This is a collation of some of the world’s railway formal inquiry reports. It includes a brief incident synopsis, along with the main causes and recommendations from each investigation. Readers may find some of the actions and recommendations useful to their own operations.

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At about 20:15, a container train derailed about four miles south-west of Gloucester station. It was travelling at 69 mph when the rear wheelset of the last wagon came off track with cyclic top.¹ The train continued to Gloucester station, where it was stopped by the signaller, who had become aware of a possible problem with the train through damage to the signalling system. By the time the train stopped, the rear wagon was severely damaged, the empty container it was carrying had fallen off, and there was damage to four miles of track, signalling cables, four level crossings and two bridges.

RAIB found the immediate cause of the accident to be a cyclic top track defect which caused a wagon susceptible to this type of track defect to derail. The dips in the track had formed due to water flowing underneath the track and, although the local maintenance team had identified the problem, the repairs it carried out were ineffective. The severity of the dips required immediate action by Network Rail, including the imposition of a speed restriction for the trains passing over it, but no such restriction had been put in place. Speed restrictions had repeatedly been imposed since December 2011, but were removed each time repair work was completed; on each occasion, such work subsequently proved ineffective.

The type of wagon that derailed was found to be susceptible to wheel unloading when responding to these dips in the track, especially when loaded with the type of empty container it was carrying. This susceptibility was not identified when the wagon was tested or approved for use on Network Rail’s infrastructure.

RAIB also observed that: the local Network Rail track maintenance team had a shortfall in its manpower resources; and design guidance for the distance between the wheelsets on two-axle wagons could also be applied to the distance between the centres of the bogies on bogie wagons.

RAIB has identified the following key learning points for the railway industry:

- Network Rail should remind its staff responsible for managing the maintenance of its track (such as Track Maintenance Engineers and Section Managers) of the requirements in the Network Rail standard, relating to the imposition of a speed restriction due to poor track quality. If the vertical track geometry of an eighth-mile long section of track is recorded in the maximum band, and the remedial work undertaken is not sufficient to move the track quality out of that band, then a speed restriction must be imposed. This restriction should remain in place until a further repair is made and it is confirmed that the repair work has improved the vertical track geometry.

- Designated bodies responsible for assessing a vehicle against Railway Group Standard GM/RT2141 (Resistance of railway vehicles to derailment and roll-over), as part of the work to gain approval for that vehicle to be used on Network Rail’s infrastructure, should be reminded that they are required to assess vehicle conditions and loads that can affect a vehicle’s resistance to derailment. Section 2.2 of the standard (Issue 3) describes the range of test conditions of which an assessor must take account, including the range and effect of possible in-service loading configurations. For a vehicle which has a suspension with a change point in its stiffness, assessors

¹ This refers to regularly spaced dips in both rails.
are reminded to consider testing with a partial load that places the suspension at the change point, particularly if the vehicle is designed to carry a variable load such as containers.

**Recommendations**

- Network Rail should review the effectiveness of the drainage in the area where the train derailed to confirm if the work that was undertaken to improve the drainage, when the track was renewed in March 2014, will control the risk of water from the local water table affecting the track’s vertical geometry and the recurrence of cyclic top.

- Network Rail should revise its processes for the management of cyclic top. It should:
  - Review the requirement that immediate action cyclic top track defects must be repaired within 36 hours to understand if it is feasible for an effective repair to be made in this timescale and, if not, mandate the actions that must be taken to mitigate the risk due to the cyclic top track defect until an effective repair can be planned and made;
  - Provide guidance, which is briefed out to its track maintenance staff, on how to make effective repairs to cyclic top track defects. This guidance should tell track maintenance staff not to carry out manual repair work that is only aimed at breaking the cyclic top track defect into sections of track with poor vertical track geometry, unless the risk presented by the residual poor vertical track geometry is assessed and mitigating actions taken (such as the imposition of a speed restriction);
  - Review the adequacy of its processes for imposing and removing emergency speed restrictions applied for cyclic top track defects. This is to assure itself that there are adequate controls in place for the removal of cyclic top related speed restrictions. Such controls could include an assessment of the track’s vertical geometry, carried out after trains have run over the repaired track, but before line speed is restored; and
  - Have a process in place that raises the visibility of repetitive cyclic top track defects, so that senior management responsible for the local maintenance team are made aware of it and can monitor the actions being taken to address the cyclic top.

