rightTrack

Issue 16 **Summer 2016**

Seeing the signals from history

Our regular features

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RSSB

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Welcome to the Summer 2016 issue of Right Track!

In this issue, we look at lessons from history: what failings in railway regulations have incidents of the past revealed and, more importantly, what have we as an industry done to close the gaps in the Rule Book?

We also look at railway emergencies: Craig Munday tells us the theory behind responding to emergencies; and Claire Volding tells us how this was put into practice during the Vauxhall fire.

Of course, we also have our regular features, including Newswire and SPADtalk. Our RAIB report has the final findings into the Wootton Bassett incident; and in the Lowdown Danny Buss tell us how the Tonbridge Depot is preparing for leaves and ice in the months to come.

We want to keep bringing you articles that are relevant to the safety of the railway, and to your job. To make sure we're on the right track, we'd love you to answer a few questions about the magazine.

The survey can be found via Opsweb **www.rssb.co.uk/opsweb/**
Or you could always email us at **righttrack@rssb.co.uk**

Right Track can be downloaded from Opsweb: www.opsweb.co.uk.
Right Track is produced by RSSB through cross-industry co-operation. It is designed for the people on the operational front line on the national mainline railway, yards, depots and sidings, and London Underground.
Their companies are represented on various cross-industry groups, including the System Safety Risk Group, managed through RSSB, and Right Track is overseen by a cross-industry editorial group.

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Emergency exercise

Serious incidents on the railway are mercifully rare. Although this is something to celebrate, it does mean that staff need training on how to deal with serious incidents, so we can deal with a problem in the best way possible, no matter when or where on the network it happens. In November 2015, over 90 people from the emergency services, council, railways and volunteer services took part in a tabletop exercise at Truro County Hall. Craig Munday, Deputy Local Operations Manager for West Cornwall, tells us about this fictional nightmare day.

09:00: Incident

At Paradise Crossing, on the mainline just West of Truro, a high speed train (HST) 1C77 collides with a lorry carrying gas bottles. The collision causes the front power car and first two carriages (coaches A and B) to derail; with a fire between coach B and C where they split. Throughout the incident, *injects* – injecting new pieces of information into the unfolding incident – were unleashed at timed intervals. This included calls to the emergency services from the media and members of the public, new hazards, and problems that developed as the exercise progressed.

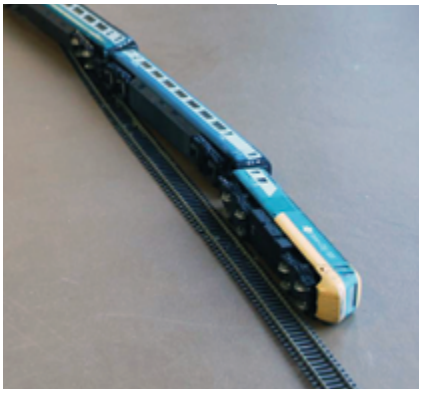
The first emergency services and the Rail Incident Officer arrive on site. It is believed that 500 people were on board 1C77 at the time of the incident. Passengers from the unaffected carriages were out on the track wandering around, using social media, tweeting pictures of the initial scenes. An up train is stationary at Chacewater, and both Falmouth services have been stopped.

It is believed that the driver is incapacitated. The train manager is dazed but okay; he is assisted by two revenue staff. The customer host is injured after being thrown the length of the buffet car. The Fire Brigade has a 150 yard exclusion zone around the HST due to the fire and close proximity of the gas bottles from the lorry, some of which are on fire. A plume of toxic smoke is being blown towards Threemilestone. A team of Truro P-Way staff had travelled to Paradise, but were unable to access the site due to the exclusion zone.

The BTP hands control of the incident to Devon & Cornwall (D&C) Police, and several areas are immediately secured as scenes of crime:

- The site of the crash
- Nearby points (Penwithers Junction)
- Truro's signal box and all data concerning the level crossing at Paradise. The Signaller at Truro and the traincrew of 1C77 are implicated.

"This was an exercise situation that lasted one day. There was a great deal of tension, with phones constantly ringing and noisy activity taking place all around, making it seem very realistic. To encourage future participation and discussion, the various issues considered on the day are left open so that other railway industry colleagues could provide solutions. I was allowed to take pictures of the day's events, although some in the military team wished to be excluded."



09:30: Rescue

The main strategic roles, including Senior Police Officer, Fire Officer, and RIO, worked their operations from a bunker, away from the immediate action. There were regular updates from the bunker to gold control. These were hosted by the Senior Police Officer (wearing the blue and white chequered tabard). The pre-planned injects came thick and fast: around 16 lines were manned by volunteers; of the 400 calls during the day, most were in the first hour.

