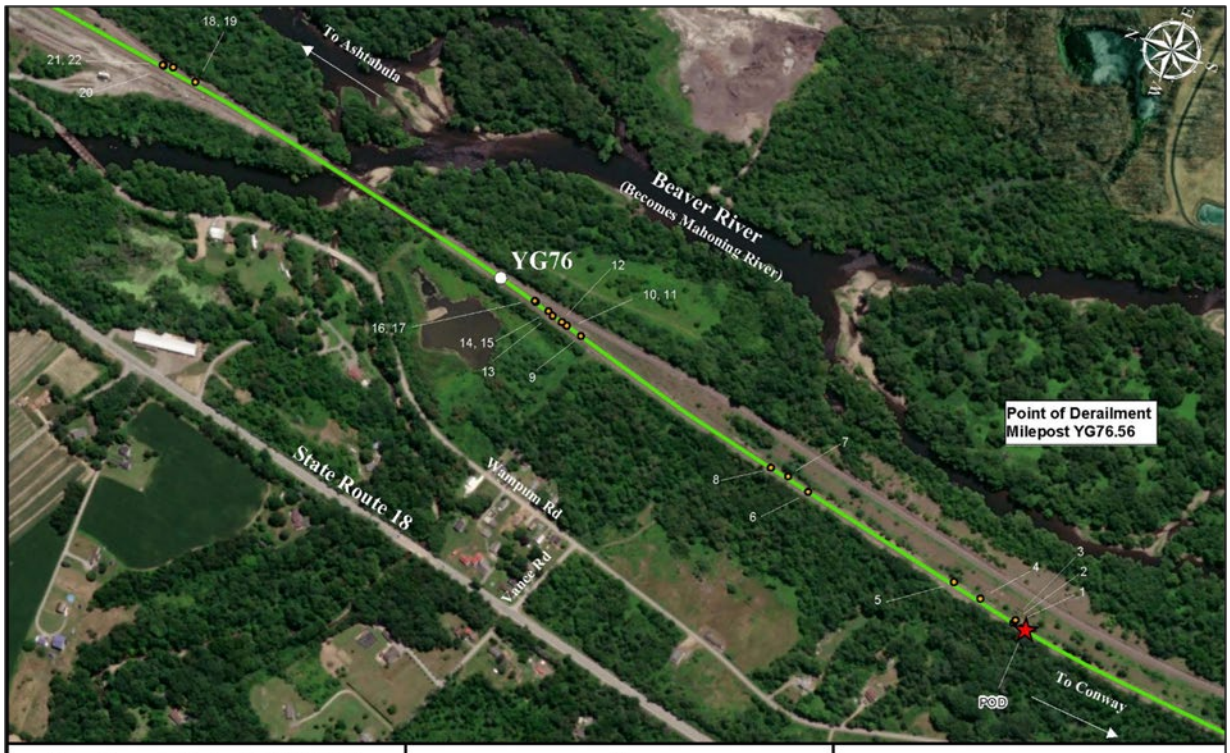


Figure 3. Truck frame with heat marks. (Source NTSB)

Further to the south of MP YG 76, NS tracks split into main track 1 and 2. During the site walk, investigators found additional debris and damaged rail on main track 1 leading to the point of derailment at milepost YG 76.56. Norfolk Southern mapped and identified the debris with locations and conducted distance measurements from the point of derailment and provided the NTSB with the following debris map (Figure 4).