- Network Rail should provide its maintenance staff with a method of measuring repairs to vertical track geometry which provides early confirmation that the repairs undertaken have been effective.

- Network Rail should investigate methods of making more effective repairs to vertical track geometry faults on steel sleeper track, especially if the underlying formation is poor or the ballast is contaminated. Any methods that are identified by this work should then be incorporated into procedures and Track Work Information Sheets, and briefed out to its track maintenance staff.

- RSSB, in conjunction with the Rolling Stock Standards Committee, should carry out a review to identify how a vehicle’s response to regular changes in vertical track geometry should be assessed (ie a cyclic top assessment). RSSB should then propose changes to the standards which are used assess the compatibility of vehicle’s ride performance with the railway infrastructure in Great Britain (at present this is GM/RT2141), which will implement the cyclic top assessment identified by the review. The proposed changes to the standards should then be implemented by RSSB by means of a time-bound programme.

- Direct Rail Services should implement measures to reduce the susceptibility of the IDA wagon’s ride performance to changes in vertical track geometry when in tare or a partially laden condition. This could be by means of either the introduction of operating restrictions or modifications to the wagon’s suspension.

- RSSB, in conjunction with the Rolling Stock Standards Committee, should propose that guidance on the design of freight wagons in GM/GN2688 is amended, to explain that as well as two-axle wagons, if a wagon is designed with a bogie centre spacing that matches a wavelength commonly associated with cyclic top, it may be susceptible to poor ride on jointed track and cyclic top.
At around 02:40 on 15 October 2013, a freight travelling from Birmingham to Felixstowe derailed close to the site of the former Primrose Hill station in north-west London. There were no injuries, although the train and infrastructure were damaged. The North London route, which carries London Overground passenger services as well as freight trains, was closed for six days as a result.

One wagon in the train ran derailed until the train reached a junction near Camden Road station. At this point, an empty container toppled off and damaged overhead line equipment. The derailment was caused by a combination of the track geometry and condition, as well as the longitudinal and lateral asymmetric loading of the wagon which reduced its resistance to derailment on twisted track.

RAIB determined the immediate cause to be that the leading right-hand wheel of the trailing bogie on wagon No. 641063 (an FEA-type) derailed after its flange climbed up and over the rail.

The causal factors are as follows:

- The track had opposing twist faults which significantly reduced the load on the first wheel to derail.
- There was no check rail on the tight radius curve to provide lateral restraint to the wheels of the wagon and prevent flange-climbing as it negotiated the curve.
- The combination of longitudinal and lateral asymmetric loading of the wagon. Linked factors include:
  - The extent of asymmetric loading of wagon No. 641063, which reduced the load on the right-hand rear wheels; and
  - The rules on the loading of FEAs had been relaxed following the derailment at Duddeston Junction in 2007, allowing greater longitudinal asymmetry.

RAIB note that it is ‘possible’ the following factor was causal:

- The level of friction between wheel and rail may have increased the probability of derailment.

RAIB also concluded that:

- Lateral track irregularities increased the probability of derailment by increasing the lateral forces at the wheel/rail interface; and
- There is a possibility that the FEA(E) wagon is particularly prone to flange-climbing derailment on twisted track when loaded asymmetrically.

The underlying factors were:
The effect of asymmetric loading on the resistance of the FEA(E) wagon to derailment on twisted track was not considered as part of the process for accepting the wagon for operation on Britain’s railway infrastructure.

Following previous similar derailments, neither the duty holders, Freightliner and Network Rail, nor RSSB had fully quantified the risk from operation of FEA wagons with asymmetric loading or determined whether measures were required to mitigate the risk.