The railway team was not closely involved at this point, as the priority was on the emergency services' rescue. We used the time to discuss issues affecting us:

- The welfare of all railway staff involved.
- Getting staff to relevant locations
- The train crash site, walking wounded, dazed customers wandering along the track
- Accessing voice comms remotely
- Accessing the trapped trains (with Truro signal box now a crime scene)
- Necessary resources (Emergency T3 possession, track repairs)
- Stranded passengers at stations along the route, with numbers now rising
- Alternative train plan for the rest of the county
- Obtaining an incident command vehicle
- Possibility of splitting the upright portion of the HST and taking it back to Truro
- Investigations needed (for instance, by the RAIB)

10:30: Analysis

There was huge concern about passenger numbers, names, belongings and fatalities. It was estimated that there were between 30 and 35 bodies or body parts, and it would be some time before they could be extracted from the train. Casualties were to be taken to various hospitals, which were under a huge strain.
The fire was being brought under control, but the Fire Brigade was struggling with water pressure and the length of hoses needed to reach the front power car. Home owners in the direction of the smoke plume were being advised to stay indoors with the windows closed. The access at Paradise is very tight, and all lanes and roads were blocked with vehicles; and some residents were trapped on the wrong side of the crossing. The army was enlisted to provide a temporary road to the crash site.

It was very difficult to get accurate timescales from the emergency services of when we could actually access the train. We advised D&C Police that there had been no call from Paradise Crossing during the 35 minutes prior to the incident, and none involving this type of vehicle in the previous 24 hours. The HST was shut down, and all those on board who could exit the train had done so. We were asked about walking these people back along the track to Truro station (over a viaduct and through a tunnel).

12:15:

The fire was extinguished, and all the people on board 1C77 were extracted. The bodies were removed from the train, but remained at the crash site. They would be moved to a temporary mortuary site later in the day. There was still concern over fuel leaking from the leading power car, as it could potentially pollute local water courses.

Truro signal box and the points at Penwithers Junction were no longer secure crime scenes, although all data and staff were still required for investigation. The Falmouth service was resumed, and we re-established the Penzance - St Erth and Plymouth - Par services. We were looking at running services through to Truro.

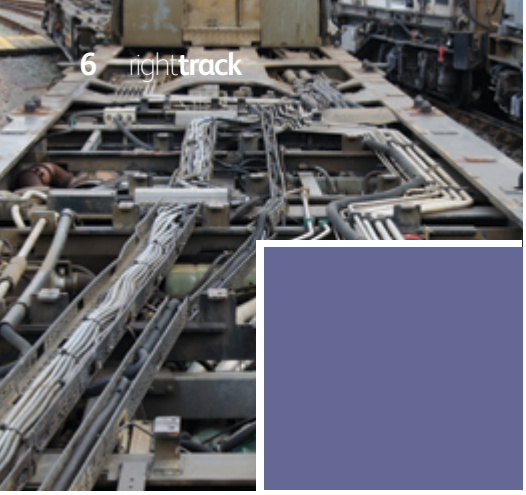
07:00: The morning after

All parties agreed that the rescue part of the accident was complete. The gas bottles had all cooled to a safe level, though the Fire Brigade were monitoring for potential fire restarts, and had taken precautions to protect the gas bottles. The Police were securing the site and the Senior Police Officer declared the site safe. There was a much bigger presence from BTP this morning as additional resources were provided.

The HST set was secure, with personal belongings still on board. However, it was still a crime scene, and the Police were not giving reasonable time frames for the splitting and removal of the HST portion. This was escalated to Gold Control, with industry pushing for a decision later that morning.

The RAIB, Network Rail and Great Western Railway investigation teams were ready to start looking at the site. The breakdown crane had arrived at Truro, having been rushed down from Wigan during the night. Various yellow plant and breakdown vans were assembled in Truro Yard, ready for deployment. Their presence meant using Truro became difficult. We made arrangements for an Emergency T3 possession, exclusive of Penwithers Junction between 06:00 and 23:00, and Truro – Roskear between 23:00 and 06:00. Approximately half a mile of track needed to be renewed.

Train services around the county were slowly getting back to normal, with Falmouth St Ives branch services and Penzance - St Erth and Plymouth - Truro mainline services running normally.



Lowdown

Every autumn, a fleet of machines clears our railways of leaf contamination. Every winter, the same fleet anti-ices the third rails. But what do they do the rest of the year? **RSSB's Martha Parkhurst** met **Danny Buss** at Balfour Beatty's Tonbridge Seasonal Treatment Depot.

I go to meet Danny Buss on a glorious day late May, when the leaves are still attached firmly to the trees and the warm sunshine make snow and ice seem like a distant memory. But the men and women of Tonbridge Seasonal Treatment Depot are already hard at work, preparing for the problems that will come next season.

Danny, whose title 'Business Manager' doesn't quite do justice to all his responsibilities, is looking out for me from a first floor window as I arrive, and buzzes me through the security gate. His strict safety awareness comes out throughout our walk around the site, starting with an in-depth site induction.

The fleet

The Tonbridge engineers have **12** consisted Windhoff Multi-Purpose vehicles: **8** Tranche **1** units, and **4** Tranche **2** units.

These are kitted out with water jetter modules (and water tanks), anti-ice modules, and auxiliary power units **(APU)**.

