

Collision with buffer stops at King's Cross station, London, 15 August 2017

1. Important safety messages

This accident demonstrates the importance of:

- effective and comprehensive fatigue risk management on the part of both individuals and organisations, including not just controls on working hours but also suitably timed breaks, preparation for duty and the appropriate use of mitigations

2. Summary of the accident

At around 06:23 hrs on Tuesday 15 August 2017, a passenger train collided with the buffer stops at platform 9 at London King's Cross station. The train was the 05:13 hrs Great Northern service from Royston, formed of a four-carriage class 387 unit. It was travelling at about 4 mph (6 km/h) at the time of the collision. Four passengers and one member of staff reported minor injuries as a result of the accident, and there was minor damage to the train and the buffer stops, which were pushed back by over one metre.

The train's on-train data recorder (OTDR) showed that it passed the Train protection and Warning System (TPWS) overspeed sensor at 9.2 mph (14.8 km/h), which was appropriate for this location (the sensor is located 53 metres from the buffer stops and set to intervene at 12.5 mph (20.1 km/h) or more; the system is designed to ensure that trains passing the sensor are approaching the buffer stops at a speed from which they can stop, but will not necessarily prevent a collision if the driver does not control the train). A brief brake application was made about six seconds later. After a further nine seconds, the emergency brake was applied; this was about three seconds before the collision.

3. Cause of the accident

The accident occurred because the driver was suffering from fatigue and apparently experienced a microsleep in the last few seconds of the approach to the buffer stops. The driver reported being aware of passing the TPWS sensor but then briefly closed her eyes because they felt tired and were stinging. When she opened them, she was close to the buffer stops and, although she made an emergency brake application, it was too late to avoid a collision.



The train and the buffer stops after the collision (images courtesy of Network Rail)

The driver was fatigued because this journey was at the end of a relatively demanding night shift, which was her first night shift after a period of rest days, and because she was not sufficiently well rested.

On the night before the accident, her shift started at 21:55 hrs, and was due to finish at 06:30 hrs on 15 August 2017, for a total shift duration of 8 hours and 35 minutes. RSSB advocates a limit of 8 hours for the first night shift in its [guidance document](#) on controlling fatigue associated with first night shifts.

The duty involves driving a train from Cambridge to London King's Cross, then another from King's Cross to Royston. This train is then taken to Letchworth sidings at about 02:50 hrs, where there is a scheduled rest break from 03:00 to 03:30 hrs, some five hours into the shift. [RSSB guidance](#) recommends a maximum of four hours' work before a break, based on research that found an increase in SPAD risk after five hours or more. After the break, the driver is responsible for preparing the next train to leave Letchworth at about 04:40 hrs, which will form the 05:13 hrs passenger service from Royston. The driver reported that this particular duty is more intensive than other night shifts and leaves less opportunity for rest during the shift.

During the stopover at Letchworth sidings, the driver found time for a 40 minute nap. Whilst napping should not be seen as a primary fatigue management strategy, it can be a useful countermeasure for fatigue arising during a shift and is sanctioned by many train operators. Although Great Northern provides napping facilities at some of its depots, there are none at Letchworth, so the driver took her nap in the train cab. She set an alarm to wake her up, and reported that she did not feel suitably refreshed when the alarm went off. Consequently, she took another 10 minute nap in the cab at Royston station while awaiting departure, after which she felt better. On other comparable night shifts, the stopover in the sidings is longer and the scheduled rest break is earlier in the shift, affording a more flexible and appropriate opportunity for a restorative nap.

Great Northern's procedure to manage the risks of fatigue is dated October 2010, and has not been updated in the light of comprehensive guidance on fatigue risk management published by both the Office of Rail and Road (ORR) and RSSB in 2012. The procedure focuses on the working time limitations that resulted from the Clapham Junction accident of 1988, and does not impose specific requirements on rest breaks, nor does it reference napping as a potential fatigue mitigation.