There was insufficient awareness of the ongoing poor condition and classification of the North London lines (both as a passenger route and as ‘category 3 track’) among the managers of the Euston Maintenance Delivery Unit.

The following factor exacerbated the consequences of the event:

- The spigots on the wagon did not restrain the 40-foot container following the derailment.

RAIB has identified the following key learning point:

- Network Rail is reminded to give particular attention to the possible consequences of a high turnover of responsible staff with detailed local knowledge of the infrastructure, such as may occur during reorganisations of its maintenance function.

**Recommendations**

- Network Rail should provide specific guidance to managers with responsibility for track maintenance on the action to be taken to confirm that track quality remains acceptable should a planned run of a track geometry measurement train over a section of line be cancelled. This should include the criteria for whether it is necessary to conduct additional track geometry measurements, as well as the timescales for any such measurements to be completed.

- Freightliner and Network Rail should jointly request that RSSB:
  - a) researches the factors that may increase the probability of derailment when container wagons are asymmetrically loaded, and in particular:
    - i. sensitivity to combinations of longitudinal and lateral offsets in loads that can reasonably be encountered in service;
    - ii. the predicted performance of wagons with high torsional stiffness along their length (using the FEA type as an example); and
    - iii. the effect of multiple twist faults, track twist over distances other than 3 metres (as commonly specified and measured by Network Rail) and lateral track irregularities.
  - b) updates and amends as necessary the risk assessment contained within the RSSB and Transport Research Laboratory joint report (‘Potential risks to road and rail transport associated with asymmetric loading of containers’); this should take into account the results from the research referred to in a) and additional evidence presented in this investigation report; and
  - c) works with industry stakeholders to use the outputs of a) and b) to identify, evaluate and promote adoption of any additional reasonably practicable mitigations capable of reducing the risk from asymmetric loading of wagons.

- RSSB should amend Railway Group Standard GM/RT2141 to refer specifically to asymmetric loading, including possible combinations of longitudinal and lateral load imbalance.
**UK: Collision at Kitchen Hill, near Penrith, 12 January 2014**

For the full report, click [here](#).

At 13:25 on Sunday 12 January 2014 two freight trains, which were being operated in connection with engineering work, were involved in a collision at Kitchen Hill access point on the West Coast Main Line, around five kilometres north of Penrith station. Both trains were within a work site contained inside an engineering possession. Train 6L43 was stationary and waiting for permission to pass the work site marker boards at the north end of the work site.

Train 6L42 was also preparing to leave the work site and was making a move, authorised by the Engineering Supervisor, towards the north end of the work site. It ran into 6L43 at 17 mph, and pushed it forward around 20 metres.

Around 20 metres of rail fastenings unclipped as a result of the collision, allowing the track gauge to spread and causing four wheelsets of 6L42 to derail.

Wagon buffers overrode at two locations: between the leading wagon on 6L42 and the locomotive, and mid-way along 6L43. The driver of 6L42 jumped from his cab just before the collision. He sustained abdominal injuries and was detained in hospital overnight. No-one else was injured.

The West Coast Main Line remained closed between Penrith and Carlisle for recovery of the trains and repair to the track until 14:04 on Monday 13 January 2014.

RAIB notes that this accident emphasises the importance of the previous Recommendations 1b and 2ai from its investigation of the collision at Arley with respect to the rules for permitted speeds in work sites (and possessions) and the related information given to drivers. RAIB has not conducted any further investigation since it believes it unlikely that this would lead to the identification of any new recommendations.

However, the accident has highlighted the importance of the following two learning points:

- That all movements of engineering trains (and on-track machines and plant) in work sites (and possessions) are made ‘at caution’ – this means that trains should always be capable of stopping in the distance ahead that the driver can see the line to be clear; and

- Engineering Supervisors (and Persons in charge of Possessions – PICOPs) are aware of the risks from misunderstanding railway place names and that they take the most appropriate measures to check that drivers (and machine controllers) clearly understand the locations associated with movements in work sites (and possessions).

**UK: Passenger dragged a short distance by train at Holborn station, 3 February 2014**

For the full report, click [here](#).