During the **2015/16** season, they did:

- **1208** circuits
- Average about **200** miles per circuit
- Total of **236,295** miles – enough to go around the world **10** times.
- **19.26** million litres of water – enough for **8** Olympic swimming pools
- **617,822** litres of red diesel – enough to fill almost **31,000** hummer tanks.

The men and women at Tonbridge depot apply track treatment in Kent and Sussex throughout the autumn and winter, allowing freight and passenger services to operate with minimal disruption.

From 4 October, the drivers will be out with the water jetters; and from 18 December will start putting anti-ice on the third rail. There'll be a period when both are used simultaneously, with trains carrying both a water jetter and an anti-ice module. Of course, the staff at Tonbridge have to be responsive to the weather. For example, a big storm, like Barney or Katie last year, can lead to big leaf fall. And the anti-icing stops when winter stops: this year, that wasn't until 1 April.

The crew

22 drivers at Tonbridge and Horsham

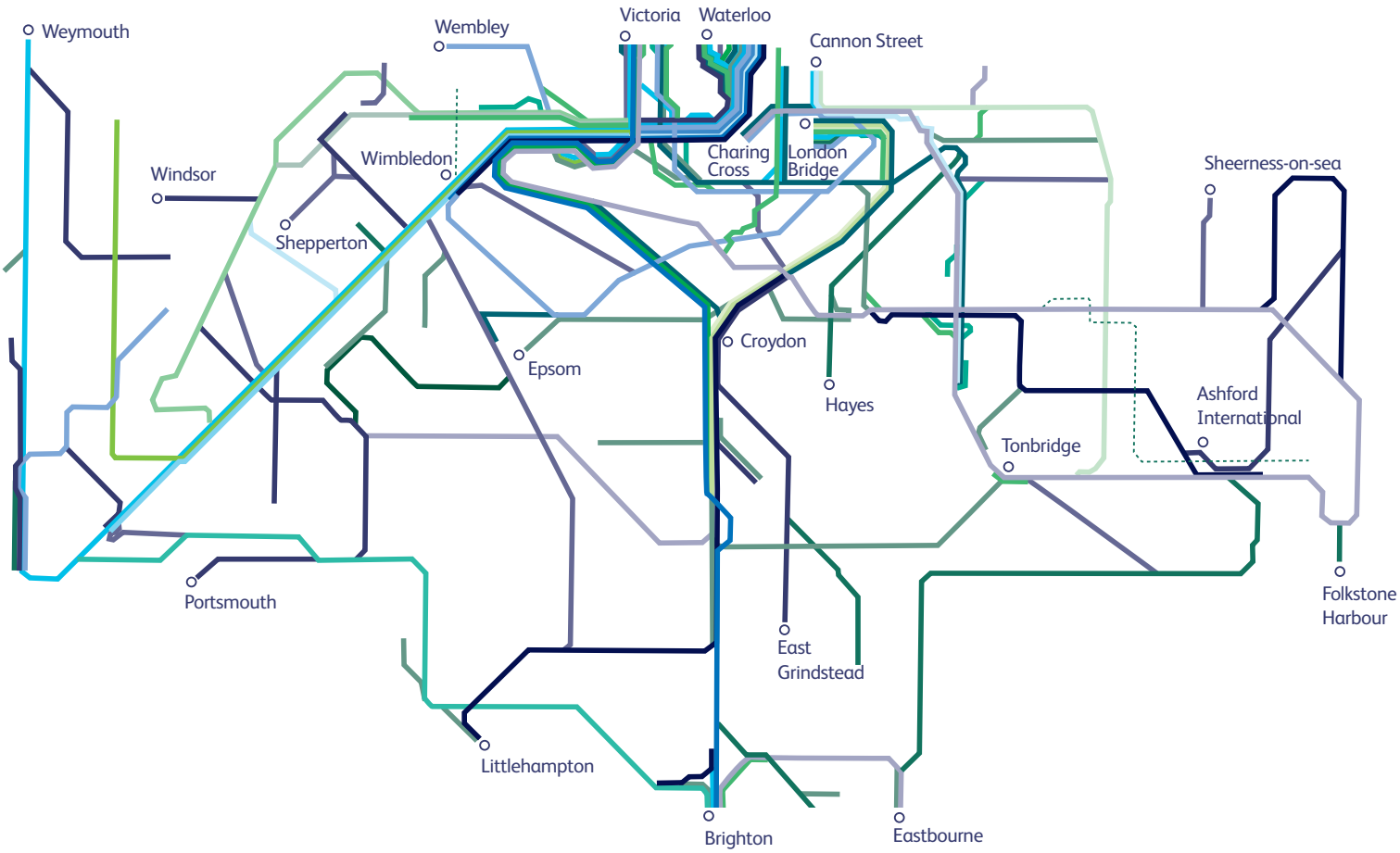
9 of the **11** Tonbridge drivers have route knowledge to drive anywhere in Kent; **8** can drive all of Sussex too.

Operators

Fitters

Engineers

Last year, their hard work paid off, with Kent and Sussex routes achieving 99.82% availability during the season. Not that they're likely to rest on their laurels: their aim is 100%. This requires extremely powerful pieces of kit.