Nevertheless, in September 2016, Govia Thameslink Railway (GTR, the parent company of Great Northern) issued and briefed a 24-page guidance booklet to its staff on shift work and fatigue awareness. The booklet includes advice on the importance of getting enough sleep, lifestyle factors, and the appropriate use of napping. Great Northern's drivers are also required to demonstrate knowledge of fatigue management during their two-yearly competence assessments.

RSSB's guidance document for front line staff and managers offering advice on controlling fatigue specifically associated with first night shifts was published in December 2016. The document covers organisational control measures (such as shift length, breaks and appropriate use of napping) as well as individual countermeasures (including sleep before a first night shift and using caffeinated drinks).

The driver in this case had about two years' experience of driving trains on the lines out of King's Cross. She was aware of the increased risk of fatigue on night shifts, and used several strategies to counteract the effects, including napping, taking healthy snacks and drinking diet cola. Whilst these may be appropriate mitigation strategies when used judiciously, both ORR and RSSB emphasise that they should not be relied upon as primary fatigue controls; the most effective approach is to prevent fatigue by getting adequate sleep.

Prior to her shift on Monday 14 August 2017, the driver had four rest days during which she adopted a normal, night-time sleeping pattern, getting around nine to ten hours sleep a night. On the Monday afternoon, in preparation for her night shift, the driver slept for an extra three hours between 12:00 and 15:00 hrs. She had therefore been awake for about 15.5 hours at the time of the accident. The [ORR's guidance document on fatigue](#) cites research that shows being awake for 16 to 17 hours or longer can impair performance. RAIB notes that managing the transition in sleep patterns onto a first night shift is difficult, and further observes that night shift workers commonly wake several hours before the start of their shift, meaning that the time since waking (a key determinant of fatigue) is longer than it needs to be.

The driver reported that another reason her eyes felt tired was because the airflow from the cab's air conditioning system was directed into her face, and the direction of the airflow is not adjustable. Although the fan can be switched off temporarily, [Railway Group Standard requirements](#) for fresh air in the cab mean that it automatically switches on again after 20 minutes.

4. Previous similar occurrences

The investigation into an uncontrolled freight train run-back at Shap ([RAIB report 15/2011](#)) detailed the risk of first night shifts as a determinant of fatigue. In that case, the driver had maintained a night-time sleeping pattern before his first night shift, and had been awake for over 18 hours at the time of the incident. Two of the report's recommendations focused on reducing shift-related fatigue, specifically considering the impact of and transition to first night shifts.

RAIB investigated a passenger train collision at Norwich ([RAIB report 09/2014](#)) which occurred under similar circumstances as the accident at King's Cross. The accident involved a train approaching the terminal platform at Norwich station, which collided with another unit stabled in the same platform. The RAIB report identified that the driver was fatigued due to his sleep patterns leading up to this second consecutive late shift, and that it was possible he had a microsleep on the approach to the station. One of the report's recommendations was intended to improve the train operator's fatigue risk management system.

[RAIB report 18/2016](#) addressed related issues in the investigation of two signal passed at danger (SPAD) incidents involving freight trains. The investigation found that both incidents occurred towards the end of a long night shift, and that on both occasions the drivers were not sufficiently rested, partly due to a lack of adequate napping facilities during their mid-shift stopover. The RAIB report recommended that the freight operating company concerned should revise its shift patterns at that depot, while all freight operating companies should review their fatigue risk management systems to ensure that they are consistent with published good practice from the ORR and RSSB.

Although unrelated to the causes of the accident on 15 August 2017, another buffer stop collision occurred at King's Cross station on 17 September 2015 ([RAIB report 15/2016](#)). On that occasion, the train was being driven by a trainee driver, who selected the power handle rather than the brake control on the approach to the buffer stops. The investigation identified factors associated with the training and monitoring of trainee drivers and instructors, and RAIB made two recommendations to GTR in these areas.