At about 19:00 on Monday 3 February 2014, a passenger was dragged about ten metres along the platform at Holborn by a departing Piccadilly Line train, after her scarf became caught between the closing doors of one of the carriages.

The train had stopped normally in the platform and passengers had alighted and boarded. A member of staff on the platform signalled to the train operator, by raising a baton, to begin the process of closing the train’s doors. As the train operator started to close the doors, a passenger arrived on the platform and moved towards the train, stopping as she realised that the doors were closing. As she stopped, the end of the scarf that she was wearing round her neck continued to swing towards the train and became trapped in the closing doors.
The train operator was unaware that the scarf was trapped. He started to move the train, and the passenger was dragged along the platform. The member of staff on the platform tried to help the passenger by catching hold of her, and she fell to the ground. This resulted in the scarf being forcibly removed from the passenger’s neck and carried into the tunnel by the train. The passenger suffered injuries to her neck and back, but the actions of the member of staff may have saved her from being more badly hurt.

The investigation found that the force required to remove the trapped scarf is likely to have been less than the maximum specified in the relevant London Underground standard, but it may have been difficult for a person taken by surprise and being dragged along the platform to exert such a force.

Recommendations

- London Underground Ltd should provide staff acting as Station Assistant (Train Services) (SATS) with an effective means of alerting the train operator to a dangerous situation that arises after the SATS has given the signal to start the door closing sequence, and before the train has begun to move.
- London Underground Ltd should also review how the role of the SATS is described in its rule book (and other company documents), so that the duty of the SATS to rapidly respond to dangerous events that occur during the dispatch process is given appropriate emphasis.

Published 23 October

**UK: Concrete falls at Denmark Hill station, 1 August 2013**

For the full report, click [here](#).

At about 16:00 on Thursday 1 August 2013, concrete cladding fell from the bridge spanning Denmark Hill station, London, and most of the debris landed on Platform 1. The fallen concrete was reported by two train drivers and services were stopped on the nearest line. Fortunately no-one was struck and there was no damage to trains.

The cladding had been added to the bridge structure in about 1910 and fell because of gradual deterioration of the fixing arrangements. Deterioration of the cladding fixing arrangements had been reported to Network Rail over a period of at least four years but the resulting actions taken by Network Rail and its works contractor were inadequate.

RAIB has identified several factors which led to the absence of appropriate remedial work. Urgent repairs were not implemented in a timely manner and information collected by examiners was not entered promptly onto Network Rail’s asset management database (CARRS). Communications between Network Rail’s asset management and works delivery team were sometimes ineffective. Remedial work was not always precisely specified, staff implementing the work sometimes lacked the necessary competencies, and processes for verifying completion of remedial work were inadequate. Repeated reports of the same defect should have, but did not, led Network Rail to recognise that remedial works instructions were not achieving the intended effect. The high workload of some staff is a possible factor. Non-compliance with Network Rail’s maximum permitted intervals between bridge examinations was noted but was not a factor in the incident.
Actions already taken

Actions which would otherwise have led to a RAIB recommendation

After the incident, all concrete was removed from beneath the Windsor Walk edge beam and significant amounts of concrete were removed from beneath other parts of the bridge. Network Rail reports that all areas of concrete ‘with fractures’ were removed.

Network Rail has undertaken a nationwide programme to identify, review and, where it considered it necessary, repair structures with cladding similar to that which failed at Denmark Hill.

Network Rail has, in response to an action arising from an ORR National Rail Inspection Programme, completed a nationwide review of resources required to meet its asset management obligations. Network Rail reports that the number of staff now available in the former Kent and Sussex routes (recently combined as the South East route and covering Denmark Hill) now meets the requirements identified by this review. Some routes have not yet met the review requirements but Network Rail reports it is implementing time bound recruitment plans intended to meet the requirements.

Other action

Network Rail have stated that, at least on the South East route, asset management engineers now review photographs showing work reported as complete.

