

National Transportation Safety Board
Office of Railroad, Pipeline and Hazardous Materials Investigations
Washington, D.C. 20594

Amtrak Train 501(18) Derailment
Dupont, WA
December 18, 2017
Mechanical Factual Report

Accident #: RRD18MR001
Accident Type: Derailment with Fatalities and Injuries
Location: Dupont, WA
Date of Accident: December 18, 2017
Train Operator: Amtrak
Fatalities: 3
Damages: Total preliminary estimated mechanical damages are \$40 million

Mechanical Group Members

National Transportation Safety Board-Group Chairman

Joey Rhine

490 L'Enfant Plaza East, SW

Washington, D.C. 20594

Cell: [REDACTED]

Email: [REDACTED]

FRA

Matt Thompson

Cell: [REDACTED]

E-Mail: [REDACTED]

FRA

Chris Lewis

Cell: [REDACTED]

E-Mail: [REDACTED]

Washington UTC

Matt Arnold

Cell: [REDACTED]

E-Mail: [REDACTED]

Siemens

Paul Aichholzer

Cell: [REDACTED]

E-Mail: [REDACTED]

Talgo

Joshua Coran

Cell: [REDACTED]

E-Mail: [REDACTED]

Amtrak

Devon Parsons

Cell: [REDACTED]

E-Mail: [REDACTED]

Amtrak

Marie LaPosta

Cell: [REDACTED]

E-Mail: [REDACTED]

SYNOPSIS

For a summary of the accident, refer to the *IIC Accident Summary* report within this docket.



Figure 1 Photo of Siemens locomotive, owned by WSDOT, WDTX 1402 being transported offsite for examination. (Photo provided by Paul Aichholzer, Siemens)

EQUIPMENT INVOLVED

Consist

The train consisted of 14 vehicles. A lead locomotive manufactured by Siemens, 12 passenger cars manufactured by Talgo, and a rear locomotive manufactured by General Electric. The total length of the train was 651 feet, weighing 925,898 pounds.

- 1402 Lead locomotive
- 7903 End power car

- 7454 Business class car
- 7554 Business class car (ADA)
- 7804 Dining car (Table car)
- 7303 Bistro car
- 7504 Coach (ADA)
- 7424 Coach
- 7423 Coach
- 7422 Coach
- 7421 Coach
- 7420 Coach
- 7102 Baggage car
- 181 Rear locomotive

Lead Locomotive 1402

This Siemens Charger passenger locomotive (SC44) is a Tier 4, 125mph, 4,400 horsepower diesel-electric Alternating Current (AC) locomotive manufactured by Siemens Mobility in Sacramento, CA and powered by a Cummins QSK95 V-16 cylinder prime mover. The State of Washington purchased a fleet of eight (8) Charger locomotives for exclusive use in Amtrak Cascade service between Eugene, OR and Vancouver, BC as a subset of a larger multi-state order—these locomotives are operated and maintained by Amtrak under lease agreements. WDTX 1402 was released from the Siemens Mobility factory on 3/30/17 and arrived in Seattle on 5/27/17 from the Transportation Technology Center (TTCI) where extensive test runs were completed prior to delivery. The locomotive was transferred to Washington Department of Transportation (WSDOT) ownership on August 1, 2017 after conditional acceptance for further test trains and clearance to be a trail locomotive in a consist. WDTX 1402 underwent final acceptance by Amtrak, WSDOT, and Siemens for use as a lead locomotive in revenue service on 11/17/17. WDTX 1402 was first used in revenue service on 12/10/17 and operated on 5 revenue trains until the incident.

Car Consist

The Talgo Series 6 trainsets were manufactured by Talgo for Amtrak and the Washington State Department of Transportation (WSDOT) between 1996 and 1998. One 12-unit train set and four 13 unit were produced, four of which were put into service in Cascades service between Vancouver, BC and Eugene, OR, with major stops in

Seattle, WA and Portland, OR starting in 1998. A fifth trainset was originally slated for Amtrak service between Los Angeles and Las Vegas but was eventually purchased by WSDOT and is the subject train set.

