Learning from operational experience:

Annual report 2015-6
Learning from Operational Experience Annual Report
2015/16

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1 Report summary

Just before 20:15 on 23 February 2007, a ‘Pendolino’ carrying 109 passengers and crew derailed at 95 mph near Grayrigg in Cumbria. All nine vehicles left the line, eight of them jack-knifing down an embankment.

Twenty-eight people suffered serious injuries. Most were soon discharged from hospital. Not so 84-year-old Margaret Masson, who sadly succumbed to her injuries whilst being airlifted to safety.

RAIB’s investigation confirmed that the train derailed on a crossover, the immediate cause being the condition of the stretcher bar arrangement, which holds the point’s moving blades the correct distance apart.

Part of the problem had been about inspections; part of the problem had been about a lack of understanding about the behaviour of points with non-adjustable stretcher bars. The train itself, however, was widely praised, its crashworthiness helping minimise the harm to crew and passengers alike.

Major train accidents like this are part of how our industry learns. To help with that endeavour, every year, RSSB produces a safety performance report, bringing together data on derailments, collisions, fires, fatalities and injuries to passengers, staff and members of the public. And every year for the last 10 years – every year since Grayrigg – it’s recorded zero passenger and workforce fatalities in train accidents.1 Numbers give context, and the trend lines you get when you join the dots can help focus resource where it’s most needed. But some of us in rail also look beneath that impressive trend, at the daily incident reports, keeping a watch for things that don’t look quite right.

RSSB considers the lessons learnt from Britain and around the world, from railways and other sectors, tying much of it together in the Learning from Operational Experience Annual Report. It doesn’t guarantee an incident-free railway, but it considers specific issues that can impact on rail operation and maintenance, and suggests ways of avoiding them.

Summary of points arising during 2015/16

- The idea that an illuminated traction interlock light does not necessarily mean a passenger train is safe to leave was demonstrated by two incidents during 2015. However, when RSSB promoted this lesson, it was found that the rail industry had learned it after a similar incident in 1989. The need to retain corporate memory was therefore underscored.
- Though the risk from SPADs is low, the incident at Wootton Bassett on 7 March 2015 shows that industry cannot afford to be complacent, cultural issues being demonstrably able to negate the effects of technology if unchecked.
- Fatigue remains an issue that needs to be monitored with vigilance. It was causal in the SPADs and Reading and Ruscombe, but can affect the performance of all grades – including management

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1 Train accidents are defined as: derailments on the running line (other than whilst shunting), or which affect an unprotected running line; collisions between trains on the running line (excluding roll backs and open doors); buffer stop collisions which cause damage; trains striking road vehicles; large objects falling onto trains; and train explosions.
• The risk from freight train derailments is low, but mindful of the possibility of high-consequence events (inter alia), a Cross-Industry Freight Derailments Working Group is seeking to find ways to reduce underlying issues around track and wagon condition.

• There have been several significant accidents outside Britain in the last year, but analysis of them has not led to any major concerns over how we think the risk is managed here. That said, we recognise that overseas incidents provide vital food for thought, allowing us to measure our own controls against them as we check for any gaps in our processes, rules and methods.

• Regarding the protection of engineering staff, there have been a number of incidents involving signallers sending trains into blocked lines, and a number of cases where possession limit boards and detonators have been put on open sections of line. The Infrastructure Safety Liaison Group (ISLG) is working with RiskTec to produce guidance, and consulting with Network Rail on ways to reduce risk.

• Incidents involving overspeeding in possessions has galvanised the need to consider driving at caution.

• ISLG’s survey on work-related pressure revealed issues around the balance between delivery and safety. Planning is cited as a cause, sleepless nights, headaches and mood swings among the effects.

• Road driving risk remains an industry concern, though under-reporting remains an issue. The cross-industry Road Risk Group focuses on this issue, discussing key issues and sharing good practice ideas.

• Most level crossing risk arises from user behaviour, but recent reports and incidents highlight questions around crossing design and signaller error in addition.

• The rail industry’s understanding of health and wellbeing issues is growing, but RSSB is mindful that more needs to be done. Specific lessons about mental health and the need to report health conditions were highlighted this year.

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**About this document**

RSSB has produced a *Learning from Operational Experience Annual Report* since 2009. Originally concerned with tracking recommendations from our own formal inquiry reports, it has evolved to focus on learning information gleaned from GB and non-GB rail incidents and incidents occurring beyond the railway boundary.

We aim this at RSSB member organisations, rail employees, passengers, the government, and the public at large.

We have written this in a more conversational style, in order to help the stories it tells and the learning points it raises stick in the minds of the readers.

We welcome all feedback on the LOEAR. Please send your views to enquirydesk@rssb.co.uk.
2 Prologue

The challenge of corporate memory retention

Imagine being in the cab of a train. Maybe it's a job, maybe it's a dream come true. Either way, you're at a station. Waiting. On the Ilkley branch. Waiting. At Burley-in-Wharfedale. Waiting. At last you get the tip and you power away. Except you don't. There's a problem. It's an elderly lady, whose coat had caught between the closing doors, who was dragged along for several yards, who died three weeks later from an infection to the wounds she suffered.

What happened – back in 1989 – was that the coat was thin enough to fool the 'interlock' system, allowing the blue 'traction interlock light' to illuminate. The guard took this as proof that the train was safe to leave and gave the 'right away' without performing a final check.

As a result, British Rail made a couple of safety films to highlight the dangers, and saw to it that the instructions relating to power-operated doors were reissued, with emphasis put on the need for that final check and the unacceptability of relying on the interlock light.

Lesson learned...

...or so you might think.

If the above sounds familiar, that's because it is. That's because the assumption that getting the traction interlock light means it's safe to go was a factor not only in the similar incident at West Wickham on 10 April 2015, but also the one at Hayes & Harlington the following July.

That's the trouble with corporate memory: it only exists while we remember it – ‘we’ the people there at the time, not the company as it existed then. So, while ‘we’ learned in 1989 – and did something with that lesson, the fluid nature of our industry – in which people retire, move on, or move in from elsewhere – cannot possibly guarantee that a lesson learned 25 years ago will remain 25 years on.

Yet if you’ve read our Annual Safety Performance Report, you’ll know the GB rail industry is the safest in Europe. You’ll know too that we’re marking ten full years without a passenger or workforce fatality in a train accident. That is a remarkable achievement and shows what the rail industry can do when it works together.

The trouble is, we live in an uncertain world, where real life does not always follow the trendline as neatly as we’d like. As James Reason wrote, ‘[t]he large random component in accident causation means that ‘safe’ organisations can still have bad accidents, and ‘unsafe’ organisations can escape them for long periods. Bad luck can bring down the deserving, while good luck can protect the unworthy.’

Luck. A nasty little word for the safety practitioner, but it’s there all the same. And a glance at the daily incident logs will reveal how many near misses and irregular working events we’re having day in, day out. So we can say we’ve been lucky. But what can we say we’re doing about it?

The short answer is that – as both a listening and a learning organisation – RSSB can help.

Through our research programme, periodic safety reports, strategic risk papers, publications on incidents inside and outside the railway, production of the RED DVD series, Right Track magazine,

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2 James Reason, Managing the Risks of Organisational Accidents (Ashgate, 1997)
and the analysis and support we provide to stakeholder groups, we learn; through the groups, Close Call, CIRAS and SMIS, we listen, we record, we share.

In addition, we play a part in the accident investigation process by providing relevant training and guidance, and by providing statistics to help the Rail Accident Investigation Branch (RAIB) set incidents into context, by offering expert knowledge from staff with extensive industry experience, and by bringing cross-industry groups together to tackle industry-wide issues.

Finally, tying much of this together, is the Learning from Operational Experience Annual Report (LOEAR) and associated workstreams, which look at some of the tools available to facilitate learning, capture some of the lessons learnt in the fiscal year and consider specific issues affecting rail users and employees.

It’s essential reading for everyone who’s serious about safety.
3 Scope and structure

The rail industry learns from operational experience by investigating specific events and continuously monitoring trends. RSSB is here to help with that process:

- This Learning from Operational Experience Annual Report (LOEAR) contributes by summarising some of the learning points arising from investigations and other sources of information;
- The Annual Safety Performance Report (ASPR) – the ‘sister’ publication to the LOEAR – contributes by providing wide-ranging analyses of mainline rail safety performance data.

Furthermore – mindful that good safety performance can bring complacency, RSSB compiled, consulted on and completed Leading health and safety on Britain’s railway, a new strategy document developed to provide a framework for the collaborative improvement of health and safety performance vital to maturity and understanding.

Scope and structure

The LOEAR considers a range of learning sources and identifies the key issues that arose between 1 January and 31 December 2016 in the following areas:

**Signals passed at danger**

**Derailments**

**Overseas accidents**

**The platform-train interface**

**Track working**

**Road vehicle driving**

**Level crossings**

**Health and wellbeing**

Hyperlinks (underlined blue text) have been used throughout this document to aid navigation and access to relevant documents and websites.

Grey boxes like this one have been provided to aid navigation.

Green boxes have been provided to highlight learning points and extra information that readers might like to consider.
4 How do we learn?

The railway and its regulatory bodies have been learning lessons from accidents since William Huskisson MP was struck and killed by Rocket at the opening of the Liverpool & Manchester Railway in 1830.

Early incidents like this led to the first Railway Regulation Act (1840), which required all injurious accidents to be reported to the Board of Trade. Within 50 years, block signalling, interlocking and continuous braking on passenger trains had been made mandatory. The twentieth century saw further advancements, ranging from continuous welded rails and multi-aspect signalling, through to automatic train protection systems.

The cycle of safety planning and performance reporting has become essential to ensuring that this development continues, but much learning also comes from investigations into accidents that have occurred, near miss data, reports to the industry’s Confidential Incident Reporting and Analysis System (CIRAS) and Close Call.

In this report, LOE is defined as the process by which knowledge from the operation of systems is gained, exchanged and used, leading to continuous improvement and the development of a positive safety culture.

LOE is discharged through the rail industry’s national stakeholder groups, all of which were established by the RSSB Board.

During 2013/14, a new meeting structure was progressively introduced. A System Safety Risk Group (SSRG) now reports to the Board and looks at safety risks across the industry, while supporting the development of strategies to address them. SSRG is supported in turn by a number of sub-groups, including:

- Level Crossing Strategy Group (LCSG)
- People on Trains and in Stations Risk Group (PTSRG)
- Train Accidents Risk Group (TARG)
- Road Risk Group (RRG)

In addition, the Data and Risk Strategy Group (DRSG) looks at the industry’s mechanisms for capturing and processing risk information, while the Infrastructure Safety Liaison Group (ISLG) considers the risks involving the contractor community.