The incident bridge was closed to road traffic by Network Rail in August 2014, and remained closed to road traffic at the publication date of this RAIB report, for a reason which is unrelated to defects in the concrete cladding of the bridge beams.

Learning point

RAIB has identified a key learning point for the rail industry:

- It is vital that structures asset managers rigorously record, all defects that have been observed by examiners. The creation of a new record of the same defect, even if duplicating a previous entry, can be vital for understanding and so for managing safety risk.

Recommendations

- Network Rail should carry out a review of the means by which defects identified by the structures examination process are evaluated by asset managers, and repairs actioned. Network Rail should then make the improvements necessary. As a minimum, this review should consider:
  - Ways of improving the integration of asset management and works delivery management systems (by means of technology and/or improved management arrangements);
  - The ways in which contractors are remitted to carry out work, particularly for works reliant on the application of judgment, and the degree of supervision that is required;
  - The robustness of processes for confirming that works with an impact on safety have been completed in the manner intended by asset managers; and
  - The process for assessing the implications of repeat, or similar, defects at the same location.

Published 23 October

Canada: Fatal shunting accident at Murphys, Saskatchewan, 18 November 2013

For the full report, click here.

On 18 November 2013, a trainee conductor was struck and killed by a Canadian National (CN) freight train being shunted at Murphys, just east of Tisdale, Saskatchewan.
On the day of the accident, the crew came on duty at 09:00 (local time). They had planned to complete shunting at Murphys by about 18:30. They would then turn the train around at Crooked River and return to Melfort by about two hours later. Whilst en route, the crew was instructed to pick up an additional 14 high-priority, empty, covered hopper wagons at Melfort. These were to be transported to Tisdale.

On arrival at Tisdale, the crew noted that the wagons they had picked up in Melfort consisted of one empty and 13 laden wagons, rather than all empty ones, as originally instructed. After completing other shunting activities at Tisdale, the crew was instructed to hold on to the 14 wagons and bring them back to Melfort on the return trip. The 14 wagons remained positioned at the head end of the train as it continued to Murphys. Departing Tisdale, the train comprised three locomotives and 78 wagons (13 laden; 65 empty).

In the dark at Murphys at around 18:18, the train struck and seriously injured the trainee conductor while reversing at approximately 12 mph. The trainee was taken to hospital by ambulance, but succumbed to his injuries before arrival.

The Transportation Safety Board of Canada (TSBC) concluded that the accident occurred while the trainee was securing a derailing device mounted between the rails on track TS 23 with his back to the train.

The trainee had returned to the north side of the interchange track to pick up a sense-and-braking unit (SBU) that he had left near TS 23 points. The trainee had intended to place the SBU on the tail-end wagon, which was now on the main track adjacent to TS 23 points, and then place TS 22 points in the normal position and apply both derails to protect against the unintended movement of the wagons that had just been shunted. While this work plan was reasonable considering the original consist, the plan had changed due to the addition of the 14 wagons that had to be returned to Melfort. As a result, after communicating his intention to the rest of the crew, the trainee was instead told to leave the SBU and place the main set of points (TS 22) to the normal position, allowing the train to reverse and pick up the conductor. To complete this task, the trainee would need to line TS 22 to the normal position.

However, the trainee's actions suggest that his mental model of the work plan had already been formed and was fixated at his location, north of the main track, which affected his situational awareness. Consequently, he did not recognize that TS 22 points were 282 feet west of his location, did not pay full attention to the points he was switching, and did not ensure that the points (and target) were properly lined for the main line. The required switching tasks likely conflicted with his mental model and, instead of lining TS 22 to the normal position, he inadvertently reversed the nearest switch (TS 23) and lined it into the interchange loop where he was working.