Derailment Date: 05/10/2023

- Point of Derailment
- Points of Note
- Milepost
- NS Rail

NORFOLK SOUTHERN ENGINEERING
MAINTENANCE OF WAY & STRUCTURES

0 130 260 520 780 1,040 1,300 Feet

Point of Derailment Map

Keystone Division: KS-ASH
Lawrence County, PA

Map Marker	Description	Distance from POD (feet)
STAR	POD	0
1	Cap Side Bearing Outer Seal	55
2	Rung Journal	55
3	Cap side Bearing Inner Seal	55
4	Roller Bearing 1	248
5	Roller Bearing 2	384
6	Roller Bearing 3	1157
7	Cage Piece	1271
8	Roller Bearing 4	1360
9	Roller Bearing 5	2405
10	Roller Bearing 6	2485
11	Roller Bearing 7	2486
12	Roller Bearing 8	2514
13	Roller Bearing 9	2576
14	Roller Bearing 10	2662
15	Roller Bearing 11	2667
16	Roller Bearing 12	2857
17	Bearing Spacer	2859
18	Bearing Race Cup	4491
19	Backing Ring	4495
20*	A End Truck (reference only)	4616
21	Wheel Side Bearing Spacer	4656
22	Bearing Shell	4662

Figure 4. Norfolk Southern derailment component location map and index.

5.0 Accident Timeline

Based on information gained from the review of the radio tapes and the locomotive event recorder/video review, the Operations Group developed the following combined/actual timeline of events associated with this accident.

Actual data and their uncorrected times are listed separately in this report (i.e. event recorder, video and audio recording).

CONVERTED TIMELINE	EVENT
22:12:49	Start HBD 30.5 No Defects message (Beaver Falls, MP-PC30.5, FTW Line)
22:12:57	END HBD 30.5 No Defects message (Beaver Falls, MP-PC30.5, FTW Line)
22:13:00	91.9 HBD Records arrival of train 14M
22:13:11	Head end of 14M at Vale HBD-DED MP-YG91.9 Youngstown Line
22:13:16	START- No Defects message from HBD at Beaver Falls, MP-PC30.5, FTW Line
22:13:24	END - No Defects message from HBD at Beaver Falls, MP-PC30.5, FTW Line
22:17:12	Train 14M, Axle 671 crosses over Vale HBD-DED.
22:18:20	START-Critical Alarm Message, Hot Box Axle 671, East Rail, MP 91.9
22:18:24	Train 14M engineer states "Hot wheel south rail axle 10,256"
22:18:38	END-Critical Alarm Message, Hot Box Axle 671, East Rail, MP 91.9
22:19:07	START- Rebroadcast Message, No Defects, MP30.5 on FTW Line
22:19:18	END- Rebroadcast Message, No Defects, MP30.5 on FTW Line
22:19:35	START- Rebroadcast Message, No Defects, MP30.5 on FTW Line
22:19:44	END- Rebroadcast Message, No Defects, MP30.5 on FTW Line
22:19:54	91.9 HBD Records train 14M Clears the Vale HBD detector.
22:20:06	START- Critical Alarm Message, Hot Box Axle 671, East Rail, MP 91.9
22:20:21	END- Critical Alarm Message, Hot Box Axle 671, East Rail, MP 91.9
22:20:36	Engineer engages Trip Optimizer
22:20:38	START- Critical Alarm Message, Hot Box Axle 671, East Rail, MP91.9
22:20:52	END- Critical Alarm Message, Hot Box Axle 671, East Rail, MP91.10
22:57:36	Distributed power unit (DPU) brake pipe at 0 psi
22:57:39	PCS Switch from “closed” to “open”.
22:57:43	Brake pipe pressure changes from 71 psi to 0 psi.
22:58:15	14M at complete stop (36 seconds; 862 feet from when PCS occurs).
22:58:22	Engineer moves ABV handle to the “Emergency” position.
23:00:44	Engineer Tones Radio
23:03:54	Radio Check- engineer to conductor

6.0 Locomotive recorders and radio tape review.

Digital evidence reviewed by the operations group included the locomotive outward facing videos and event recorder information from NS 4362 and the audio recordings of the radio transmissions associated with the movement of train NS14M on May,10 2023.

During the event recorder review, the Operations Group noted that event recorder table data included GPS times, distance measurements and Norfolk Southern timetable milepost locations. The party agreed that this data was accurate and would be used as the official times and locations for the following events.