An example of learning in action may be seen in the work the industry has done on reducing the risk at the platform-train interface (PTI).

RSSB uses data from the Safety Management Information System (SMIS) to provide the industry with regular updates on risk and safety performance. In 2010, exposure of a rise in PTI risk to the (then) Operations Focus Group (OFG) prompted a poignant dramatisation of the subject in RED 28, numerous articles in Right Track and led OFG to develop a Station Safety Improvement Programme.
As part of this process, RSSB held a Station Safety Improvement Workshop in 2012 to provide an update on operational risk management initiatives, promote sharing, encourage good practice and obtain the views of front-line staff on the issues associated with the management of operational risk at stations.

This information was combined into a PTI strategy, the development of which was approved by the RSSB Board in September 2013. More information on this work may be found later in this report.

Cross-industry groups review the outputs from a number of RSSB activities, including:

- **Safety performance reporting** – information on the latest trends, updated on a regular basis
- **Operational Feedback** – learning from rail and other industry accidents
- **CIRAS** – the rail industry’s Confidential Incident Reporting and Analysis System
- **Human Factors** – concerning the optimisation of human performance in the workplace, considering the working environment from a human-centred viewpoint, looking at the whole system and its influence on the way people behave and interact with the railway
- **Safety Management Systems programme**
- **R&D** – RSSB’s management of research and development on behalf of government and the railway industry
- **Health & wellbeing** – RSSB’s part in promoting this vital part of the safety matrix
What can help us learn?

Just as businesses have to work as one to make a profit, and football teams play as one to win championships, the rail industry needs to work together to maintain acceptable levels of safety and performance. This section describes five tools and methods which assist in that process:

**Taking safe decisions**

**Investigations (including the Incident Factor Classification System)**

**CIRAS**

**Right Track magazine**

**Close Call**

### 5.1 Taking safe decisions

Just over 60 years ago, the railway was about to change forever. Everyone knew that track and train had been over-used and under-maintained during the war. Everyone knew the industry had been left with what the Chancellor of the Exchequer, Hugh Dalton, described as ‘a very poor bag of physical assets’. On paper, the answer was simple: modernise. In reality, a committee was formed, a plan was published and a number of purchase orders were raised for a number of diesel locomotives of varying reliability.

That was in 1955. To us now, the biggest difference came with the withdrawal of steam and the coming of diesel and electric traction, which meant that – by 1966 – most regions had sent their ‘Castles’, ‘Scots’, ‘A4s’ *et al* to the scrap lines and a new-look, Inter-City railway was starting to attract passengers back to the fold.

But there was a problem, as the events of 31 July 1967 would demonstrate all-too-clearly...

**Big change**

Just after 3:15 that afternoon, a cement train was heading from Cliffe to Uddingston at about 45 mph. Unbeknown to the driver, one wagon began to sway, the movement increasing until its wheels left the rails near Thirsk. It clattered along for 170 yards, before a coupling broke and eight wagons tumbled down the embankment. In the tumult, one ended up foul of the next line.

When the dust settled, the driver of an express saw the obstruction and slammed on the brakes. He was too late. The collision killed seven of his passengers and injured forty-five more.

The accident started a debate that had been building for some time. Modernisation had also seen the introduction of more steel-framed wagons, which were easier to maintain, but exacerbated the phenomenon of ‘hunting’ – a lateral wheel oscillation at the root of many derailments. The trouble was that being less flexible than their older counterparts made them more prone to a build-up of these oscillations following any imperfections in the track. Being laid on concrete sleepers, continuous welded rail could introduce even more rigidity, while its lack of joints
meant fewer natural breaks to disrupt the effect. When these factors combined with the sustained high speeds that diesels could achieve with fully braked trains, incidents increased alarmingly.

Specialist research led to a new suspension system that could combat ‘hunting’ and achieve good ride quality on all types of track. The knowledge gained from this work was also applied to bogie vehicles, and materialised in the ‘Mark III’ coach, capable of 125-mph travel, and still in front-line service some 40 years after introduction.

**Little change**

We all know about the big events: arguably bringing in high-speed push-pull services between Glasgow and Edinburgh without considering the risk from animal strikes led to the Polmont collision of 1984; similarly a failure to understand the methods of work behind resignalling the lines out of Waterloo may have resulted in the Clapham disaster of 1988.

There are two things to think about here: first, the “retrospectoscope” makes any accident seem somehow inevitable (when in fact the causes are anything but obvious before they join to become a chain). Secondly, it’s not all about the big train accidents. A decade or so ago, when slam door trains were finally banished from the network, and units with automatic doors and hustle alarms began to be used more widely throughout the country, the numbers of people being struck while boarding or alighting went up. When dispatch procedures and passenger information were improved, and the passengers themselves got used to the new doors, the numbers of incidents dropped again.

The point is that almost any change to technology, processes, rules – and even personnel – will affect risk. Over all, the advantages will outweigh the disadvantages, but it’s important to keep a close eye on how things that look good on paper perform in the real world.

**What can be done?**

To help our industry avoid the problems of the past, RSSB has produced *Taking Safe Decisions*, which sets out the need for a proactive risk and evidence-based approach the safety management by describing the principles that companies apply to ensure safety, satisfy the law, respect the interests of stakeholders and meet wider commercial objectives.

It’s all about managing risk – every day and when a change is made – by asking three specific questions:

- Is my operation safe or do I need to make a change? *(Monitoring safety)*
- What (if anything) should I change and can it be done safely? *(Analysing and selecting options)*
- How do I make sure the change is safe? *(Making a change)*

**Monitoring safety** and **making a change** are both embedded in the European Common Safety Methods (CSMs). Analysing and selecting options – how to decide what to do when a problem or opportunity is identified – are activities required to meet general safety responsibilities under the Health and Safety at Work etc Act.

The diagram clarifies the relationships between these three activities:
Most ‘big changes’ are made to meet commercial objectives or requirements, and might involve:

- New technology that could improve a company’s performance
- Replacing life-expired equipment
- Changes in operating conditions that present new commercial opportunities
- New legislation; or
- Local complaints that highlight a specific issue.

As the left-hand side of the diagram suggests, the need to change can also come out of safety concerns raised by internal monitoring, investigation reports or indeed RSSB LOE material. In this case, the options might relate directly to the implementation of new safety measures.

- Either way, the decision will be based on considering:
  - The business case associated with the change; and
  - The need to meet the legal obligation to reduce risk to an acceptable level.

The diagram below shows how the above framework applies to two hypothetical changes. One involves implementing a simple risk control in response to an issue raised by safety monitoring. The other is a more complex change being made to meet commercial objectives.
5.2 Investigations

As alluded to above, while the cycle of safety planning and performance reporting is essential to ensuring that safety continues to improve, much of the industry’s learning comes from investigations into accidents and incidents, much as it always has done.

The principal investigation of any safety event is conducted by the party immediately responsible for the activity. To facilitate this, railway companies have their own arrangements for carrying out internal formal and local investigations, as defined in Railway Group Standard GO/RT3119 (Accident and incident investigation) and its associated Guidance Note, GO/GN3519. The outputs are managed by the companies concerned, with actions being picked up by their own tracking systems. The results of duty holder-led formal investigations are also summarised in SMIS to give others the opportunity to learn from them.

The more significant accidents (involving loss of life or potentially significant consequences) are investigated by the Office of Rail and Road (ORR) as the national safety authority, and the Rail Accident Investigation Branch (RAIB). The latter was set up after a recommendation made by Lord

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3 Note that ‘3119’ is being withdrawn as of March 2017, although its contents have been retained within a new Rail Industry Standard, RIS-3119-TOM.
Cullen’s inquiry into the Ladbroke Grove accident of 1999 (although a subsequent Directive on rail accident investigation also required Member States to create such bodies). RAIB was fully established in 2005, after which RSSB ceased its own (interim) accident investigation role.

If an accident involves a derailment or collision which results in, or could result in, the death of at least one person, serious injury to five or more people or extensive damage to rolling stock, the infrastructure or the environment, then RAIB will lead an investigation, draw conclusions and make recommendations.\(^4\)

RAIB investigates incidents on UK railway infrastructure without apportioning blame or liability. It is independent of the rail industry, the police and the ORR, the Chief Inspector of Rail Accidents reporting directly to the Secretary of State for Transport.

RAIB’s recommendations on the rail industry are addressed to the ORR\(^5\), which must then ensure that they are considered and that, where appropriate, action is taken.

5.2.1 Accident investigation assistance

RSSB can help companies with the investigation process and the monitoring that follows on from it. First, it runs a Human Factors awareness course for accident investigators. Secondly, it provides guidance and training on conducting the investigations themselves, safety assurance, and dealing with the EU’s Common Safety Method (CSM) for Monitoring.

**Accident Investigation Guidance and Training (AIT) Programme**

In 2011, RSSB produced a three-part guidance on accident investigation:

- Part 1: The role of the senior manager;
- Part 2: Development of policy and management arrangements; and

Each was updated in 2014, being supported by material to help companies decide on the proportionality of their response to an accident. Also included is a comprehensive training programme, aimed at those undertaking all but the more serious accidents, in a bid to raise the quality and consistency of investigations – and investigation reports – across the industry.

The course material can be delivered in a classroom environment or via a laptop. It consists of 10 modules and takes around six hours to complete. Several companies have already used it to train investigators or line managers who may undertake occasional investigations.

For more information, click [here](#).

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\(^4\) RAIB may also investigate other incidents that have implications for railway safety, including those which, under slightly different circumstances, may have resulted in an accident.

\(^5\) RAIB can also address recommendations to other safety authorities and other public bodies, such as the police, the Department for Transport and so on.
Safety Assurance and the CSM for Monitoring

Since June 2013, the CSM for Monitoring has required transport operators to include problems identified via their monitoring strategies and plans\(^6\) – and the actions put in place to address them – in their annual safety reports to the ORR.

As accident investigations are an important source of monitored information, RSSB has published safety assurance guidance to help companies meet these requirements. However, the guidance also emphasises the importance of learning lessons, including from accidents, and the need to integrate the learning into safety management systems. For more information, click here.