Routes driven by Tonbridge and Horsham

The water jetters, which blast the leaves off the track, have a pressure of 1500bar. This is 700 times as much as a car tyre. Such pressure clears the leaves right off – but it can also damage metal, if it is exposed long enough (more than about 5 seconds). To avoid damaging the rail, the jet setters cannot be turned on unless the train is going faster than 5 mph.

And now? Well, they're making hay while the sun shines, so to speak. Danny works with Network Rail to have the circuits ready for the autumn. When Balfour Beatty started this contract in 2013, the circuits would arrive in September. This didn't allow for much preparation time, so Danny has arranged for the circuits to come in May instead. This gives the drivers enough time to perfect their route knowledge, and to see where the ROLAS (risk of low adhesion areas) are. Which means, when leaf fall season arrives, they will be completely ready to go on the track and remove contamination.

Spring and summer are also when the machines are given a bit of much needed TLC. Throughout the year they have daily, weekly, monthly and quarterly servicing; but now, the engineers do a thorough health check. There is the heavy duty maintenance of both trains and modules; and preventative maintenance, to avoid things going wrong in the next season.

Showing me round the depot, Danny introduced me to Matt, Will and Finn. These mechanics and shunters, who spend their summer days preparing for what is to come, will ensure that the pitfalls of autumn and winter do not affect our customers, our passengers, our staff. They work tirelessly to keep the railway moving no matter what the conditions.

Metal strip used to test water jetter

Seeing the signals from history

Drivers need to be able to see signals, but the Ladbroke Grove crash revealed serious deficiencies in managing signal sighting. What did we learn that can help us today?

Just after eight o'clock on the morning of 5 October 1999, in bright, low autumn sunlight, a 3-car Class 165 forming a service to Bedwyn left Paddington and passed SN109 signal at danger. In less than 600 metres, at Ladbroke Grove, points brought it on to the adjacent running line and, tragically, it collided with an HST coming into London at a combined speed of 130 mph. 31 people died and more than 500 were injured.

A public inquiry led by Lord Cullen followed the 1999 tragedy and unearthed a wide range of shortcomings that led to the crash. It also looked in detail at both the chain of events and the weaknesses in the overall approach to safety taken by the industry of the day.

One of the factors was found to be signal sighting. The Cullen report pointed to a whole raft of issues concerning readability of the signal aspects on the approaches to Paddington. These began with the new signalling and track layouts in 1993, and were made worse by the electrification for the Heathrow Express service.

In fact, issues were raised but overlooked because of a desire to keep the electrification project on track. There was a lack of process for dealing with poor signal sighting, which meant that drivers didn't feel encouraged to report them. This all led to an undetected sighting problem for a signal located on an overhead gantry with four other signals. It was potentially obstructed by catenary, and on winter mornings drivers struggled to see it, with low, direct sunlight shining on it. SN109 was passed at danger eight times in the six years before Ladbroke Grove.

The lessons learned meant clearer standards with renewed commitment to 'signal sighting committees'. These are groups of technical experts from the signalling profession, as well as train operators, who consider how well sighted signals are, and oversee corrective action where it is needed. Industry's approach was now to work together, capture and act on the right intelligence.

What triggers a signal sighting assessment?

In some cases, it may well have to be done to comply with the laws around change management. This includes before a new signal is put into use, but also any other change which could affect sighting of a signal including modifying existing signalling infrastructure, installing overhead electrification, using different types

Newswire

7 March 2016, US: 14 injured as 'Altamont Express' derails after striking tree near Sunol

At around 07:45 local time, the Altamont Corridor Express derailed when it struck a tree on the line near Sunol, California. The leading carriage plunged into the nearby Alameda Creek. Fourteen people were injured, four of them seriously.

14 March 2016, US: Passenger train strikes lorry and derails near Dodge City

Just after midnight local time, an Amtrak service derailed in Cimarron, near Dodge City, Kansas. Five carriages overturned, injuring 32 people. The train had been travelling at 75 mph, but the driver saw an anomaly in the track and applied the emergency brake. Later reports suggest that an agricultural vehicle may have damaged the track prior to the incident.

25 March 2016, US: Level crossing collision in Callaway leads to conflagration

At 12:25 local time, a lorry carrying propane was struck by a freight train on a level crossing in Callaway, Minnesota, causing a fire and explosion that saw 230 local residents evacuated from their homes. Two members of the train crew sustained minor injuries. Eleven wagons were derailed, though none were carrying dangerous goods.

of rolling stock, or even changing the way trains are operated.

It's also clearly important to act on reports that signal sighting has become an issue, whether that's via drivers, signallers, managers, indeed anyone working on the railway. Drivers, in particular, will see first-hand how well they are anticipating signals and reading them.

A new block of flats, bridge, road, indeed any change to the built environment can directly obscure a signal, or create a new distraction. Likewise, nature can intervene, especially trees and bushes, to cause a signal to be less easily seen.

An incident or accident investigation, whether by a company internally or by an agency like RAIB or ORR, could also lead to recommendations to do a signal sighting assessment.