6.1 Lead Locomotive event recorder review (NS4342).

At approximately 22:13:11 pm on May 10, 2023, the Vale HBD-DED located at MP YG 91.9 recorded the arrival of the head end of train 14M. Locomotive event recorder data shows that train 14M was traveling timetable north on main track 1 at 21 mph with 38,000 lbs. of tractive effort in throttle position 5. The locomotive trip optimizer (TO) [5] was not active at this time.

At 22:17:12 pm, axle 671 which was on the 164th car in the consist passed over the Vale HBD-DED at MP YG 91.9. Event recorder data recorded that train 14M was traveling at 21 mph with 37,000 lbs. of tractive effort in throttle position 5. The locomotive TO was not active at this time.

At 22:19:54 pm, train 14M clears the 91.9 Vale HBD-DED and continues to travel timetable north at 25 mph with 29,000 lbs. of tractive effort in throttle position 5. The locomotive TO was not active at this time.

At 22:20:27 pm, The event recorder table records the engineer engaging the locomotive TO at milepost YG 89.2259. When the locomotive TO is engaged, train 14M is traveling at 25 mph with 32,000 lbs. of tractive effort in throttle position 5.

Between the hours of 22:20:28 pm and 22:58:15 pm, the Event Recorder data shows that train 14M continued to travel in a timetable north direction without stopping. Train speed remained fairly constant ranging between 25 and 28 MPH with the locomotive TO engaged during this entire time. Event recorder table data indicates that the brake pipe and EOTD pressures remained constant during this time with the locomotive TO utilizing the trains dynamic brake system to control speed.

[5] "Trip Optimizer ("TO") is a smart cruise control system for trains that takes into account terrain, train make-up, speed restrictions and operating condition to calculate an optimum speed profile. It then automatically controls locomotive throttle and dynamic brakes to reduce fuel burn and provide efficient train handling." Source: Wabtec product description.

At 22:57:39 pm, train 14M was traveling at 28 mph at NS milepost YG 73.0145 with the locomotive TO engaged when event recorder data records the pneumatic control switch (PCS) [6] changing from the "closed" to the "open" position. This event was recorded on the event recorder data table "as "PCS (1 Sec)" in the header and "Open" in the corresponding time column. This data indicates that the train went into emergency at this time and can be corroborated by the event recorder recording the brake pipe pressure dropping from 89 psi to 0 psi within the same time period.

At 22:57:42 pm, event recorder data shows that the engineer used the locomotive bail feature to release the locomotive brakes during the undesired emergency application of the bakes. This was recorded in the event recorder table data in the "Brake Cylinder PR" header showing brake cylinder rising from 0 psi to 15 psi during the time when the PCS opens at 10:57:39 pm and returns to 0 psi at 22:57:42.

At 22:58:15 pm, event recorder data indicates that train 14M came to a complete stop at NS Milepost YG 72.8633. Event recorder data indicates that train travel distance from when the locomotive went into PCS to when it came to a complete stop was 862 feet. Once stopped, event recorder data records that the engineer applied a full independent brake application and restored the locomotives brakes. This was indicated in the recorder data when brake cylinder pressure changes from 0 psi to 76 psi.

At 22:58:28 pm, the engineer placed the locomotives automatic brake valve (ABV) handle into the Emergency position.

6.2 Locomotive Head-End camera review (NS4342).

The locomotive camera on NS4342 provided by Norfolk Southern was reviewed by the Operations Group. The video that was reviewed contained audio recordings and a time date stamp embedded in this video. Party members noted that the date and time were incorrect and not in sync with the actual event times. Utilizing known event times and locations from event recorder data, the Operations group was able to calculate the embedded video time to actual time offset within reasonable certainty.

The time difference determined by the Operations working group was minus 2 hours, 6 minutes and 34 seconds. This information was found to be accurate and verified by the NTSB recorder specialist. The following event descriptions with times

[6] PNEUMATIC CONTROL SWITCH (PCS) is an air-operated switch, activated by an emergency or penalty brake application, that drops the engine speed to idle on EMD locomotives or throttle notch 1 on GE locomotives. Source: Norfolk Southern NS-1 Rules for Equipment Operation and Handling (January 1, 2015).

are not converted and are listed in the raw head end video times as observed by the working group.