RSSB has also published a set of six guidance notes (GE/GN8640-8645) which give practitioner level guidance on the application of the risk management process set out in the Common Safety Method on Risk Evaluation and Assessment (CSM RA).\(^7\) The CSM RA has applied since July 2012 to the implementation of all significant changes to the railway system – ‘technical’ (engineering), operational and organisational – and the latest revised version has applied from May 2015. The notes may be found via www.rgsonline.co.uk

Modernisation of Safety Cooperation

Over the last two years, RSSB has facilitated a restructuring of the main safety groups across the industry. Significant progress has been made and this now allows an improved systematic review of industry risks. The new hierarchical structure is intended to link the industry’s management of risk across sectors, functions and routes more effectively. The remits of these new groups encourages the right information to go to the right representatives to facilitate the best decisions on management of risk at the interfaces. A key part of this information is the output from investigations.

5.2.2 Incident Factor Classification System

As mandated under GO/RT3119, RSSB receives investigation reports from all GB railway organisations. Currently, around 4,500 are stored, dating back to the late 1990s. The conclusions therein carry a great deal of valuable information about event causes.

The trouble is, once their recommendations have been acted upon, there’s a danger that some of their learning points will be lost or will not reach other parties who could benefit from them.

What to do?

The Shap rollback incident of 2010 demonstrates why a new way of capturing how accidents and incidents happen had to be devised.

In short, Shap was caused by driver fatigue, but it was not mandatory to flag this factor up in SMIS. This meant that there was little accurate, tangible evidence available to show the magnitude of the issue. Clearly, some way of capturing this sort of information was going to be vital if we, as an industry, were to get to grips with common themes below the root causes.

\(^6\) That is, their safety assurance processes.

\(^7\) Note that the guidance notes are being rewritten with a view to publication in December 2017.
RAIB recommended that RSSB improve rail industry information on fatigue-related accidents and incidents, although the project to address this – and more – was already under way.

**What we did**

In 2009, RSSB developed a means to analyse accident reports through an Incident Causal Classification System (ICCS), using a taxonomy developed by RAIB, to help us understand (inter alia) what makes operators do certain things at certain times and what makes certain equipment fail under certain conditions.

Previous editions of the LOEAR featured analysis using the ICCS. More recently, however, RSSB and Network Rail have worked together with the rest of the industry to combine the ICCS, human error and violation taxonomies, and Network Rail’s ‘10 incident factors’ within the upgrade to SMIS, SMIS+.

Software for a single module – the Incident Factor Classification System (IFCS) – was commissioned in November 2012.\(^8\) Between January 2013 and March 2014, it was populated with data by a team of specialists at RSSB to enable:

- **Cross-Industry learning** (The information in the IFCS is used by RSSB and Network Rail learning functions in their central reporting and analyses.)
- **Incident investigation** (The IFCS is being used by incident investigators to identify past incidents with similar causes, which not only aids analysis, but also helps prevent previous recommendations being duplicated or contradicted.)

In 2014, IFCS data was used to produce a report for rail industry managers on fatigue’s contribution to a sample of high-risk incidents (collisions, derailments and so on). In all, 246 (covering 2011-13) were analysed. Fatigue was identified as a factor in 21% of them. Furthermore, 40% of the incidents where fatigue played a part included fatigue from home and lifestyle-related issues and their management; 38% included work-related fatigue, which covers factors such as shift pattern design and hours of work. Click [here](#) to access the full report.

The IFCS is being integrated into the [new SMIS](#), the intention being that industry will increasingly enter and classify IFCS-type information using the 10 incident factors as part of it.

As the system is implemented during 2017, RSSB plans to support industry in using these parts of SMIS. RSSB will also continue to implement the IFCS review process for investigation reports from 2016, particularly for SPADs.

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\(^8\) As part of research project [T994: Development of an incident factor classification system module for SMIS](#).
5.3 SMIS + and Close Call

At the request of Network Rail and its contractors, RSSB has developed a new internet-based Close Call System (CCS), which allows the industry to record and analyse ‘close call incidents’ centrally.9

A ‘close call’ is defined as ‘an event that had the potential to cause injury or damage’, like leaving a cable troughing cover where someone might trip over it, but not a near miss with a train or on-track plant, both of which will continue to be reported into SMIS.

In 2015, a programme was launched by RSSB to expand SMIS to include the CCS (inter alia). The overall ‘SMIS+’ plan will provide new functionality resulting in the implementation of a national Safety Management Enterprise System. This will help the industry manage its safety management system (SMS) responsibilities, give it more control when making changes, and cut costs.

The first phase of implementation is imminent.

5.4 Right Track

In 2012, RSSB launched Right Track, a quarterly magazine aimed at front-line personnel to capture, share and promote safety learning and initiatives in a down-to-earth way.

This year, the magazine has focused on station safety, suicide prevention, SPADs, track worker safety, train dispatch and autumn adhesion, among many other subjects relevant to drivers, guards, on-train staff, station staff, dispatchers, signallers, shunters, depot workers and track workers.

Right Track is available to staff at London Underground and all RSSB member companies.

It is available as a pdf and in paper form. Hard copies are distributed in bulk by arrangement with individual companies.

Stories are also shared on RSSB’s Facebook page.

5.5 CIRAS

Of course, learning does not only occur after an event; many valuable lessons are revealed by what might be termed ‘accidents waiting to happen’.

Reports to the industry’s Confidential Incident Reporting and Analysis System (CIRAS) focus mainly on such ‘near miss’ events or perceived deficiencies in safety systems and arrangements, a better understanding of which provides a solid foundation for shared learning across different industry sectors.

Capturing this knowledge, which comes from workforce members who have daily operational contact with the railway, makes it possible to identify issues before they cause injury.

Maintaining confidentiality is a key aspect of CIRAS, but while we recognise that this could restrict the information that can be disclosed, it allows reporters to state their real concerns – and describe underlying causes – more openly than they might to their line manager. This gives CIRAS the potential to provide unique insights into safety issues.

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9 This was managed as research project T1015: Revision of the close call system.
6 Lessons learnt in 2015/16 – train operations risk

The statistics suggest we have the safest railway in Europe. The statistics say there were no passenger or workforce fatalities in train accidents\(^1\) for the tenth year running – the longest such period on record.

Some, however, look beneath that impressive trend line, look at the daily logs, take Carl Macrae’s advice to keep a watch for something that doesn’t look quite right.\(^1\) Those who do see a lot of near misses, a lot of low level incidents that could be precursors to something larger. And of course when there is a train accident, it’s always going to be news. Partly, as L.T.C. Rolt wrote in *Red for Danger* (1955), this is down to ‘the contrast between trivial error and terrible consequence’, which embodies ‘the essential stuff of all great tragedy’.

There’s always a human element to the railway accident – but while hardly “conspiracies”, most are multi-causal and most of the people involved doubtless felt themselves naught but hapless victims.

This chapter considers some of GB rail’s lower level events from the last 18 months or so, none of which became major incidents, but which could have done if circumstances had been slightly different, if luck hadn’t been on our side.

6.1 Signals passed at danger

SPADs were the immediate causes of Southall (1997) and Ladbroke Grove (1999), two high-profile, multi-fatality accidents that called into question many of the railway’s safety management systems at the time. Both gave the industry pause to take a closer look at the causes of SPADs, the precursors to SPADs and the risks that surround them.

Groups were set up nationally and locally to monitor the situation and implement various initiatives to bring the situation under control.

When this work began, there were over 500 SPADs a year; now there are fewer than 300 (on a much busier railway); furthermore, the level of underlying risk is down to 38% of the September 2006 baseline – the lowest figure on record.

The professionalism of drivers, the relevance of ‘professional’ driving policies and practices and the success of the Train Protection and Warning System (TPWS) have combined to achieve a situation where:

- Only one SPAD occurs for around every 50,000 red signals approached;
- Over 99.9% of train journeys are SPAD-free;
- Only a small minority of drivers are ever involved in a SPAD; and
- Human error by the driver is by far the single biggest cause.

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\(^{10}\) Train accidents are defined as: derailments on the running line (other than whilst shunting), or which affect an unprotected running line; collisions between trains on the running line (excluding roll backs and open doors); buffer stop collisions which cause damage; trains striking road vehicles; large objects falling onto trains; and train explosions.

But though SPADs are relatively low in frequency, they still have the potential for high-consequence loss. On 7 March 2015, we came worryingly close to that situation.

6.1.1 SPAD at Wootton Bassett Junction raises questions about main line charter operations and safety culture

The *Railway Magazine*\(^{12}\) likened it to **Quintinshill**, Britain’s worst railway accident. It sounds melodramatic, but of course the editor was right: had the timings been slightly different, a collision could have occurred that would almost certainly have resulted in death at levels not seen in this country for decades.

As it was, on the afternoon of 7 March 2015, a train hauled by no. 34067 **Tangmere** passed SN45 – the signal protecting **Wootton Bassett Junction** – at danger. It fouled the junction soon after an HST had passed through on clear signals.

The incident train was a charter – a 13-car special – operated by West Coast Railways (WCR), and although **Tangmere** is a steam locomotive, it is fitted with Automatic Warning System (AWS) and TPWS equipment. Drivers must stop and contact the signaller if either intervenes.

**What did RAIB say?**

SN45 was passed at danger because the driver did not reduce the train’s speed on the approach to it. This meant he was unable to stop the train in time, once he realised it was at danger.

The driver hadn’t seen the preceding signal, which was at caution and should have alerted him that SN45 was red, because he’d become distracted in the cab. He may also have been experiencing a higher workload than normal.

Distraction may explain too why the driver misunderstood the nature of an AWS warning he received and why his knowledge of the junction did not alert him to the fact that he’d missed a signal. That said, he may have misunderstood the nature of the AWS warning, as a sign relating to a temporary speed restriction (TSR) had not been positioned correctly.

In addition, the TPWS was unable to reduce the train’s speed by applying the brakes automatically, having been rendered ineffective by **Tangmere**’s crew when they isolated the AWS to by-pass an automatic brake application that occurred at the TSR. Isolating AWS in this way is against the rules, but RAIB found it had almost certainly become an accepted practice among some crews on **Tangmere**. This was probably because warnings from AWS were not always apparent to drivers, who were also anxious to avoid delays resulting from brake demands. The driver and fireman also may have had a low perception of the risks associated with isolating the AWS.

RAIB listed the following underlying factors:

\(^{12}\) Britain’s oldest railway publication, established in 1897.
The way the AWS on Tangmere was designed and installed meant that AWS warning horns were not always audible to drivers. This meant it didn’t meet the required standards. In addition, the AWS isolating cock was in a position accessible to train crew when the train was moving. Despite this, the AWS was certified as compliant and the engine was allowed into service.

The TSR 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 resulted in the warning board for the TSR being placed between the fixed AWS magnet for SN43 and the signal itself.