As a result, train accident risk has fallen hugely.

Industry memory

Moving to the present day, signal sighting is just as important as ever. It's been nearly 20 years since Ladbroke Grove, and there have been (thankfully) very few serious train accidents since, and none involving fatalities to passengers or staff for nearly 10 years. This blessing comes with an interesting side-effect: new recruits to the rail industry may not have professional experience or even mental recall of Ladbroke Grove and its impact on the way we think about safety. RSSB has recently helped industry keep on top of best practice and retain corporate memory on the topic, taking into account changes in the law.

Working with industry signalling and human factors experts, RSSB has looked in detail at the relationship between the lineside signalling system and the train driving task. The result is a new Rail Industry Standard which serves as an update to the existing requirements for signal sighting assessment. It means all the best practice learned and compiled over the years has been distilled into an effective working manual for signal sighting committees.

It includes how to do an assessment, roles and responsibilities, issues that affect readability, calculations for required readable distance and the corresponding driver's response time, best practice for how to lay out signal and indicator aspects, as well as a whole host of supporting references.

Signal sighting also benefits from technology too, including using virtual reality to simulate signalling layouts and effectively test out different scenarios.

The new standard has already been signed up to by all the relevant companies, and formally became available in June, marking the latest chapter in the railways improving safety through learning.

3 April 2016, US: Passenger train collision with digger kills 2 near Chester

At around 07:50 local time, an Amtrak passenger train derailed after striking a mechanical digger in Chester, Pennsylvania. Two maintenance workers were killed. Debris entered the saloons of the first two carriages, injuring passengers, 35 of whom required hospital treatment for minor conditions.

Minnesota-based Loram Maintenance of Way had several employees working on the ballast at the time of the accident. The line in question had been taken into possession, but the digger had been permitted to traverse the other three lines.

9 February 2016, Germany: Bavaria collision – UPDATE

At 06:48 local time, two passenger services collided at around 60 mph on the single line between Bad Aibling and Kolbermoor, killing 11 people. In April, it was reported that the signaller had been arrested, as prosecutors suspect him to have been distracted by playing a game on his mobile phone at the time of the incident.

2002: Potters Bar

1989: Purley

Rail safety rules, ok?

Quintinshill, Lewisham, Ladbroke Grove – an accident's location alone can stir the memory and chill the blood. Yet as time passes, such names grow symbolic too of recommendations made and actions taken. Whether led by industry itself or government report, our industry has a long history of learning from accidents.

The steam whistle, for example, was invented after a collision between a train and a farmer's cart in 1833; while the fatal collision at Armagh in 1889 led to legislation that mandated the adoption of block signalling, the use of automatic continuous brakes on passenger trains and the interlocking of points and signals.

When we're striving to improve, unfortunately bitter irony will occasionally come into play. The SPAD and multi-train collision at Harrow & Wealdstone in October 1952, for example, occurred as BR was about to start trials of the Automatic Warning System (AWS), a system that might have saved 112 lives there alone. Yet the accident sped up its development and implementation, reducing SPAD count and probably saving many more lives.

Many of the safety improvements we've seen over the last 200 years or so have been down to new technology. But technology won't have all the answers. Sometimes an accident will show the need for a change to the Rule Book. The SPAD at Paisley Gilmour Street in 1979 is a case in point, being one that AWS did not prevent. The guard had been given the Right Away (RA) by platform staff and used the buzzer to tell the driver that it was ok to go. The trouble was the starting signal was red – and the driver didn't check it. He opened up, passed over the points, and the train struck an incoming service, claiming seven lives. This led to the rule that a train should only be given the RA when the starting signal has been cleared.

Similarly, the 1984 collision between a high-speed push-pull train running in push mode and a cow at Polmont demonstrated gaps in communication technology and train crashworthiness. Shortly after 17:45 on 30 July, the 17:15 Glasgow - Edinburgh slowed to 30 mph, thanks to restrictive aspects just beyond Falkirk. Routine stuff...until the driver caught sight of a cow up the bank,

Newswire

22 April 2016, South Korea: 8 injured, driver killed as passenger train derails

At 15:41 local time, a passenger train derailed in Yeosu, killing the driver and injuring eight passengers. The cause has yet to be determined, although overspeeding has been suggested.

30 April 2016, Belgium: Explosion on heritage line injures 4

On the afternoon of 30 April 2016, an explosion occurred in the cab of a steam locomotive in Balgerhoeke, East Flanders. One crew member was taken to hospital with severe burns. Another broke his leg when he fell awkwardly after jumping to safety. Early reports say the incident may have been down to low water levels and a subsequent build-up of pressure in the boiler.

1 May 2016, US: Freight train derails in Washington, chemicals spilled

A freight train derailed near Rhode Island metro station, Washington DC. 14 of the consist's 175 wagons were involved, one of which leaked sodium hydroxide. There were no reported injuries and no evacuation order was issued. The cause has yet to be determined.

chewing grass. When the train pulled in to Polmont shortly after, the driver told his secondman to inform the station staff.