At 20:06:15, Headend video/audio records a "No Defect message" from milepost 30.5, track 2 on the Fort Wayne line. This message is complete at 20:06:23.

At 20:06:42, Headend video/audio records a "No Defect message" from milepost 30.5, track 2 on the Fort Wayne line. This message is complete at 20:06:50.

At 20:06:38, the working group observed the head-end of locomotive NS 4342 pass the Vale HBD at milepost YG 91.9.

At 20:11:50, the audio recording of the head end video records the following: "Hot wheel south rail, axle 10,256".

The operations group reviewed this footage multiple times between 20:05:51 and 20:15:59 and agreed that the critical alarm message from the Vale 91.9 HBD was not heard within the operating compartment of the lead locomotive.

6.3 Locomotive Inward cameras review (NS4342).

The NS4342 was equipped with two Inward facing cameras located within the operating compartment. These cameras were situated both in front of and behind the engineers control stand with a 180-degree view of the operating cab.

Both inward facing videos were reviewed by the operations working group. As with the Head end video, these video's contained audio recordings and a time date stamp embedded in this video. Party members noted that the date and time were incorrect and not in sync with the actual event times. Utilizing known event times and locations from event recorder data, the Operations Group was able to calculate the embedded video time to actual time offset within reasonable certainty.

The time difference determined by the Operations working group was minus 2 hours, 6 minutes and 34 seconds. This information was found to be accurate and verified by the NTSB recorder specialist.

The following event descriptions with times are not converted and are listed in the raw Inward facing video times as observed by the working group.[7]

At 20:06:15, Inward facing video/audio records a "No Defect message" from milepost 30.5, track 2 on the Fort Wayne line. This message is complete at 20:06:23.

[7] See Recorders specialist factual for corrected timeline converted from displayed inward time at the following web address: https://data.ntsb.gov/Docket/?NTSBNumber=RRD23FR011

At 20:06:42, Inward facing video /audio records a “No Defect message” from milepost 30.5, track 2 on the Fort Wayne line. This message is complete at 20:06:50.

At 20:11:50, the engineer of train 14M was heard and observed making the following statement in the locomotive cab: “Hot wheel south rail, axle 10,256”. The conductor of train 14M is seated and facing forward on the fireman’s side of the cab and does not respond.

At 20:14:02, Inward audio records the engineer notifying the conductor that the locomotive TO is engaged with the following statement: “Ok, its auto-controlled and limited to thirty”. The conductor responds with “Roger”.

At 20:14:20, the conductor and the engineer begin discussing how the locomotive the locomotive TO works. The conductor is viewed leaving the Fireman’s seat and moving to the engineers control stand as the engineer begins describing the system. During this discussion, both the engineer and conductor are observed to be watching the engineers soft key screen which is located in front of the engineer’s seat and next to the control stand.

The operations group reviewed this footage multiple times between 20:06:01 and 20:15:59 and agreed that the critical alarm message from the Vale 91.9 HBD was not heard within the operating compartment of the lead locomotive.

6.4 Radio Tape review.

The Operations working group reviewed Norfolk Southern audio recordings relating to this accident. The below listed events and times were extracted by the operations working group from that review. The times listed below are the raw time stamps which are unconverted.

TIME	**Channel 89-89 Audio Message**
0:46:53	“Critical Alarm, critical alarm, critical alarm, Norfolk Southern mile post 91.9, Hot Box axle 671 East rail.”
0:47:41	“Rebroadcast Norfolk Southern Mile Post 30.5, track two, no defects.”
0:48:09	“Rebroadcast Norfolk Southern Mile Post 30.5, track two, no defects.”

0:48:41 "Norfolk Southern, milepost 91.9, critical alarm, hot box axle 671 East Rail."

0:49:11 "Norfolk Southern, milepost 91.9, critical alarm, hot box axle 671 East Rail."