WCR had a weak safety culture. This affected how its staff complied with the Rule Book, relevant railway group standards and the company’s own safety management system.

What was done?

In brief, after Network Rail had suspended WCR’s track access agreement, the ORR had considered revoking its safety certificate and issued an improvement notice, WCR introduced several measures – including joining RSSB – to improve its safety management system.

However, as a result of an incident on 2 October 2015 at Hexthorpe Goods chord, where a TPWS brake demand was interfered with by the fireman of an empty coaching stock (ECS) train, the ORR issued a prohibition notice preventing WCR from operating further steam movements until locomotives had been fitted with an effective means of preventing interference with the correct operation of AWS and TPWS.

The following month, WCR was issued with another prohibition notice, which prevented it from operating any further trains on the mainline network with effect from 18 February 2016.

On 22 March 2016, WCR wrote to the ORR, stating that it committed to:

- Undertaking a strategic review with the intent of reducing business complexity.
- Restructuring the board and management team to include a subcommittee with an independent chairman drawn from the UK rail industry.
- Appointing an independent safety consultancy to review the company’s management arrangements, to conduct safety culture surveys and undertake a gap analysis.
- Allowing the managing director to pursue safety and training improvements independently.
- Directing more resources into the development of route risk assessments.
- Placing traction inspectors on all steam charters except for regular operations where a risk assessment had demonstrated that this is not necessary.
- Drawing the steam drivers it uses from a pool of 29, all of whom have been re-assessed.
- Prohibiting the use of trains that mix vacuum and air-braked rolling stock.
- Trialling the use of CCTV in the cabs of steam locomotives.

As a result of these commitments, the ORR lifted the prohibition notice on 28 March 2016.

Eventually, WCR and the driver were charged with offences under the Health and Safety at Work Act 1974. Both pleaded guilty. The former was fined £200,000 and £64,000 costs. The latter was given a four-month prison sentence, suspended for 18 months. He was also ordered to do 80 hours’ unpaid work.

In addition, RAIB recommended:
- Reviewing the current standards, policies, procedures and risk assessment tools intended to assess, prevent and mitigate the risk associated with overruns.
- Reviewing the arrangements by which drivers acquire and retain route knowledge.
- Considering 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 locomotive cab and how drivers are to be provided with additional competent assistance in sighting any signals or lineside signs falling within this category.
- Reviewing the arrangements by which OTDRs are maintained.
- Reviewing how the design and implementation of emergency and temporary speed restrictions is managed.

6.1.2 SPADs at Reading and Ruscombe Junction highlight fatigue issues

At 08:22 on 28 March 2015, a DB\textsuperscript{14} freight running from Acton to Westbury passed a signal at danger at Reading Westbury Line Junction.

At 06:11 on 3 November 2015, another freight forming the same service passed a signal at danger at Ruscombe Junction, about seven miles east of Reading.

Both SPADs occurred because the drivers involved were too tired to control their trains properly; both said they momentarily fell asleep on the approach to the signals concerned.

They were suffering from fatigue because they hadn’t had enough sleep, due in part to the rest facilities at Acton being not fit for purpose, and because the drivers were nearing the end of a long night shift. Neither reported as unfit when reporting for duty, a fact also causal to both incidents.

What did RAIB say?

There were a number of underlying factors associated with supervision and management at the drivers’ home depot of Westbury, and with the general approach to the management of fatigue within DB.

RAIB also identified the following key learning points:

- Drivers should be aware of the importance of managing fatigue in preparing for duty, and make sure they’ve had enough sleep before doing safety-critical work.
- Drivers should also be aware of their company’s reporting processes in cases where they feel unfit for work due to fatigue, either before or during a shift, or where they’re aware of a sleep disorder that could affect their fitness for duty.

\textsuperscript{13} RSSB’s research project \texttt{T1044 (A review of the process used to introduce speed restrictions and driver compliance with them)} covered this issue, and although there has been some progress by industry against its recommendations, more clarity is being sought.

\textsuperscript{14} DB Schenker Rail (UK) was the operator of the train and employer of the drivers. On 1 March 2016, the company changed its name to DB Cargo (UK) Ltd.
• Napping can combat fatigue, although its restorative benefits are limited to those who can nap, and should not be relied upon to control fatigue in place of preventative measures.

What was done?

DB reorganised the management structure at Westbury, providing the depot with a clearer management chain both in terms of safety assurance and driver line management.

Both drivers were given development plans involving additional monitoring and assessments. One has also been placed on indefinite sick leave following a diagnosis of sleep apnoea.\(^{15}\)

Since November 2015, if a DB driver reports unfit for work due to fatigue, this is recorded as a specific ‘fatigued worker’ instance on the company’s incident reporting system.

DB has moved the crew facilities at Acton depot, including the designated rest facility, into a refurbished building. It is now segregated from other rooms, such that it is not on a through route between facilities.

RAIB also recommended:

• Reviewing the driver diagrams and rosters at Westbury to identify those at risk from fatigue, amending them accordingly.
• Reviewing fatigue risk management systems to make sure they have sufficient controls in place consistent with published good practice (such as that from ORR and RSSB).
• Analysing incident patterns using normalised data, revisiting previous research in this area and building on recent advances in SPAD data analysis.

6.1.3 SPAD risk reduction strategy

In January 2015, the RSSB Board agreed the need to develop a strategy for the continued risk management of SPADs over the next ten years, covering the period before widespread installation of ERTMS is expected, but proportionate to the risks SPADs present to the industry.

The strategy has been developed through a three-phase approach that considers the ongoing need for mitigations in the short, medium and long term, while recognising existing good practice and making the case for new controls for the future.

Note, however, that existing management activity to address SPAD risk will continue across the industry during the development phases, via established industry mechanisms, local tactical groups, and at national level through SSRG and its expert subgroup, TARG. These existing mechanisms will help inform Phase 1 of the strategy.

Phase 1 – Review of existing management activity, tactical improvements and good practice

Phase 2 – Next generation of risk mitigation

Phase 3 – Delivering the long-term plan

\(^{15}\) See RSSB research project T299 (Human factors study of obstructive sleep apnoea in train drivers).
(Phases 1 and 2 are running in parallel.)

A SPAD Risk Reduction Strategy Steering Group has been established to provide executive level commitment and support, establish and set the remit for the expert working groups, make strategic decisions, monitor progress with individual projects or workstreams, and assist with any cross-industry issues. It has developed a ‘vision’ for SPAD risk management, and will endorse business cases, set the critical success factors, and (where appropriate) set specific targets for risk reduction over time, aligned to the phases and various controls proposed.

**Phase 1 – Review of existing management activity, tactical improvements and good practice**

The issues that affect SPAD performance and risk are varied and multi-faceted and have been the subject of considerable analysis and review over many years. This has resulted in a number of cross-industry improvement initiatives, including:

- Identifying fit-for-purpose and continuously improving Safety Management Systems (SMS);
- Optimising the existing infrastructure, including signal risk assessment and management of multi-SPAD signals;
- Highlighting the opportunities and risks posed by infrastructure renewal schemes;
- Recognising the role of recruitment, competence, fitness and the human performance of train drivers;
- Recognising the effects of timetabling and performance on SPADs;
- Ensuring TPWS remains an effective and reliable system;
- Delivering and managing the ERTMS fitment programme;
- Making sure we have robust SPAD and signal risk assessment tools that people can understand and use to make informed decisions; and
- Undertaking comprehensive investigations and learning from identifying underlying causes.

This phase will therefore consider the ‘as is’ situation, through understanding the existing SPAD mitigations in place within the industry, reviewing previous research and literature, identifying patterns and trends, and capturing existing good practice.

The industry continues to invest considerable resources and efforts to mitigate SPAD risk and these efforts have been successful in driving improved performance over the last 15 years (mainly through the implementation of TPWS), and although the total number of SPADs has plateaued at around 270 incidents a year, the risk levels are almost at their lowest on record at 38% (at December 2016) when compared to the 2006 benchmark year.

**Phase 2 – Next generation of risk mitigation**

Work has begun to develop Phase 2 by following the principles set out in *Taking Safe Decisions*, which are aligned to overarching legislative requirements. Implementation of Phase 2 therefore requires the need for initial analysis to underpin the selection of options and initiatives. This will include not just data and expert judgement, but also the collation of existing good practice through Phase 1.
RSSB has recently made significant progress in its ability to understand and analyse SPAD risk. In particular, it’s starting to identify the SPAD rate per demand on a signal by signal basis through a tool known as Red Aspect Approach to Signal (RAATS). This analysis should drive a more targeted appreciation of risk; therefore the ability to understand and implement more targeted, cost-effective control strategies at particular higher risk signals on the network.

**Phase 3 – Delivering the long-term plan**

Phase 3, if supported by the industry, will see the delivery of longer-term mitigations to reduce further the risk from SPADs through Control Period 6 and beyond, supported by the business cases developed as outputs from Phase 2.

Many of these mitigations will be aimed at engineering solutions. Success will require a step-change in the industry’s approach to such strategies and their funding mechanisms. A new approach will need wide industry ownership and support in order to seek appropriate levels of funding in future control periods.

### 6.2 Freight train derailments

RSSB’s statistics show the overall risk from freight derailments to be low – due largely to the typically low consequences involved. But low risk doesn’t mean no incidents, as those that occurred at Reading West and Camden West Junctions demonstrated.

Both these derailments raised a number of issues that had been building for some time. Indeed, by 31 December 2014, RAIB had published 34 reports on non-passenger derailments, 26% of which were caused by a combination of poor track condition and one of the following:

- Defective rolling stock;
- An undesirable design feature of rolling stock; or
- An unevenly distributed payload.

In many cases, the track and rolling stock faults were within tolerances defined by current standards, but the intersection between the outer limits were enough to cause problems.

The derailment at Reading West Junction resulted from a combination of an asymmetrically loaded container and an undetected track twist fault on a crossover. Camden Road West was caused by an unevenly loaded train running on track suffering from excessive twist. RAIB noted that the rules on the loading of such wagons (FEAs) had been relaxed following the derailment at Duddeston Junction in 2007, and wrote to the ORR to point out that this would have the effect of increasing the risk associated with dynamic loading.

RAIB’s annual report for 2014 noted that ‘[m]any in the railway industry argue that as long as track condition, and wagon design and operation remain close to that in the past (sometimes referred to as the ‘historical norm’), the risk associated with wagon derailments will not vary a great deal from its current level’. However, it went on, the ‘industry needs to better understand how container wagons and their payloads are interacting with the type of track faults that might sometimes be encountered.’
The suggestion is that reliance on this ‘historical norm’ is no longer enough to ensure safety, a position that was galvanised by ORR’s letter to the industry of 5 December 2014, which sought action on risk.