If the cow had actually been on the track, or if there'd been a whole herd on the bank, the driver would've stopped, put down detonators, used track circuit clips, and phoned the signalman. The actions he took were legitimate, but not enough to prevent the 17:30 Edinburgh–Glasgow service from striking the cow, derailing and killing 13 people. The official investigation recommended improvements to fence inspection methods and the provision of cab-to-shore communications. It also recommended that the Rule Book be changed to make sure large animals within the boundary fence were treated 'as an immediate danger to trains'. This amendment was duly made, and remains today.

Three years later, the collapse of Glanrhyd Bridge on 19 October 1987 led to changes in the requirements for examining the line for suspected track defects, while the fatal collision at Southall on 19 September 1997 brought about a reassessment of the way train-borne safety equipment is regarded in relation to whether or not it is vital for the safe running of a train – and what to do if it goes wrong.

More recently, the incident at Sutton Weaver in September 2014, in which a driver got out of the cab to check his location and came into contact with a live overhead cable that had dropped, will see the rules changed to stipulate that staff must not leave a train in emergency conditions unless it's electrically safe to do so.

Incidents like Polmont, Southall and Paisley Gilmour Street show that sometimes there are gaps in the rules, but that's why we close them when they come to light. The rules are there to protect us all, so it's vital to follow them. After all, our good safety record isn't just about technology; it's about people too.

1915: Quintinshill

1952: Harrow and Wealdstone

2001: Great Heck near Selby

7 May 2016, Malaysia: 3 hurt as passenger trains collide in Kuala Kubu Bharu

Shortly after 12:30 local time, two passenger trains collided in Kuala Kubu Bharu, leaving three passengers with minor injuries. Press speculation suggests the cause to have been badly maintained track.

13 May 2016, US: 3 killed after Amtrak train strikes pick-up in California

Three people were killed when their pick-up truck was struck by an express on a level crossing in Madera County, California. The train's guard sustained minor injuries; there were no reported injuries among the passengers.

17 May 2016, Bangladesh: Train strikes bus in Chittagong, killing 2

Two people were killed and at least five were injured when an oil train struck a bus on a level crossing in Chittagong. The bus was dragged for about 150 yards. A witness said the crossing keeper failed to lower the barrier before the bus had started to cross, although the keeper claimed that the bus had driven on to the interface while the barrier was coming down.

RAIB report: *Wootton Bassett*

Images courtesy of RAIB

RAIB report brief: *Wootton Bassett Junction*

Right Track has covered this incident – and the various prohibition notices placed by the ORR as a result – several times before (see issues 12 and 15). Now, however, the RAIB report is out – and it makes sobering reading.

What happened?

Just before 17:30 on the afternoon of Saturday 7 March 2015, the 16:35 steam charter from Bristol Temple Meads to Southend passed SN45 signal at danger. SN45, which is on the approach to Wootton Bassett Junction, was red to protect a scheduled passenger train. Thankfully, this train had already passed through the junction…though only about 44 seconds earlier.

The findings

The charter was operated by West Coast Railways (WCR) and consisted of the West Country 'Pacific' no. 34067 Tangmere and 13 coaches. Although Tangmere is a steam locomotive, it's fitted with AWS and TPWS. RAIB found that SN45 was passed at danger as the driver didn't reduce the train's speed on the approach to it. This was because – thanks to distraction and a possibly higher workload – he hadn't seen the preceding signal, which was at caution. Distraction may also explain why he misunderstood the nature of an AWS warning he received and why his knowledge of the junction didn't alert him to the fact that he'd missed the signal.

RAIB adds that the driver may have misunderstood the nature of the AWS warning because a sign relating to a temporary speed restriction (TSR) was not in the right place.

Furthermore, the TPWS was rendered ineffective when the crew isolated the AWS. They wanted to by-pass the automatic brake application at the speed restriction, which broke the rules (although the driver and fireman probably had a low perception of the risks associated with their course of action).

That said, RAIB found that isolating the AWS like this had almost certainly become an accepted practice among some train crews on this locomotive. Measures intended to prevent the misuse of AWS isolations had either not been adopted by WCR or had not been implemented properly.

The report listed the following underlying factors:

The way the AWS on Tangmere was designed and installed meant that its warning horns were not always audible to drivers. In addition, the AWS isolating cock was in a position accessible to the crew when the train was moving. Despite this, the AWS was certified as

Newswire

3 June 2016, US: Oil train derails in Oregon, track fault the cause

Just after 12:00 (local time), an oil train carrying Bakken crude derailed in Oregon. There were no reported injuries; but the local water treatment plant, sewer system and Columbia River were contaminated by a serious leak. An investigation determined a track defect to be the immediate cause, multiple fasteners connecting the line to the sleepers having failed, allowing the gauge to widen.

5 June 2016, Belgium: Rear-end collision kills 3 near Liege

At 23:03 (local time), a passenger train struck a freight train that was on the same line at Hermalle-sous-Huy, near Liege. Three people (including the passenger train driver) were killed, nine were seriously injured and 27 were treated at the scene. Belgian infrastructure manager Infrabel said there had been a 'lightning incident' on the line earlier in the day. Operator SNCB also mentioned a signalling fault.