0:59:01 "Norfolk Southern File Post 40.15 track 2, No defects."

0:59:28 "Norfolk Southern, milepost 40.15 track 2, No defects."

7.0 NS Operating rules in effect at the time of the accident.

Operating Rules that were in effect at the time of the accident and include the following:

- NS Operating Rules, effective April 15, 2023.
- NS-1 Rules for equipment operation and handling, effective April 15, 2023.
- Pittsburgh Division, Northern Region Timetable No.1 with special instructions.
- Dispatchers Bulletin 623 issued May10, 2023 for train 14M.
- Norfolk Southern Safety and General Conduct Rules, effective April 15, 2023.

7.1 Norfolk Southern Youngstown Line method of operations.

The following description of the Youngstown Line method of operations are derived from the Pittsburgh Division Timetable number 1 dated July 1, 2012.

The method of operation between Conway Terminal and the point of derailment on the Youngstown line was governed by Norfolk Southern operating rule 261 on main tracks 1 and 2 with signal indication as the authority for a train to operate in either direction on the same track in this territory.

7.2 NS Operating Rules specific to Train inspections.

The following are operational rule excerpts from the Norfolk Southern Operating rules dated April 15, 2023.

7.2.1 NS Rule 140. Inspecting Trains

(a) Employees must inspect passing trains for their entire length for defects such as sticking brakes, hot journals, broken or loose wheels, brake rigging down, loads shifted, or any other defect. Inspection on both sides is required when two or more employees can safely position themselves in advance.

EXCEPTION: During train meets, crew members must inspect passing trains from either inside the locomotive cab or from a safe ground location. When performing the inspection from the ground, employees must dismount the locomotive on the field side away from the adjacent track, if possible. Crew members are not required to cross tracks to inspect a passing train.

(b) If any defect is observed, prompt action must be taken to notify the crew. If the crew cannot be notified, the train Dispatcher must be notified as quickly as possible.

(c) After the train passes, the employee performing the inspection must notify the crew by radio of the condition of their train.

(d) Crew members must frequently observe their train for defects and maintain a vigilant lookout along the right-of-way for conditions affecting train movement. If a dangerous condition is observed, prompt action must be taken to notify the train Dispatcher and to warn any approaching train.

7.2.2 NS Rule 141. Equipment with Defects

Conductors must if possible remedy defects in their equipment, and must remove from the consist any cars that are unsafe to run. They must report all defective brakes, hot boxes or other defects, as well as repairs made between terminals.

They must comply with instructions for reporting materials applied to cars and disposition of defective parts.

Conductors must not move cars bearing Bad Order tags without proper authority.

Cars bearing Home Shop tags must be moved in accordance with any restrictions shown.

7.3 NS Operating Rules specific to Hot Box detectors.

7.3.1 NS Rule 145. Defective Equipment Detectors

Locations, functions, and associated instructions of defective equipment detectors are listed by timetable.

7.3.2 NS Rule 146. Train Inspection – "No Defect" Message For All Detectors

(a) When no defects have been detected, the exit radio message will be:

"NS detector, milepost location, identification of track to which message is applicable (in multiple track territory)," and followed by "NO DEFECTS."

(b) If a "NO DEFECTS" message is received before the rear of train has cleared the detector, the train may proceed in accordance with Rule 149 "Failure Messages."

7.3.3 NS Rule 147. Defect Message For All Detectors (Except Stress State Detectors)

(a) When a train is occupying a detector and a defect has been detected, an automatic radio transmission as described below will occur:

• A defect warning alarm and/or a "TONE" will indicate that a defect has been detected.

• A defect warning message stating "CRITICAL ALARM" will indicate that an excessively hot journal or dragging equipment defect has been detected. The train must be immediately stopped for inspection, consistent with safe train handling procedures anytime a "CRITICAL ALARM" is received for detection of a hot bearing (hot box) or any dragging equipment defect.

(b) When a non-critical defect message is received, the train must immediately reduce speed to not less than 8 MPH until the rear of the train clears the detector at which point the train must be stopped for inspection.