Although there have been no fatalities or injuries to date, in multi-track areas, there is clearly a risk from collision with a passenger train on an adjacent line. There are also performance issues: the derailment at Camden Road West Junction, for example, caused almost 23,000 delay minutes.

6.2.1 What’s being done?

In view of the need to let rolling stock and infrastructure experts consider all the issues together, RSSB established a Cross Industry Freight Derailment Working Group (XIFDWG), which includes representatives from Network Rail, freight operators, RSSB, SNC-Lavalin, Huddersfield University, Lloyds Register Rail and the ORR.

Facilitated by RSSB, the Group is looking closely at derailment data, but will also review the origin of current requirements, with a view to ascertaining what could be done differently to manage the situation in light of both the risk and the changes the industry has seen over the last decade.

So what has changed?

Although the amount of freight carried fell from 110.5 million tonnes in 2014-15 to 86.1 million (22.1%) in 2015-16, we’ve witnessed a general increase in traffic since 2005. Thus while our track recording regime is more extensive and track quality has improved, our hours of operation have gone up too. At the same time, the wagon fleet has fallen by a quarter, though bogie wagons – one-third of the total fleet in 2005 – have doubled in number and now carry more than 90% of the total tonnage. Around 70% of the more ‘twist-prone’ two-axle wagons have also been withdrawn, but changes to the standard covering a wagon’s structural strength has resulted in vehicles which ‘flex’ less and may therefore be less tolerant of track twist.

At the same time, we’ve seen a 50% rise in container traffic, while the containers themselves are getting larger both in height (8’ to 9’ 6”) and length (20’ to 40’, 45’ and 50’). These increases may have a bearing on stability, although the two recent incidents involving containers being blown from freight trains (Scout Green 07/03/15, and Deeping St Nicholas 31/03/15) appear to implicate the reliability of the retaining spigots.

In addition, the Group is conscious of the need to ensure that offset loads are not merely rejected from the railway and transferred to road – a modal shift which would actually increase societal risk from overturned lorries, road traffic collisions, increased pollution and so on. The ORR is therefore working with the HSE and the International Maritime Organisation to try to reduce loading risk at source. To take the matter forward, the Group has also proposed to:

- Review its understanding of the hazards and risk associated with container freight train derailments,
- Ensure a common understanding of the effectiveness of current risk control measures, and
- Identify improvements to reduce the risk as low as reasonably practicable.

Other linked actions agreed with ORR are found in the interim report to the ORR, which may be found on the RSSB website.
6.2.2 How was the situation assessed?

Using a list of incidents outlined by the ORR, the Group set about following a structured process in accordance with *Taking Safe Decisions*:

Thus the group elected to hold workshops to:

- Define the improvement needed for each new or under-performing control;
- Assess the effort required for each improvement and the safety benefit derived from each improved control; and
- Agree on the control measures that provide the best focus for the industry’s efforts.
- Agree the detailed studies to be undertaken for improvement, including detailed risk assessment and cost-benefit analysis, reached through review of the bowtie risk analysis report and by consultation. (At this stage, the work would be handed over to industry under governance of the FOSG for further development.)
- Consider detailed studies by industry of the chosen areas for improvement.
- Review studies and implement chosen risk control improvements by industry.
- Monitor effectiveness and assess residual risk as a result of the changes.

6.2.3 What was the outcome?

The study took the 66 risk controls identified by ORR and, through the workshops, identified a total of 184 risk controls, refining these down to three key enablers:

**Port survey of offset container loads**

This was taken forward as RSSB R&D project T1112 (*Quantify the distribution of unevenly loaded containers carried by road and rail*). The XIFDWG is currently deciding if follow-on work is required.
Simulation of wagon sensitivity to offset load and track twist

The specification for this has been developed as RSSB R&D project T1119 (*Investigating the effects of offset loading in containers on the risk of derailment on twisted track*). Publication is expected in the summer of 2017.

Use of offline GOTCHA for wagon twist and offset loads

The work on offline GOTCHA is progressing between the Network Rail project team and the University of Huddersfield, and via a GOTCHA sub-group of the Freight Technical Committee. Results are expected in the summer of 2017.

RSSB recognises that a further study will be required into cyclic top (which contributed to the derailment at Gloucester on 15 October 2013, for example). The issue will be considered after the track twist work.

### 6.3 Passenger operations

#### 6.3.1 Permissive working incident at Plymouth

At 15:35 on 3 April 2016, station staff at Plymouth reported that a Penzance–Exeter St. Davids service had collided with the rear power car of a Plymouth–Paddington HST set after being signalled (‘called on’) from P15 signal into Platform 6.

The HST was stationary at the time; it moved 2 feet as a result of the impact. Forty-eight people were injured and both trains were damaged.

Initial investigations revealed that the HST had been booked to depart from Platform 7, but the train was re-allocated to Platform 6 as the lifts for Platform 7 were out of order (there were stores to be loaded onto the HST).

The ex-Penzance was booked to run into Platform 8 to make a step-free connection (across the platform) for passengers wishing to board the HST. The signaller was of the opinion that there was enough room for the four-car train to pull in to Platform 6 behind the HST.

The incident occurred on a platform line authorised for passenger permissive working. This is a useful method of operation, which allows trains to proceed (with caution) into a block section, signal section or dead-end platform road, already occupied by another train. While outside the ‘one train, one section’ rule of railway safety, this can clearly increase capacity and aid efficiency.

There are essentially three types of permissive working:

- Emergency conditions;
- Passenger permissive working; and
• Freight permissive working

Most of the permissive working accidents that have occurred in the past have involved freight trains on freight only lines. However, on 4 August 1990, an ECS formation was ‘called on’ to a platform at Stafford that was occupied by a Manchester Piccadilly–Penzance and failed to stop in time. The collision killed the driver of the former and injured 36 people on the latter.

Though the investigation suggested that the ECS driver might not have been in a fit state to drive, having worked 25 shifts in a row without a day off and attended a presentation party shortly before taking duty, it added that the passenger train had been given a proceed aspect, which might have been taken by the ECS driver as applying to his train.

The internal inquiry led (among other things) to an enhancement of the Track Circuit Block regulations, specifically the addition of an instruction that, before signalling a train into an occupied platform line at a station where it’s not booked to call, the signaller must advise the driver of the circumstances verbally.

The HSE report of 1994 recommended a different addition, similar to what later became part of Regulation 3.3.4 of Rule Book module TS2:

*Once you have signalled a second train into an occupied platform, you must wait until the second train has stopped in the platform before you can allow the first train to leave.*

Stafford – and a number of other accidents during the 1990s – also led to a 60% reduction in places where permissive working was practiced, and to the introduction of ‘Huddersfield controls’, which prohibits two trains moving in a section simultaneously (that is, one departing while a second enters the platform). Where the signalling does not enforce this, the signalling regulations require the signaller to do so him/herself.

Furthermore, a national exercise, prompted by HMRI/HSE, reviewed all locations where permissive working was authorised, and withdrew it unless it was essential for operational purposes. This meant that the practice generally remained authorised for attaching, but was not widely perpetuated for platform sharing.

All these changes helped reduce the risk associated with permissive working to a point where incidents have fallen since the 1990s. Looking ahead, the greater approach speed control possible with ERTMS may allow more permissive moves to be undertaken, which may increase flexibility further by allowing more attachments to be made in stations, and so on.

But while collisions may be less common, the incident at Norwich on 21 July 2013 – like this most recent incident at Plymouth – shows that the inherent risk from putting two trains into one section remains.

Permissive working is one of those occasions when a driver must drive ‘at caution’, as defined in Rule Book module TW1 (*Preparation and movement of trains*), section 25:

*If instructed to proceed at caution, you must, as well as not exceeding any specified speed, proceed at a speed which takes account of conditions (such as the distance you can see to be clear), that will allow you to stop the train short of any train, vehicle or other obstruction, or the end of your movement authority.*
To access RSSB’s guidance on driving at caution, produced in association with TARG, click here (you will need to be logged in to Opsweb).

6.4 Overseas accidents

There have been several significant accidents outside Britain in the last year, particularly Europe, but analysis of them has not led to any major concerns over how we think the risk is managed here.

That said, overseas incidents can provide vital food for thought. With a railway enjoying such a long period of good safety performance as ours, there’s a very real danger of complacency, so measuring our own controls against accidents from abroad means we constantly keep a check on any gaps in our processes, rules and methods.

RSSB’s regular papers covering recent incidents and investigation reports are sent to the PTSRG, ISLG, the National Freight Safety Group, the Dangerous Goods Group and OFG’s successor: TARG – and the paper we send to TARG gets sent out by them to local groups up and down the country.

Now we’re doing more, by working a bit smarter. While these papers continue to include information on each incident, we’ve also started asking Group members to decide whether an industry response – and further analysis – is required. These responses will be tracked via a database on SPARK, which will create – in effect – an audit trail for action taken.

International accidents provide a useful reminder that such things are always possible, no matter how mature and technologically developed we are. They’re a useful source of information and cross-learning, though we should note that we also need those less severe local incidents to help expand our analysis of risk. Which is where Close Call and CIRAS data comes in...

6.4.1 Buffer stop collisions

At 08:45 (local time) on 29 September 2016, a passenger train struck and overrode the buffer stops before coming to rest on the concourse at Hoboken station in New Jersey. One person was killed and 114 were injured.

One witness reported that the train ‘never slowed down’. There has been a suggestion that the brakes failed.

It has also been reported that the line on which the accident occurred is not fitted with Positive Train Control. The National Transportation Safety Board is investigating.

The risk from buffer stop collisions has been largely mitigated on GB rail by TPWS. Metro systems like London Underground also have a ‘train stop’ system offering similar protection.

However, the incident at King’s Cross on 17 September 2015 demonstrated that such collisions can still happen and that drivers need to remain vigilant. This particular case involved a trainee driver being trained by a driver trainer who had himself not been trained to teach. The trainee may also have been distracted by someone on the platform, and had yet to acquire the ‘instinctive
competence’ to select the correct control; this led him to apply power instead of the brake when told to bring the train to a stand.

6.4.2 Other collisions

Germany

At 06:48 (local time) on 9 February 2016, two passenger services collided at around 60mph on a curve on the single line between Bad Aibling and Kolbermoor. One train derailed and several of its carriages overturned. Eleven people were killed (7 passengers and 4 staff, including both drivers).