The Talgo Series 6 trainsets are fully articulated trainsets with ten 43' 1.32" long units and two 38' 8.17" long (over buffers; approximately 40' inside pulling faces) that each share a single wheelset with the adjoining unit. Each wheelset is composed of two separate stub axles held within a truck with vertical towers that support the car's suspension. The first and last car also have a single wheelset to themselves. This elevated suspension supports the cars from the top, allowing them to passively tilt while going around curves, allowing for increased passenger comfort at high cant deficiencies over conventional rail cars. Each car is 10' 10.12" tall and 9' 7.83" wide. Those with revenue seating accommodate between 19 and 36 depending on interior configuration. In addition to the coaches, business class cars, and table car, there is a bistro car with food service but no revenue seating, a baggage car, and a power car that provides head-end power (HEP) when not available from the locomotive. The power car and baggage car are only open to crew. The cars weights range from 28,000lbs for the bistro car and approximately 31,000lbs for the coaches, up to the baggage cars at 37,000lbs and the power car at approximately 43,000 lbs.

The semi-permanently coupled configuration of the trainset requires a long facility to be able to effectively make repairs without uncoupling cars. A special facility owned by Amtrak was built in Seattle in order to maintain the Talgo trainsets, with maintenance work completed by Amtrak agreement labor under Talgo supervision.

Rear Locomotive 181

This P42-8 Genesis locomotive is an EPA Tier 0, 110mph, 4,250 horsepower diesel-electric Direct Current (DC) vehicle powered by a 16-cylinder 7FDL engine manufactured by General Electric in 2001. Amtrak owns, operates, and maintains a fleet of 191 P42 diesel locomotives and 13 identical P40 locomotives for use across the nationwide network in both regional and long-distance services.

ACCIDENT SEQUENCE

Preliminary review of the event recorder data shows that just previous to the derailment, Train 501 was traveling at about 83 mph in throttle position 2 with no brake application. The throttle moved into the idle position just before the engineer applied a minimum service application. Seconds previous to the derailment, the train had reduced its speed to 78 mph as the brake cylinder pressure increased. There was no indication of an emergency brake application or dynamic brakes being applied leading up to the incident.

Further examination of the data will be completed in the NTSB event recorder specialists' factual report in Washington, D.C.

PRE-DEPARTURE INSPECTIONS

On December 18, 2017, Amtrak qualified inspectors conducted an air brake test with no exceptions and a pre-trip inspection. The following are items that were inspected:

- Air pressure
- Brakes
- Communication systems
- Mechanical systems including sanders and wheels
- Car body components
- Propulsion systems
- Electrical systems including breakers, cab signal, and lights
- Couplers
- Doors
- HVAC systems
- Vandalism

Train 501(18) consist was built at the Amtrak Holgate St. yard and daily inspections were completed on both locomotives with no exceptions. While Amtrak mechanical personnel performed a sequence test to properly set up the locomotives in the consist, locomotive 1402 had a Multiple Unit (MU) prime mover shutdown condition due to an unknown signal in the trainline. A technician was called for assistance and the 1402 central computer system (CCU) was rebooted. No further issues arose and the consist was deemed properly configured. The consist proceeded to Seattle King St Station with no further issues. While in the station prior to departure, another MU shutdown fault occurred, and a technician disconnected the MU cable

between the 1402 and the Talgo power car to isolate the locomotive to troubleshoot the problem. Once disconnected, it did not exhibit any further engine shutdown faults after running self-tests and eliminating potential problems downline in the train consist. Train 501(18) took a 9 minute mechanical delay—entered by an onboard crew member for “loading problem, MU issue with Siemens Charger communicating to p42 and engine 1402.” The event recorder download indicates that the operating crew did not use dynamic brakes leading up to the incident.