(c) When the rear clears the detector, or a detector times out due to lack of movement, a radio message is transmitted to indicate nature of any defects and its location in the train by axle count, starting at the first axle in the locomotive consist.

7.3.4 NS Rule 148. Train Inspection – Defect Message For All Detectors (Except Stress State Detectors)

(a) If train speed drops below 8 MPH while passing over the detector, and a "DEFECT" message is received, the train must be stopped and all cars must be inspected.

(b) When an inspection is required, the crew must contact the Wayside Detector Help Desk. After briefing with the Help Desk:

1. A thorough inspection must be made of the car(s) indicated as being defective. Except when relieved by the Help Desk, both sides of the cars must be inspected.

2. The crewmember must take the necessary tools and supplies. Crews in road service must have a Temperature indicator and a hand-held counter accessible while on duty. The hand-held counter must be used to ensure the proper axle is inspected.

Exception (Not Applicable to Key Trains or Passenger Trains):

The Help Desk may relieve a crew from inspecting their train for defect alarms when information is available confirming it is safe to proceed. Trains relieved of inspection may proceed, in accordance with existing authority, at a speed not to exceed 30 MPH to the next detector or to the location where the car is to be set out, if applicable. Trains relieved of inspection at the last detector prior to entering a yard must notify the yardmaster, or other designated authority to ensure a proper inspection is made.

(c) The Inspection results must be provided to the Help Desk prior to the crewmember departing the car location.

7.3.5 NS Rule 149. Failure Messages

(a) A train receiving no message or a failure message as listed:
"Analyzer Failure",
"System Failure",
"Detector Malfunction",
"System Not Working", or
"Train Too Slow",

must contact the Help Desk and may proceed, in accordance with existing authority, at a speed not to exceed 30 MPH to the next detector provided:

1. Train is not a Key Train or Passenger Train.
2. No erratic operation of the train is detected by the train crew.
3. The previous detector over which the train passed detected "NO DEFECTS".

(b) A train receiving a failure message at the first detector after departing a yard, or on 2 consecutive detectors, must be stopped and a roll-by inspection of one (1) side of the train must be performed.

(c) A train receiving a failure message at the last detector prior to entering a yard must notify the yardmaster, or other designated authority, to ensure a proper inspection can be made.

7.3.6 NS Rule 150. Hotbox Detectors

(a) When authorized by the Help Desk, after stopping, a roll by inspection performed on the side of the train indicated as having defects. The person making the inspection must visually monitor the train during the roll-by inspection for any defects, and must stop the train and inspect the cars identified as being defective.

(b) Inspections must be made using a temperature indicator to determine if a bearing is overheated and car cannot continue in service. Results must be provided to the Help Desk.

(c) If no apparent defects are found, 20-axles ahead and behind of the designated defect must be inspected for the noted defect.

7.4 NS Operating rules specific to End of Train devices.

The following are operational rule excerpts from NS-1 Rules for Equipment Operation and Handling dated January 1, 2015.

7.4.1 NS-1 DISTRIBUTED POWER (DP) OPERATIONS

MOMENTARY COMM LOSS (DP) - a loss of communication between a controlling lead locomotive and a controlling remote locomotive lasting less than 45 seconds. This type of communication loss will be displayed on the controlling lead locomotive with the word "COMM" displayed in yellow letters above the controlling remote locomotive with which the controlling lead locomotive cannot communicate.

SUSTAINED COMM LOSS (DP) – a loss of communication between a controlling lead locomotive and a controlling remote locomotive lasting 45 seconds or longer, or in 10 seconds if an automatic brake application is made. A sustained COMM LOSS will be displayed on the controlling lead locomotive

with the word "COMM" in red letters above the controlling remote locomotive with which the controlling lead locomotive cannot communicate.