The chief prosecutor later gave the cause as ‘human error’ on the part of the signaller, who had allowed both trains on to the single line and had tried in vain to warn the drivers after realising the likely outcome of his actions.

It transpired that the signaller had been distracted by playing a game on his mobile phone – something he had done every day for some weeks during working time, even though this was banned by his employer. He was later sentenced to 3½ years in prison.

Italy

At 11:30 (local time) on 12 July, two passenger trains were involved in a head-on collision on the single line between Andria and Corato.

Twenty-three people were reported killed (including one of the drivers and a person working in a nearby Olive Grove who was struck by debris).

Some sections of the line had been doubled since a 1990s upgrade, but the remaining single line sections operate on a ‘telephone block’ system, in which station masters at either end of the section must confirm by telephone that the last movement has passed through before the next one can be given authority to enter.

- Are you aware of your company’s mobile phone/device policy? Is it fit for purpose?
- Are you and your staff taking the risks from mobile device use seriously?
- Have you read RSSB research project T989 (Development of an education programme on the risk from using mobile phones and electronic communication devices in the railway industry)?
The line also lacks a train protection system and is one of the few lines in Italy not to be equipped with sensors to determine a train’s location.

The station master at Andria has admitted dispatching a train, allowing it onto the occupied single line, in error. He and his counterpart at Corato have been suspended while inquiries continue.

This is the second head-on, single-line collision in five months. Like the incident in Germany, this latest accident highlights not only the importance of modern signalling technology, but also the need to avoid single points of failure and the need to adhere to accepted, and risk-assessed, dispatch procedures.

6.4.3 High-speed derailments

Santiago de Compostela – UPDATE

The European Commission has raised concerns about the conduct and findings of the investigation into the fatal high-speed derailment at Santiago de Compostela on 24 July 2013.

Last October, the Commission asked the European Union Agency for Railways (EUA) to review the work of Spanish accident investigation body CIAF, and its final report in particular.

The Agency concluded that CIAF’s investigation ‘did not comply with requirements in articles 21.1 and 21.2 of the Railway Safety Directive’ to ensure its independence from any infrastructure manager, railway undertaking or other party ‘whose interests could conflict with the tasks entrusted to the investigation body’. (ADIF, RENFE and Ineco staff were all on the investigating team.)

The EUA also expressed concern that the investigation had placed sole responsibility for the accident on human error. ‘The emphasis of the CIAF report,’ it wrote, is ‘on the direct cause and on the driver’s [non-]compliance with rules, rather on the underlying and root causes’, which ‘are most likely to include the organisational actions of ADIF and RENFE.’

Furthermore, the investigation did not consider sufficiently the design of the line, the train or the signalling arrangements, focusing mainly on the actual derailment, without analysing the impact of the subsequent collision of the train with a lineside retaining wall and the resulting fire in the rear generator car: ‘The proposed safety recommendations seem to arise from the topics discussed and not from a well-understood and established causation chain leading to evidence-based conclusions.’

CIAF has insisted that it looked at all the circumstantial aspects of the accident, ‘including those considered relevant to the aims of the investigation’.

It pointed out that its investigation did not determine responsibility for the accident, which had been addressed by a separate judicial investigation. That concluded last October, when the driver was charged with 80 counts of ‘reckless manslaughter’.

CIAF also noted that infringement proceedings initiated by the Commission ‘had been concluded on terms favourable to Spain’, adding that the ERA had expressed no objections when the initial report into the accident was submitted in July 2014.

In the light of the ERA findings, politicians are now calling for an independent investigation by international experts to address the wider issues surrounding the accident.
6.5 What do the numbers say?

Version 8.1 of the Safety Risk Model (SRMv8.1) shows the risk from train accidents to be 8.0 fatalities and weighted injuries (FWI)\textsuperscript{16} per year. This is 5.8\% of the total accidental risk profile (which includes accidents in possessions and in yards, depots and sidings).

As noted, Grayrigg is the only train accident\textsuperscript{17} to have led to an on-board fatality in the last ten years.

Train accident risk at a glance

For more statistical analysis on train accidents, see Chapter 6 of the \textit{ASPR}.

\textsuperscript{16} Fatalities, injuries and shock and trauma are combined into a single figure, termed fatalities and weighted injuries (FWI). For more details on the injury classifications and their associated weightings, see the \textit{Annual Safety Performance Report}.

\textsuperscript{17} Train accidents are defined as: derailments on the running line (other than whilst shunting), or which affect an unprotected running line; collisions between trains on the running line (excluding roll backs and open doors); buffer stop collisions which cause damage; trains striking road vehicles; large objects falling onto trains; and train explosions.
7 Lessons learnt in 2015/16 – people on trains, people in stations

It’s a cool autumn morning and a passenger’s late for her train. Some mornings, things just don’t go right – first you forget your phone, then you forget your keys, then you can’t be sure if you locked the door anyway. Doors. What a pain they can be! You don’t realise how right that’s going to be, later on.

You run for the bus and sit panting as you plan your work for the rest of the day. It’s going to be a coffee first!

The traffic lights aren’t with you today, but eventually the bus pulls into the station forecourt – if you run, you’ll make it.

As you head through the ticket office, you hear the hustle alarm go; you pick up speed, you stick your arm in the closing doors, expecting them to open. They don’t, and the driver doesn’t see you. You’re dragged along the platform until you fall...

* * * * * *

It’s six years since RSSB exposed a rise in platform-train interface (PTI) risk, prompting the focus of resource and expertise on this important area.

Now, of course, there’s a PTI Strategy, which recognises that passengers are ‘often unaware of the dangers they face on the railway, particularly as a result of their own behaviour’. 18

Recent RAIB reports have emphasised this side of the equation: a common theme of those on the Hayes & Harlington, Jarrow, Newcastle Central and King’s Cross accidents, for example, being that the passengers involved all expected closing train doors to open ‘like a lift’ once they’d become caught.

7.1 ‘Trap and drag’

7.1.1 Passenger perception

Hayes & Harlington – the most recent incident – occurred when a passenger ‘ran for it’ and stuck her arm and leg in the closing train doors, despite knowing it to be an unsafe act. The doors didn’t open again like she thought they would and she was dragged some 8–10 metres before falling to the ground. Furthermore, the driver hadn’t seen her in the platform monitors.

RAIB lists three possible reasons for this:

- The driver may have looked at the CCTV monitors before departing, but didn’t see the passenger near the door;

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18 See RSSB, Platform-train interface strategy (January 2015), p.36.
• He may not have looked at the CCTV monitors at any time after pressing the ‘door close’ button; or
• He may have been aware of the passenger, but didn’t perceive her to be at risk.

The accident also revealed some traincrew and station staff to be unaware that traction interlock – and power – can be obtained when someone’s arm is trapped in train doors, a lesson that members later reminded us had been learned back in 1989.

7.1.2 Staff perception

Hayes & Harlington didn’t only highlight issues around passenger – and staff – perception of what a train can and can’t do with something trapped in the doors. It also showed us something about the driving task itself.

The driver at Hayes & Harlington may have ‘looked without seeing’ and – in this – he may have something in common with the driver involved in the incident at West Wickham on 10 April 2015.

At about 11:35 that morning, a passenger was dragged along the platform when a Cannon Street–Hayes service departed while her backpack strap was trapped in the doors. As the unit (a Class 465/1) moved off, she fell into the PTI gap, suffering life-changing injuries.

The incident train was being driven by a trainee driver under the supervision of an instructor. Like Hayes & Harlington, the service was DOO, meaning that – again, like Hayes & Harlington – the driver was required to check that it was safe to depart by looking at CCTV monitors on the platform.

RAIB’s report suggests that the trainee driver and instructor were aware of the rules and procedures relating to this method of dispatch.

Moreover, evidence suggests both to have been aware of the importance of not starting the train unless it was safe to do so, and of the need to perform a ‘train safety check’. Despite this, the trapped passenger was ‘continuously visible’ in two of the 5 CCTV monitors for 9 seconds. That neither driver nor instructor were aware of the situation, suggests a need for greater focus on non-technical skills, like using risk-triggered commentary to help drivers concentrate on the job in hand.
• Do you include non-technical skills as part of your driver training?
• Do you monitor its use and effectiveness?
• How often do you train your trainers?
• Are your dispatch staff under pressure to dispatch as quickly as possible?

7.1.3 What does RAIB say?

In its report on West Wickham, RAIB identified the following learning points:

• Dispatchers must let train doors be released long enough for passengers to board and alight safely.
• Train crew must not rely on illumination of the train door interlock light as a reassurance that nothing is trapped in the train’s doors.
• Dispatchers must allow sufficient time to undertake the train safety check. The check must be carried out systematically, without reducing vigilance even when a station is quiet or a train is lightly loaded.
• Those involved in train specification and design should make sure door control systems do not have the potential to mislead passengers. They should also make sure that, if opened by a passenger-operated door control, doors reach the fully open position – and remain fully open – for a period consistent with safe use by a passenger.
• Train operating companies should, where practicable, use simulation to allow drivers to practise handling low-probability, high-hazard PTI events such as passengers trapped in closed doors by thin objects which are not detected by the door obstruction system.

RAIB also recommended:

• Reviewing guidance such that traincrew undertaking dispatch duties should, where practicable, monitor train doors during the door closure period. (This is in addition to the existing Rule Book requirement for a train safety check after doors are fully closed.)

7.1.4 What’s being done?

The cross-industry PTI Working Group’s workplan for 2016/17 includes ‘trap and drag’ and competence as two key themes.

RSSB has also produced the Lend a helping hand booklet, which helps remind staff to do a thorough visual check of the doors before departing and not to rely on interlock indicators/lights to determine if it’s safe to depart.

19 See Rule Book Module SS1, section 3.2.
April 2016 saw the publication of T1029 *(Designing a tool to support duty holders in the assessment of PTI risk)*, which provides train operators and infrastructure managers with the web-based means to complete a PTI risk assessment. The tool – which can be accessed via mobile devices – includes station usage data and details of relevant PTI incidents. It also allows recommendations to be recorded and tracked, and a report produced automatically.

In addition, RSSB is working on T1059 *(Evaluating the use of on-train driver only operation (passenger) monitors during station departures)*, which is set to appear this summer and will weigh the reduction on-board camera use might bring in ‘trap and drag’ incidents against potential disbenefits like distracting drivers from monitoring signals.

Further PTI-related research projects are listed at the end of this chapter.