EQUIPMENT POST ACCIDENT INSPECTIONS

- December 19, 2017 – Investigators examined the incident site and assisted the recorders group in collecting memory modules for the event recorders and video data.
- December 20, 2017 – Examined an exemplar Siemens locomotive and Talgo equipment.
 - Tested rear locomotive 181 for the following parameters with no exceptions:
 - Automatic cab self-test - Amtrak procedure DXBD-11-0003
 - Aux Line
 - Equipment Blower
 - Radiator Fan
 - Power Contactors
 - DB Contactors
 - Batt Regulator
 - Trainline Relay
 - Locomotive Daily Air Brake Departure Test – Amtrak procedure DXBD-10-0003
 - BC pressure
 - BP pressure
 - ER pressure
 - Leakage
 - Emergency Airbrake
 - Alerter
- December 21, 2017 – Collected the following evidence for possible future testing:
 - Central computer unit - 1402
 - Master control unit for the TCU - 1402
 - Wheel slide protection computer - 1402
 - Traction control unit - 1402
 - Three computer operator displays - 1402
 - Cummins engine data logger - 1402
 - MU cable - 1402
 - MU cable – 181
- These components are being retained by Siemens (Seattle).

Testing of MU connection to Locomotive 181

Upon request from investigators, on January 31, 2018, Amtrak personnel conducted a static test on the MU connectivity to locomotive 181. Locomotive 181 was static tested with exemplar locomotive 1401 in Seattle with no MU or communication issues between the either two pieces of equipment. MU circuit checked extensively with no defects found.

Testing of Siemens locomotive 1402

On February 23-24, 2018 the FRA, Siemens, and Amtrak representatives met at the Joint Base Lewis-McChord military base to examine the air brake systems of the WDTX 1402. Upon examination it was noted that most of the trainline pneumatic connections on the front and rear were bent, partially damaged or torn off. Some of them upstream of their exterior cut-out valves. Those connections, specifically the brake pipe, could not be easily closed and used for testing via the exterior glad-hand connections. The locomotive central computer unit (CCU), traction control unit (TCU) and operator displays were removed, and the locomotive right-side battery box was missing. An external air compressor was connected to feed the main reservoir and supply regulated pressure through a split feed into the brake rack at 110 psi. A single car test device was connected to imitate the locomotive brake handle. Due to the system being unpowered and the CCU and TCU being removed, only the brake cylinder (BC) pressure and the emergency bypass function in the computer-controlled brake (CCB2) were tested. An emergency brake application was initiated, and a gradual automatic brake application and release were conducted. All the locomotive disk brake units applied and released as designed.

DOCUMENTATION RECEIVED

- Train list with equipment numbers and directions, weight, length
- Equipment characteristics, year built, manufacturer, when it was put into service, model, etc.
- Siemens locomotive operator's manual
- 90 days of maintenance/repair history for all equipment
- Blue cards and daily inspections for all equipment
- Air brake test inspection certification
- Wayside detector data if any. (WILD, TPD, etc.)
- Predeparture checklists and instructions
- Fault archive downloads for all equipment
- Any test records for the equipment regarding acceptance/performance testing (Cant testing, unloading, braking, etc.)
- Siemens and Talgo company summary

The mechanical group reviewed and took no exceptions to the documentation received nor to the maintenance history of the equipment.

END OF REPORT

Group Member to the Investigation - Acknowledgment Signatures

The undersigned designated *Group Member to the Investigation* representatives attest that the information contained in this report is a factually accurate representation of the information collected during the on scene phase of this investigation, to the extent of their best knowledge and contribution in this investigation.

_____ Date _____
Joey Rhine, NTSB

_____ Date _____
Matthew Thompson, FRA

_____ Date _____
Chris Lewis, FRA

_____ Date _____
Matt Arnold, Washington UTC

_____ Date _____
Paul Aichholzer, Siemens

_____ Date _____
Joshua Coran, Talgo

_____ Date _____
Devon Parsons, Amtrak

_____ Date _____
Marie LaPosta, Amtrak