At 7:03 a.m. on Friday, January 2, 2009, a Metro-North Railroad passenger train (#7808) was traveling southbound on Hudson Line, track #2, when the wheel and axle on the #2 truck of the sixth car in the train separated causing the truck to derail and drop between the rails at approximately mile post 54. The derailment went undetected by the engineer operating in the head car (#6313) and the two-person crew until the train reached the next station stop at the Cold Spring Station. The derailed car traveled 8,131 feet from the point of derailment to the station at Cold Spring. When the train arrived at the Cold Spring Station, the conductor opened the passenger door and noticed that the sixth car (#6359) was leaning against the station platform. At about the same time, several passengers approached the conductor and told him that they felt something unusual in the train’s ride. An inspection of the #2 truck on the sixth car revealed that the L3 wheel on axle #3 had dropped between the gage of the rails, and that the R3 wheel was missing. (See photo to right.) The bolster beam of the #2 truck was sitting atop the field side rail which was causing the car to lean to the right. There were no reported injuries to the 400 passengers aboard the train at the time of the accident.

The cause of the derailment was determined to be a fractured #3 axle on car #6359, which allowed the R3 wheel and outer portion of the axle to separate. A detailed metallurgic, fatigue and stress analysis of the failed axle and wheel assembly was conducted by an outside contractor hired by Metro-North Railroad. The analysis concluded that a pre-existing wheel defect consisting of two, six inch long wheel flats on the tread surface of the R3 wheel, caused a repetitive “hammering” condition which resulted in metal fatigue cracks to develop at the stress relief radius on the axle at a point between the journal bearing and the R3 wheel; causing the component to fail.

Investigation

Train #7808 consisted of seven Shoreliner III coach cars, being shoved by a locomotive engine but operated by the engineer from the cab of the head coach car. A download of train’s event recorder showed that the speed of the train at the time of the derailment was 83 MPH. Marks on the running rails and damaged cement ties indicated that the point of derailment was 216 feet south of mile post 54. The derailment occurred
as fatigue cracks developed between the journal bearing and the R3 wheel. This resulted in a catastrophic fracture between the axle and the wheel into two pieces. The R3 wheel rolled 738 feet away and broke through the ice coming to rest in the Hudson River where a river salvage company, hired by the Railroad, utilized scuba divers to enter the river and retrieve the wheel. After separating, the opposite wheel on the L3 axle dropped between the gage of track with the right side of the truck sliding on top of the field side rail on the bolster beam. The derailed car traveled through the CP 53 interlocking causing damage to the switches and continued for a total length of 8,131 feet after derailing. Approximately 400 passengers on board train #7808 at the time of the accident where asked to detrain at the Cold Spring Station and wait for the next southbound train to continue their commute.

Shoreliner Inspection

An system-wide emergency truck equipment inspection of all Bombardier Shoreliner III coach railcars was conducted over the weekend of January 3 and 4, 2009 to inspect truck axles for cracks. By Monday, January 5, 2009, the entire fleet of Shoreliner trucks had been inspected and no defects were found. Regardless of their findings, all axles manufactured in the same lot as the one involved in the derailment were taken out of service as a precautionary measure.

Damage

Equipment - Post derailment inspection of coach car #6359 revealed that the #3 axle disc brake rotors fractured from their hub assemblies as a result of the derailment. The L3 wheel was also damaged. No other defects were noted for the other major truck components and no defects were found to the brake system.

Wayside – At the point of derailment, there were a few concrete ties that were chipped on the field side of the gage. There was additional damage in the CP 53 interlocking to the switches. Switches 12B and the 21A had bent stock rails, switch points and rods, shattered concrete ties, and a broken frog. Numerous concrete ties between the switches were shattered or had their tie plates broken off. Inspection of the track between CP 53 interlocking and Cold Spring Station revealed chipped and damaged concrete ties and ties plates with broken clips.

Weather

The weather condition at the time of this daytime accident was cloudy, with a temperature of 20 degrees. The PTSB does not considered weather to have played a role in this accident.

Fractured Axle Investigation

MNR hired an outside contractor, Lucius Pitkin Incorporated (LPI) to perform a detailed metallurgic, fatigue and stress analysis of the failed wheel and axle assembly. The contractor determined that:

- an analysis of the wheel and axle assembly indicated the components, as manufactured, met MNR and American Association of Railroads (AAR) specifications;
- the R3 wheel exhibited severe damaged shelling to the tread. Two flat spots, measuring approximately 6" in length coincided with the shelling; and
- the cracking of the axle occurred due to the higher than normal cyclical stresses that developed in the axle due to the presence of the severe tread flats.

As a result, Metro-North Railroad incorporated the following corrective actions:

- Removed from service all axles manufactured in the same heat as the fractured axle;
- Increased attention to, and reinforce existing wheel inspection and truing standards;
- Performed dynamic stress analyses of any axle found with flattened wheel;
- Increased Metro-North employee awareness to report unusual equipment conditions in a timely way through notices and bulletins;
- Modified material handling and press adapters for axle support to mitigate axle surface damage; and
- Installed rail impact detectors to monitor wheel conditions.

The Public Transportation Safety Board staff finds that the most probable cause of this accident was metal fatigue due to flat spots on the wheel tread which provided a constant pounding while the wheel rotated. This resulted in stress fractures which led to a catastrophic axle failure on car #6359 into two pieces allowing the R3 wheel to separate from the train. The PTSB staff also accepts the preventive actions adopted by the Railroad to prevent a similar occurrence and will continue to monitor the effectiveness of the adopted corrective actions. Based upon these reported facts, and the corrective actions taken by the Railroad, the Public Transportation Safety Board staff takes no further issue with the property and makes no additional recommendations regarding this accident.

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<th>Investigated by</th>
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<tr>
<td>Robert Maraldo</td>
<td>Jerry Shook</td>
<td>August 27, 2009</td>
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