### 7.2 Doors

At West Wickham, the passenger’s backpack strap became trapped when the doors closed quickly and unexpectedly while she was alighting. On a Class 465/1, the power-operated doors are opened by passengers using an ‘open doors’ button, which is illuminated when the driver has released them.

When the driver starts the door closure sequence, a hustle alarm sounds for approximately 3 seconds (the ‘hustle period’) in any coach where any doors have been opened by passengers.

At the end of the hustle period, these open doors start to close. (The hustle alarm doesn’t sound in coaches where no passenger doors have been opened.)

During the hustle period, ‘open doors’ buttons remain illuminated at any doors that are already closed. At this point, it’s still possible for a passenger to initiate a door opening by pressing it.

However, if the ‘open doors’ button is pressed during the hustle period, any closed door will only open for the balance of the time available to the end of the 3-second hustle period.

In practice, this means that there are situations when a door will only come partially open before closing again, rapidly and without warning, because the ‘open doors’ button has been pressed relatively late. These are the circumstances that contributed to the accident at West Wickham, it being in this short space of time that the passenger strap became trapped.

The ‘trapped object’ in this case was a thin backpack strap with a toggle at the end. At Newcastle Central on 5 June 2013, however, a passenger’s hand was caught when she inserted it between the closing doors of a Class 185. The train then started to move, forcing her to jog alongside until passengers on board pulled the emergency door release and the guard applied the emergency brake.

The similar event at King’s Cross on 10 October 2011 involved a Class 365, RAIB noting that the passenger in this case may have been able to withdraw her fingers from the doors before being dragged if alternative door edge seals had been fitted.
The Class 365 door seal issue also featured in an incident at Huntingdon on 15 February 2006, in which a person standing at the platform edge to wave a passenger off got the edge of his coat caught in one of the doors. He was trapped before being dragged between the train and platform.

RAIB said a combination of the design of the Class 365 door seal and the closing forces of the door allowed the coat fabric to be trapped such that it could not be removed. Furthermore, the design and construction of the door allowed the interlock to be given when the coat fabric was trapped.

- Do you know precisely how the doors behave on your trains?
- How often do you check them?
- Do platform dwell times give enough time for passengers to board and alight, particularly where passenger numbers have gone up?

7.2.1 What’s being done?

The PTI strategy recognises that ‘[f]urther work is needed on the specification for sensitive door close edges to minimise potential for trapping incidents without impacting on timekeeping, capacity and performance.’ Indeed, RSSB – in consultation with the BSI – submitted the following text for the national foreword to BS EN 14752 Railway applications - Bodyside Entrance Systems for rolling stock:

The UK Committee advises, following the recommendations set out in the RAIB accident investigation report (report 19/2014 dated September 2014), that the door obstacle detection methods set out in this standard need to be combined with appropriate operational dispatch procedures to mitigate the risk from trap and drag incidents.

Furthermore, GB rail voted to approve an immediate revision to consider the suitability of the current obstacle testing methodology, given that the Newcastle incident highlighted that a door system compliant with the Euronorm can trap and not detect the presence of an arm inserted at an angle to the door. A request for a New Work Item Proposal (NWIP) was later initiated – and approved – in response to this request.

The Jarrow investigation recommended that RSSB clarify Section B6.3b of GM/RT2473 (Power-operated external doors on passenger-carrying vehicles), which relates to the obstacle extraction force re the geometry and material of the test obstacle and the direction of pull.

In June 2013, the Standard was duly amended thus:

An obstacle with dimensions of 10 mm × 50 mm...trapped with its long edge vertically between the leading door edge and the frame or between two door panels, shall be withdrawn slowly in outward direction with a force not higher than 150 N, measured perpendicularly to the door surface. Alternatively, the door shall not be indicated closed and locked. The requirements shall be verified at the middle position only of the door. This requirement is now included in EN14752:2015.

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In addition, research project T1102 seeks to address the optimisation of door closure arrangements to improve boarding and alighting.

7.3 What do the numbers say?

Ten people died in stations during 2015/16, eight of whom being passengers, two being members of the public. Six of the fatalities occurred at the platform edge, although none related to boarding or alighting trains. Three of the fatalities involved assault, while the tenth was a person who died after being struck by a station sign that fell from its mountings in high winds.

When the number of non-fatal injuries is taken into account, the total level of harm occurring to passengers and the public in stations was 52.1 FWI, compared with 48.1 FWI (four fatalities) for the previous year. The main cause of non-fatal injuries in stations are slips, trips and falls. In 2015/16, there were 179 major injuries in stations due to slips, trips and falls, compared with 201 events the previous year.

Train and station safety at a glance

For more statistical analysis on passenger risk, see Chapter 3 of the ASPR.

7.4 In other news...

Though the ASPR shows slips, trips and falls to be the area of greatest risk, here are five more other stories that came to our attention in 2015/16.

7.4.1 Retrieving items dropped by passengers – what’s the harm?

Common sense. It used to get us a long way. It still does – and still should. It’s why we don’t try to weave round the barriers at a level crossing or lift a heavy object without bending our knees.
But common sense began with someone learning the hard way. Even our rules started life with someone learning the hard way and someone else trying to get down on paper a way to stop it happening again. Yet there are a lot of rules, and sometimes it’s easy to forget why they’re there.

So, imagine you’re working at a station. It’s just past the rush hour and a passenger drops their mobile onto the track. They were just texting and it slipped. Their whole life’s on that phone! Can you help?

Of course you can!

You look up the line; you look down. There’s nothing about. Why waste everyone’s time by calling the signaller and getting the line blocked? Just jump down and get it – the passenger’ll be happy and no one will be any the wiser. Common sense, isn’t it?

We all know it goes on; we all know it doesn’t always get reported. But what happens if you ‘get away with it’, and everyone’s so pleased you do it again. And again. Seems like a good, sensible workaround – gets the job done more quickly...

What if you then start to find ways of doing other jobs more quickly? Maybe it’s the thin end of the wedge; maybe it’s not.

But what if one of those workarounds involve train dispatch? And what if you end up inadvertently sending a train out against a red?

- Is going on to the line to retrieve an item without a line blockage common sense?
- Could the item have been retrieved without going onto the line?
- Is good customer service rewarded more than good safety performance?

What to the rules say?

Station staff should consult Module SS1, 2.3:
If you need to go onto a platform line to retrieve a dropped item, you must:

* Have been trained to do so at the location concerned
* Tell the signaller your name and your employer and why you need to go onto the line
* Make sure that the signaller clearly understands on which line trains are to be stopped, including any adjacent line
* Only go onto the line when the signaller gives you permission.

When you have retrieved the item, you must tell the signaller that you have returned to the platform, that the line is clear and trains can run as normal.

For signallers, the answer is in Module TS1, 13.1.2:
If an item is to be retrieved from a platform line, you must also stop trains on any line adjacent to the platform line.

7.4.2 Passenger injuries escalate at Reading

It’s never good returning to the morning commute after Christmas, but you do expect to get to work safely. Yet sometimes something unexpected happens – as at Reading on the morning of 6 January 2016.

It was around half-seven, and a number of passengers were walking up the escalator on Platform 14/15A, which was out of use and being used as a staircase.

Suddenly, it began to move and a ‘treadmill’ effect caused it to gather speed. Some passengers jumped over the handrail; six sustained minor injuries.
The escalator had been isolated on 23 December, due to the condition of its gearbox mounting bolts. Barriers were put up to prevent passengers from gaining access. All was well until the barriers were disengaged by an unknown party. They remained ‘open’ until the morning of 6 January.

- Do you ensure ‘out of use’ equipment is secured and labelled adequately?
- Do you make sure passengers, staff and public are aware of the possible dangers associated with ‘out of use’ equipment?

7.4.3  Overhead line risk

When overhead line equipment is put up – as it has been in the past, as it’s being now, and will be in the future – good sense says we put live conductors as far from where people move about, buy coffee and wait for trains as possible.

Yet sometimes historical factors (usually Victorian ones, involving different companies building to different standards) mean that the wire is lower than ideal.

In these cases, a risk assessment is required, as you’d expect. And into that mix must go all the things that a passenger might stick up.

There have always been umbrellas – this is Britain, after all – and there have always been fishing rods. More recently, however, we’ve seen the rise of the helium balloon and the ‘selfie stick’.

The former have been banned at Ashford International, but as the latter have yet to be considered, is it time for a co-ordinated approach, for improved signage, verbal announcements, and even a restriction on the sale of balloons and selfie sticks at stations?

- Have you considered the risks in your safety management systems presented by ‘selfie sticks’, helium balloons and other items now brandished by the public?

7.4.4  Crush incidents don’t only affect big stations

It is no secret that crowding can cause crush incidents at large city stations, but what about smaller ones? Take, for example, the two-platform suburban station. Busy only twice a day, maybe, but busy nonetheless. What happens when one trainload of people taking the escalator to the concourse from an Up train are joined by a similar group from a Down one?

What happens when they can’t get through the barriers fast enough to make way for those still coming up from the platforms? Well, let’s just say everyone’s happier when the escalator stops!
RSSB’s Innovation Programme has organised a competition to identify future ticket detection technologies that could be beneficial at places like London Bridge, but would a small timetable adjustment – holding the Up train at the Home signal until passengers from the Down had cleared, for example – be just as effective in suburbia?

7.4.5 ‘Pokemon Go’ – the next concern?

Pokemon Go is a ‘reality’ game that encourages players to catch various characters by exploring their surroundings via smartphones. Using GPS, the object is to try to catch Pikachu, Hypno and co at various landmarks and locations. Unfortunately – to date – these have also included stations and level crossings.

Police have issued warnings and Network Rail has released a Safety Bulletin, reporting that a number of online forums are showing the injuries suffered by players, who are prone to become so absorbed in their smartphone screens that they forget where they are, the dangers that may be around them or whether access to an area is restricted. Network Rail has sent the game’s designers GPS information for Network Rail sites like railway lines and level crossings.

But what about yards, depots and sidings? What about the next new craze?

- If you see people appearing distracted around level crossings, stations or other railway property – or attempting unauthorised access – please warn them of the dangers and report any uncooperative behaviour to BTP.
- Don’t forget that these incidents should also be raised as Close Calls.

7.5 Research and development

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8 Lessons learnt in 2015/16 – infrastructure workers

In the early hours of a March morning, two members of possession support staff access the track to place the protection for a T3.

To save time, they use an unauthorised access point that wasn’t specified in their Safe System of Work pack.

A blockage was also planned for crossing the open lines...but they don’t contact the signaller to get it done.