23 June 2016, South Africa: 130 injured in head-on collision near Durban

130 people were injured when two trains collided head-on in Lamontville, south of Durban. The cause has yet to be determined.

being compliant with the relevant standards and the locomotive was allowed to enter service.

The TSR in force on the approach to Wootton Bassett Junction was based on an earlier emergency speed restriction (ESR). However, the design of the latter was based on incorrect information. This ultimately resulted in the warning board for the TSR being placed between the fixed AWS magnet for SN43 and the signal itself, even though this was not permitted. Opportunities to correct this error during implementation of the ESR and TSR were also missed.

WCR had a weak safety culture, which affected how its staff followed the Rule Book, relevant standards, and the company's own safety management system.

RAIB's learning point:

Allowing safety systems like AWS and TPWS to function without improper interference is vital to the safe operation of the railway. The importance of this cannot be overstated. By-passing safety systems, or isolating them other than in accordance with the requirements of the Rule Book, can have catastrophic consequences.
The risks from running trains with safety systems like AWS isolated were highlighted by the accident at Southall on 19 September 1997, in which 7 people were killed and a further 139 were injured.

RAIB recommended that:

safety culture to be reviewed by an independent party, examining specifically:

- Governance, policy and leadership.
- Control and communication and how this is organised.
- Co-operation and competence of employees.
- Planning and implementation of risk controls and how this is managed.
- Monitoring, reviewing and auditing of compliance to the safety management system and how this is managed.

WCR review the way its drivers acquire and retain route knowledge.

WCR consider how proposed routes for steam operations are assessed, in order to identify signals and lineside signs which may be difficult to see from a steam loco cab; and how its drivers are to be provided with additional competent assistance in sighting signals or lineside signs falling within this category.

Network Rail review how the design and implementation of emergency and temporary speed restrictions is managed by the Swindon Maintenance Delivery Unit, considering:

- The information, instruction and training given to designers of TSRs.
- The procurement process for designs, including the circulation list for information and designs provided to Network Rail.
- The process for conversion of ESRs to TSRs, including the criteria for deciding whether an ESR design is modified, or if a new design must be used.
- The process for implementing ESRs and TSRs, including the checking of designs and the action to be taken if conditions on the ground do not match the design.

Network Rail determine whether any of the issues identified may apply to other maintenance delivery units and take action as necessary to make any changes required.

In light of this incident, the Office of Rail and Road (ORR) brought a prosecution against WCRC and the driver at the time of the incident, for breaches of health and safety laws. Both the company and the driver pleaded guilty. WCRC was fined £200,000; and the driver was given a four month suspended sentence.

26 June 2016, US: 5 killed after Amtrak train strikes van in Southern Colorado

In the morning, an Amtrak passenger service struck a van at a level crossing in Trinidad, Southern California. Five of the van's six occupants were killed, including three children. There were no reported injuries to those on board the train.

28 June 2016, US: Two freight trains collide head-on in Texas, 3 crew missing

At around 08:25 (local time), two freight trains collided head-on near Panhandle in Texas, resulting in a large fire. One of the four crew members was injured after jumping clear; the other three remain unaccounted for. The operator told the press that fitment of Positive Train Control on this section of line is due later this year.

12 July 2016, Italy: 23 killed in head-on collision in Apulia, signaller error cited as cause

At 11:30 (local time), two passenger trains were involved in a head-on collision on a curve on the single line section between Andria and Corato, in Apulia, Italy. Twenty-three have been reported killed (including one of the drivers and a person working in a nearby Olive Grove who was struck by debris); 50 people are thought to have been injured.

Images courtesy of Network Rail

Vauxhall fire

When a major incident happens on the railway, it can have far-reaching effects. Network Rail's **Claire Volding** speaks to the staff on duty during the Vauxhall fire and its fallout.

At 02:45 on the morning of Thursday 5 May, the operator of a grinding train reported a fire had started underneath platforms 3 and 4 at Vauxhall Station. The fire was started when sparks from the grinder set alight debris and rubbish beneath the platform – even though there had been a litter pick the week before.

The crew discharged the on-board water cannons to control the fire, with no success; although luckily there were no injuries. As the British Transport Police and the London Fire Brigade made their way to the scene to help bring the fire under control, the person in charge of the possession confirmed that they were arranging an emergency switch off for the traction current. By 4am the signalling equipment had been isolated and the Fire Brigade could begin extinguishing the fire.

The Track Section Manager, Clapham

10 years on the railway

When he was contacted at 5am, Marc Brereton did not realise how big the impact would be on the service into Waterloo. As it turned out, it was the first major incident that he had dealt with.

With the emergency possession already in place, Marc began to contact the night shift to ensure they were okay. He then spoke to the day turn, to deploy them to the correct locations to pick up the possession as soon as the incident had been dealt with. When Marc got into work at 7am, he discovered that the possession was to be in place for the majority of the day, though cut back to run a partial service into Waterloo.