In accordance with operating procedures, the trainee had reported that the points were lined and locked in the normal position for the main line, and the radio transmission was properly acknowledged by the crew in the locomotive. The trainee then requested that the train reverse 20 wagons and instructed the conductor to protect the tail end of the movement. The conductor properly acknowledged this request, and the movement began. Because the trainee had inadvertently reversed TS 23 points and mistakenly reported the main line set as lined and locked in the normal position for the main track, the entire crew was unaware that the train was not following its intended route. This situation demonstrates that, if a loss of situational awareness occurs, administrative defences like rules and procedures may not always protect against switching errors, which increases the risk of an accident.
With the conductor positioned in the vicinity of the elevator (see diagram) and the two drivers on the locomotive, there was no crew member close enough to observe the trainee's actions and ensure that TS 22 and TS 23 points were properly lined for the main track. Subsequently, the trainee:

- Did not confirm that the proper switch points and target were lined for the intended movement;
- Did not ensure that rolling stock was not approaching prior to operating a derail; and
- Was unprepared for movement on any track in any direction.

As a result, the conductor trainee, who had worked at this location on three earlier trips in September 2013, who was still unfamiliar with the territory, and who was working without direct supervision, misapplied a number of safety-critical operational procedures.

The TSBC reviewed CN's conductor training programme and identified the following issues relevant to this occurrence:

- In some cases, newly qualified conductors are permitted to train new hires. Without significant experience working with the Canadian Rail Operating Rules (CROR) in the field, a trainer may not readily identify an unsafe work practice or error.
- On-the-job training is administered by a number of different trainers without requirement for review of a trainee's previous evaluations. Consequently, any potential shortcomings of a newly assigned trainee may be overlooked and may remain uncorrected.
- The company guidance or instruction provided does not require a trainer to remain in close proximity to a trainee. This situation can reduce opportunities to observe and correct any unsafe practices or errors, or misinterpretations of rules or instructions, before an accident occurs.
- Conductor trainees do not have to be familiar with the territory before working without direct supervision.

If there is a reduced training period, an absence of direct supervision, and a lack of continuity and assessment among trainers, conductor trainees may not apply rules and instructions correctly in the field, which increases the risk of an accident.

Item 12.8, *Hand-Operated Derails*, of CN's general operating instructions (GOIs) specifies a number of procedures that are required to place a hinged derail back in derailing position. These administrative defences imply that employees work from outside the rails. However, due to the weight of a hinged derailing device, its location between the rails, and its configuration, employees must frequently stand between the rails to clean debris (snow, etc.) and operate a hinged derail. Consequently, employees can be placed in a vulnerable position. Such was the case with the trainee who was operating the hinged derail that was located on the interchange track just west of the mainline switch stand at Murphys.

The TSBC listed the following causes and contributing factors:

- The accident occurred while the trainee was securing a derail mounted between the rails on track TS 23, with his back to the train. Unaware of its approach, the trainee was struck by the train.
- The required switching tasks likely conflicted with the trainee's mental model and, instead of lining main track switch TS 22 to the normal position, the trainee inadvertently reversed the nearest main track switch (TS 23) and lined it into the interchange track where he was working.
- Because the trainee had inadvertently reversed switch TS 23 and mistakenly reported the mainline switch as lined and locked in the normal position for the main track, the entire crew was unaware that the train was not following its intended route.
- The conductor trainee, who was unfamiliar with the territory and working without direct supervision, misapplied a number of safety-critical operational procedures.

It also listed following findings regarding risk:

- If a loss of situational awareness occurs, administrative defences, such as rules and procedures, may not always protect against switching errors, which increases the risk of an accident.
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- If conductor trainees work independently, without direct supervision in close proximity, there is an increased risk of error, which can result in an accident.
- If evaluations conducted by other trainers are not reviewed, there is an increased risk that trainees will not be provided with adequate reinforcement of proper procedures and work practices to correct weaknesses identified during on-the-job training.
- If there is a reduced training period, an absence of direct supervision, and a lack of continuity and assessment among trainers, conductor trainees may not apply rules and instructions correctly in the field, which increases the risk of an accident.
- If an employee is required to be positioned between the rails to operate hinged derails, there is an increased risk that a serious injury will occur.
- If there is no regulatory oversight of the effectiveness of training programs for railway operating employees, there is increased risk that these programs may not be sufficiently robust to ensure that trainees have adequate practical experience to work independently and safely.