8.0 Crew Operational Information

8.1 Crew Certification information.

NAME	HIRE DATE	CRAFT	ENGINE SVC	LAST CERT	LAST OP RULES EXAM
Accident engineer	11/8/2007	engineer	11/24/2015	11/1/2021	7/22/2021
Accident conductor	7/28/2014	conductor	N/A	9/1/2021	7/20/2021

8.2 Crew hours of service (HOS) information.

The Federal Railroad Administration (FRA) performed a fatigue analysis of the crew based on their reported hours of service. The FRA determined that fatigue was not a factor in this accident.

NAME	DATE	TL HRS ON DUTY	PRIOR OFF-DUTY	ON-DUTY OS
Accident engineer	5/10/2023	16:18	18:47	PC23
Accident conductor	5/10/2023	16:16	18:51	PC23

8.3 Crew operational testing (Jan 2022-May 2023).

NAME	FROM DATE	END DATE	TOTAL TESTS	Non-Compliant	NC %
Accident engineer	1/5/2022	5/10/2023	866	0	0
Accident conductor	1/4/2022	5/10/2023	310	0	0

9.0 Interviews conducted on scene

The investigative team conducted four interviews relating to this accident on Saturday, May 13, 2023. The interviews were held at the Holiday Inn in New Castle Pennsylvania and were conducted in the following order:

Train 14M Engineer (accident train).
Train 14M Conductor (accident train).
Train 36C Engineer.
Train 14M Conductor.

Please refer to the docket for the full interview's transcripts.[8]

10.0 External Oversight

10.1 FRA Post-accident testing.

FRA post-accident drug and alcohol tests were administered to the engineer and conductor of the accident train (14M). The results of this test were negative for both crew members. No other NS employees were tested.

10.2 Safety Advisory 2023-01 (Friday, March 3, 2023)

Evaluation of Policies and Procedures Related to the Use and Maintenance of Hot Bearing Wayside Detectors.

SUMMARY: Preliminary investigation of recent train derailments indicates the cause of, or contributing factor to, the incidents was a mechanical failure, specifically burnt journal bearings. Accordingly, FRA is issuing this Safety Advisory to make recommendations to enhance the mechanical reliability of rolling stock and the safety of railroad operations. This Safety Advisory recommends that railroads:

- Evaluate the thresholds for inspections based on hot bearing detector (HBD) data.
- Consider the use of real-time trend analyses of HBD data as a criterion for inspection.
- Ensure the proper training and qualification of personnel responsible for the calibration, inspection, and maintenance of HBDs.
- Ensure proper inspection of rolling stock with HBD alerts.

[8] The complete interview transcripts are located in the docket at the following web address: https://data.ntsb.gov/Docket/?NTSBNumber=RRD23FR011

- Improve the safety culture of their organization, particularly as it pertains to operational decisions based on HBD data.

10.3 Safety Advisory 2023-01 notice No. 2 (Wednesday, June 14, 2023)

Evaluation of Policies and Procedures Related to the Use and Maintenance of Hot Bearing Wayside Detectors (Supplement)

SUMMARY: On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, FRA published Safety Advisory 2023-01 addressing the use and maintenance of hot bearing detectors (HBDs). Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs and on May 10, 2023, in New Castle, Pennsylvania, another accident occurred that is suspected of being the result of a burnt journal bearing. Preliminary information related to this most recent accident shows that the train involved passed a HBD which alarmed prior to the accident. Accordingly, FRA is issuing this Notice to supplement Safety Advisory 2023-01 with one additional recommendation. Specifically, this Notice adds a fifth recommendation to Safety Advisory 2023-01 recommending that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health.

10.4 FRA Supplemental Safety Assessment of Norfolk Southern

The Federal Railroad Administration (FRA) conducted a safety culture assessment of Norfolk Southern between March 15 and May 15, 2023. This Assessment included a review of operational elements and an evaluation of Norfolk's Southern's overall safety culture. Relevant findings to this accident are listed in Chapter 2: Critical operational elements. The results of this assessment are included in the docket.[9]

[9] The complete FRA Norfolk Southern safety assessment is located in the docket at the following web address: https://data.ntsb.gov/Docket/?NTSBNumber=RRD23FR011