Dealing with short notice possession changes is very challenging as it is important that all the paperwork is correct. But Marc was amazed at the amount that was achieved in a short space of time by collaborative working.

The Electrification and Plant Maintenance Engineer

43 years on the railway

Roy Gardner has dealt with cable fires in the past, so when he was contacted by his section manager at 05:45 his experience was welcomed. Cross-function co-operation is vital for getting things back up and running, so he knew he needed to get his team to the incident immediately

Only a severely reduced service could operate through Vauxhall. This had a massive impact on the estimated 100,000 commuters who pass through Vauxhall during the morning peak alone. There was severe disruption to services on the line, with many losing at least 30 minutes due to congestion and station overtime with very heavy loadings. Crowding at Clapham Junction worsened during the morning peak, until the station had to be evacuated at 08:40 until 09:15.

The incident also disrupted services on the Sussex routes, with Govia Thameslink Railway trains not stopping and LOROL terminating short.

The Track Section Supervisor

10 years on the railway

Despite the numerous incidents Michael Tuvey has been involved with, this was the first time he has seen anything of this magnitude. He hopes to never witness anything like it again.

Michael was checking his emails on his way to work when his eyes were drawn to the incident report. Despite reading the output from the control, it wasn't until he passed Vauxhall Station that he saw the magnitude of the damage. Arriving at Wimbledon, he took over as Engineering Supervisor as he knew the area well from his time there as part of the Clapham permanent way.

The Fire Brigade finally completed their work at 11:52, keeping two appliances remaining on standby. During the fire, twelve cables were burnt through with others badly damaged. This prevented the restoration of traction current on the Windsor lines.

Once the Fire Brigade left around noon the extent of the possession was reduced. Platforms 12 to 19 could be re-opened, but the Windsor lines still remained blocked.

Replacement signalling cables were conveyed to site and installation was completed by 17:30. Examination of the platform at Vauxhall confirmed that the damage was confined to the timber ramp end, beyond the anti-trespass fencing.

Finally, just after 20:00, testing and route proving was completed and normal working resumed. Repairs to enable full power mode are anticipated to take several weeks.

The Infrastructure Maintenance Delivery Manager

17 years on the railway

Like the others, Andrew Malcolm has never before had to deal with an incident on this scale. After being notified of the incident at about 06:00, he headed on site to co-ordinate the recovery of the infrastructure.

He was shocked by the extent of the damage to both the platform and signalling infrastructure. With the support of his team alongside other functions and South West Trains, he was able to draw upon a large body of skilled resources to recover the infrastructure safely.

Andrew said that it was a big relief and a great feeling once the test trains passed and all four lines reopened soon after 20:00. The focus is now on learning from the incident and how we prevent it ever happening again. Andrew was pleased to say that some immediate steps have already been taken on the permanent way.

It is clear from these resilient individuals that when it comes to incident management the most important thing is good communication, working as a team and putting safety first. The immediate response was excellent, with the guys on site identifying the risk from the fire and taking action to isolate equipment to prevent damage. The fire was dealt with in model fashion and the management of the incident is a credit to all those involved.

**Special thanks to Andrew Malcolm, Marc Brereton, Mick Tuvey and Roy Gardner for taking the time to talk to me about the incident.*

SPADtalk

SPADtalk: looking beyond the human factor

Thankfully, signals passed at danger (SPADs) are not routine events for train drivers. However when they do happen, a SPAD can feel like a life changing event for the driver involved. The investigation into the root causes of the SPAD is, or certainly should be, aimed at understanding what went wrong and why. This way, preventative measures can be taken to reduce the likelihood of SPADs in the future.

A review of SPADs undertaken by RSSB's Human Factors team has identified that, whilst every SPAD is in some senses unique, some underlying factors are identified time and time again. These are around the types of human error which occur before a SPAD. Every day errors, such as being distracted by another task, misreading one thing for another, or seeing what you expect to see based on previous experience.

Many companies focus on developing non-technical skills, to help staff understand and manage their own performance, and reduce the recurrence of errors. This can help to make people more robust in the way they undertake their roles. Other factors also need to be managed to prevent errors from occurring.

To help industry understand these risks, RSSB's Human Factors teams did a SPAD review, looking at the challenges drivers and their managers face.

Holding workshops with train drivers and using input from across the industry. We established ten underlying factors as the root causes of SPAD incidents:

1. *Verbal communications*
2. *Fitness for task / duty*
3. *Processes and procedure documents*
4. *Written information on the day*
5. *Competence management*
6. *Infrastructure, equipment and materials*
7. *The person's task environment*
8. *The person's workload*
9. *Teamwork*
10. *Leadership and risk management*

Over the next few issues, we'll be looking in depth at each of these ten factors in turn, to see how they play their part in SPADs. And we'll look at strategies which can manage these. The series will improve knowledge and understanding of each of these factors, changing attitudes in the industry to human performance. This will allow investigations to focus on the underlying causes of SPADs, not just the immediate actions of the driver; and ultimately reduce their recurrence.