Action taken

On 4 February 2014, TC responded that this accident is being investigated by TC’s Prairie and Northern Surface Regional Office. A report will be completed by its investigators. Once complete, the report will be provided to the employer and to the local health and safety committee for review and action.

In addition, TC indicated that it has identified the issue of trainee supervision in its risk-based business plan for the upcoming program year, and is developing risk-control actions to address it.

On 21 November 2013, CN issued a safety flash to its Western Region employees, explaining the details of the accident and reminding employees to comply with all rules and regulations.

On 2 December 2013, CN issued a notice within the Western Region with the information contained in the November flash, and added a reminder to employees of item 12.3 of the GOIs (Pushing Equipment: Observing from the Ground).

Both the flash and the notice reminded employees of the importance of maintaining situational awareness and safety-related focus.

In January 2014, CN issued a system-wide general notice to monitor and record trainee performance, and an e-test was established to monitor and record compliance.

On 5 August 2014, CN issued an Operating Bulletin, which provided a reminder that employees who are assigned a trainee must be in a position that provides continuous monitoring of the trainee, and that allows for immediate intervention and corrective action of any non-compliant or unsafe activities observed.

Published 24 October

US: Fatal passenger train derailment in the Bronx, New York, 1 December 2013

For the full report, click here.

At 07:20 (local time) on 1 December 2013, an eight-coach Metro-North push-pull service operating in push mode derailed near Spuyten Duyvil, in the Bronx district of New York. Four people were killed and 63 were injured.

Three of the four fatalities were in the second and third carriages, the victims being ejected when the incident occurred. At least two of the coaches flipped on their side after the derailment, and one stopped only feet from the...
banks of the Harlem River.

Firefighters and ambulance crews responded quickly, some firefighters breaking through windows in order to rescue passengers, of whom 150 were said to have been aboard.

The derailment occurred at a point where four lines become three, where linespeed reduces from 75 mph to 30 mph and where the tracks enter a 30° left-hand curve. Media reports suggest the train to have been travelling at 82 mph at the time of the incident.

The National Transportation Safety Board (NTSB) determined that the probable cause of the accident was the driver’s non-compliance with the 30-mph speed restriction because he had fallen asleep due to undiagnosed severe obstructive sleep apnoea, exacerbated by a recent circadian rhythm shift required by his work roster.

The absence of a Metro-North Railroad policy or a Federal Railroad Administration (FRA) regulation requiring medical screening for sleep disorders and the absence of a positive train control system were listed as contributory factors.

The NTSB added that the loss of the window glazing, resulting in the fatal ejection of four passengers from the train, contributed to the severity of the accident.

**Action taken**

During the on-scene investigation, NTSB investigators determined that Metro-North trains exceeding the prescribed speed limits were not uncommon. As a result, on 11 December 2013, the FRA issued an Emergency Order, which required Metro-North to take a number of immediate steps to ensure trains were not operated at an excessive speed. The FRA also issued a Safety Advisory to all rail operators on 16 December 2013, recommending that they emphasise speed compliance to their operating employees.

Metro-North developed and implemented a train-speed enforcement programme that involved radar speed checks and increased reviews of event-recorder data to confirm that drivers were adhering to speed limits.

As a result of information obtained during this investigation and three additional ongoing NTSB Metro-North investigations, the FRA assembled a team to conduct a safety assessment of Metro-North operations. The FRA team interviewed Metro-North personnel, inspected Metro-North equipment, and reviewed Metro-North compliance with regulations. In March 2014, the FRA issued a report, *Operation Deep Dive: Metro-North commuter railroad safety assessment*, which contained a number of recommendations for improving safety on Metro-North. On 15 May 2014, Metro-North submitted a response to the FRA addressing the recommendations in the FRA safety assessment report.

**Recommendations**

- Metro-North should install permanent speed restriction signs, inward-and outward-facing audio and image recorders, and use the recordings to verify crew compliance with safety rules.

This information has been added to RSSB’s summary of the accident, which may be found on Opsweb. Click [here](#).

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