One gets over safely, the other gets half-way across and sees a train coming. He turns to run back, but trips and falls into its path. He rolls over the rail and into the cess with seconds to spare...

*Leading health and safety on Britain’s railway* suggests us to have a good degree of understanding around the issues that can affect the workforce. This means that many of the risks are understood and that there is some collaboration – much of which is thanks to the cross-industry Infrastructure Safety Liaison Group (ISLG).

However, irregular working incidents like the one described above appear in the daily logs with some frequency.

- Do your staff always use authorised access points?
- Do they always follow the planned SSoW?
- Are you confident that all such ‘close calls’ are being reported?

8.1 Protection arrangements

RSSB’s regular sweep of the daily incident logs has revealed a number of cases of lookouts being in the wrong place, confusion about location, not knowing the difference between the Up line and the Down, communication errors and incorrect documentation.

On the other side of the equation, a number of cases of detonators being left on open lines (or placed on open lines in error) have been recorded. Many of these are exploded by passenger trains, something that is unlikely to enhance our industry’s reputation with the travelling public – or drivers.

Thankfully, while reports of trolleys placed on open lines still come to our attention, there has been no repeat of the collision between a train and a trolley at *Heathrow Tunnel Junction, on which RAIB recently reported.* On Boxing Day 2015, however, a Eurostar service did strike a possession limit board that had been incorrectly positioned – another case of an error being a precursor to an incident.

RSSB’s studies also reveal a number of incidents involving signallers allowing trains into areas that have been blocked for track maintenance work. These issues – and many more – have been

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21 On 27 December 2014, and again the next day, track workers were at serious risk of being struck by trains at the Stockley Flyover construction site on the Heathrow Airport branch. In the second incident, a train did collide with a small trolley which was being placed on the line by staff.
highlighted to the industry by RSSB on a regular basis. Talks are under way between Network Rail and ISLG to address them.

8.1.1 What did RAIB say?

RAIB’s work in this area led to a [class investigation into irregularities with protection arrangements during infrastructure engineering work](#).

In August 2015, the Branch published findings based on its analysis of 714 operating irregularities recorded between April 2011 and April 2013. It found that around 71% of them fell into one of the following nine (significant) categories:

- Protection equipment incorrectly placed (such as detonators, possession limit boards and so on, on the wrong line or wrong side of a signal).
- Protected area set up while the line is open to traffic.
- Working outside a protected area.
- Safety issues when a protected area is given up (often involving vehicles, equipment or people on the line, or track being left in poor condition).
- Work incidents within a protected area (such as unauthorised movements, collisions, the incorrect operation of points, and so on).
- Electrical protection irregularities (staff receiving shocks when working on or near conductor rails or overhead line equipment).
- Trains incorrectly signalled into a protected area.
- Work carried out without protection.
- Level crossing irregularities within a protected area.

Many of the incidents studies involved miscommunication, violations, lapses, and the incorrect understanding of protection limits. On average, staff were being put at risk between three and five times each week.

At the time, RAIB said it was ‘aware that Network Rail is currently planning and implementing a major track safety initiative known as ‘Planning and Delivering Safe Work’ (PDSW).’ However, it also observed that the initiative was ‘only in the early stages of implementation and that the envisaged benefits have yet to be demonstrated,’ adding that it ‘is intentionally focused on the roles of those working on site. This means that it will not have significant benefits in areas where risks may be created by people in a number of other roles that are important in safeguarding those carrying out work on the railway.’

To complement the above report, RAIB has launched another class investigation into accidents and near misses involving trains and track workers outside possessions. This will:

- Review the circumstances of accidents and near miss incidents involving trains and track workers outside possessions during 2015;
- Determine the causal factors of a representative sample of those incidents;
• Understand how and why decisions are made in practice, on the choice of protection arrangement, and identify trends over the last five years in the use of different types of protection arrangement;

• Identify the key factors in planning and undertaking work on site (including the behaviour of individuals) that increase the probability of track workers’ protection from moving trains being compromised; and

• Include engagement with staff involved in planning safe systems of work and in implementing safety arrangements on site.

• RAIB will also consult with industry bodies that have an interest in track worker safety and consider previous relevant RAIB investigations, their findings and recommendations.

The safety of staff on the ground has been taken up by ISLG, which is working with RiskTec to produce guidance, and consulting with Network Rail on ways to reduce risk.

8.2 Driving in worksites and possessions

Ivybridge collision highlights driving at caution and worksite length issues

At 129 tons, the colossal Class 70s are masters of all work, able (in traditional terms) to ‘pull a house down’. Such power is vital in today’s freight environment, yet the bulk of one Type 5 was made all-too-apparent on Saturday 27 February 2016...

The train had come down from Westbury to Devon the previous evening. Once at Totnes, the PICOP took his possession around it before authorising the driver to make for a work site at Ivybridge – some 11½ miles away – where a track renewal was to take place.

About 35 minutes later, the train pulled up at the entrance to said site and the driver was handed a two-way radio, which the ES used to brief him on the next move.

The Engineering Supervisor (ES) gave the driver permission to enter the work site and draw up behind a stationary train within it. The trouble was he didn’t tell the driver at which speed to travel. He didn’t say where the other train was either. In fact, it was just 0.8 miles away.

The consist set off into the work site and the ‘70’ accelerated to 20 mph. As it rounded a curve, still at 20, the driver saw the rear of the stationary train about 100 metres ahead. He rammed on emergency brake, but it was too late...

...the collision occurred at around 10 mph.

A weighty question...

The moving train comprised 10 wagons loaded with stone and another locomotive at the rear, giving a total train weight of 1118 tonnes.

The braking performance of a train of this type and weight meant its stopping distance at 20 mph was likely to be between 200 to 300 metres – 2-to-3 times the distance available in this case.
There were no reported injuries, though the driver was badly shaken. The locomotive, the wagon immediately behind and the last wagon of the stationary train derailed. All three, and the track beneath them, were damaged.

If an ES doesn’t brief the driver about a maximum work site speed, the Rule Book requires that speed to be no greater than 5 mph. A driver should also proceed at caution, so that the train can be stopped within the distance that can be seen to be clear.

- If you’re driving in a work site, are you happy that you know your train’s braking characteristics and know the location well enough to know when to use them?
- Like Ivybridge, the incidents at Penrith and Logan also highlighted the dangers of driving at speed in worksites. For RSSB’s guidance on driving at caution, click here: LINK (you’ll need to be logged into Opsweb).
- With incidents becoming more common, is it time to rethink worksite lengths?

8.3 Equipment design and modification

Last year, we reported on an incident involving a road rail vehicle (RRV) that ran away as it was being on-tracked on a sloping section of line north of Glasgow Queen Street High Level Tunnel. The RRV ran through the tunnel and struck two scaffolds that were being used for maintenance work on the tunnel walls.

The RRV was a mobile elevated work platform (MEWP) that was manufactured for road use and then converted by Rexquote Ltd for railway use. Its road wheels were intended to provide braking in both road and rail modes. This was achieved in rail mode by holding the road wheels against a hub extending from the rail wheels.

The RRV’s design meant that, during a transition phase in the on-tracking procedure, its road wheel brakes were ineffective because the vehicle was supported on the rail wheels, but the road wheels were not touching the hubs.

RAIB identified one learning point to remind the rail industry that the rail vehicle approval process does not cover all aspects of rail vehicle performance:

- Although the vehicle approvals process assesses compliance of plant design with the relevant mandatory requirements of railway industry standards, it does not provide assurance concerning all aspects of the design and manufacture of that plant. For this reason, it’s important that designers, manufacturers and convertors of plant for use on railway infrastructure apply established principles of engineering safety management to the specification, design, manufacture and testing of plant.

This year, RAIB reported on the runaway of two vehicles forming an overhead wiring train at Bryn and subsequent collision with two MEWPs on 27 November 2014. Seven members of staff who were on and around the work platforms narrowly escaped injury.
The driver of the vehicle did not correctly operate the controls to change from a travelling mode to a working mode before he left the cab. This caused the brakes to release and, because it also caused the brake controls on the wagon to become disabled, the wiring team were unable to reapply them. No design, change management, approval or risk assessment work had identified the need for a safety measure to prevent or mitigate the consequences of the error.

When developing the new train, a philosophy of minimising technical change was followed, instead of a systematic and integrated approach to the identification and management of requirements and interfaces.

There were also differences between the design drawings and the installed wiring for the modified vehicle control circuits. Similarly, the quality of the wiring was substandard compared to that installed when the vehicle was built.

Furthermore, the ORR’s guidance on the common safety method for risk assessment (CSM RA) did not make it clear that the risk management process described in the regulation is also considered suitable for carrying out risk assessments for vehicles operating in possessions.

8.3.1 What’s being done?

On 23 December 2014, following the initial functional testing carried out on the incident vehicle, the user – Balfour Beatty – issued a National Incident Report (NIR) informing the rail industry of the risk of an unbraked condition with this type of rail-borne plant. It also issued a safety alert to its staff.

In addition, the company organised a programme to re-assess the risks associated with the wiring train and its operation.

Network Rail changed its product acceptance processes, creating a new check-list of generic acceptance requirements that incorporates guidance on the type of evidence that applicants are expected to provide.

The ORR advised that it will be clarifying its guidance on the use of the CSM RA by adding a sentence stating that ‘in circumstances where the CSM RA is not a formal legal requirement, the risk management process it describes is suitable to be used for the management of change.’

RAIB also recommended:

- Reviewing processes for risk assessing and implementing any measures necessary to ensure the identification of reasonably foreseeable hazards relevant to the design, operation and maintenance of rail-borne plant, while always taking the consequences of human error into account.
- Reviewing processes for change management and how they are being implemented.
- Reviewing and enhancing guidance on the approval and management of change of rail-borne plant to emphasise the need to follow a sound and systematic risk management process.
- Reviewing processes for the product acceptance of new and modified plant.
8.4 Infrastructure Safety Liaison Group

ISLG – the Infrastructure Safety Liaison Group – represents the contractor community. Part of its remit is to establish and implement arrangements to address the ‘duty of cooperation’ across both the mainline and non-mainline rail networks, in order to help infrastructure managers meet their responsibilities.

ISLG also has two operational sub-groups: the Rail Infrastructure Assurance Group (RIAG) and the Rail Industry Environmental Forum (RIEF), both consultation groups in their own right, but both also tasked by ISLG to address problems and advise on recommendations for ISLG to take forward.

8.4.1 ISLG releases work pressure survey

Everyone’s felt the pressure of work at some point in their careers, but it’s always been one of those hidden dangers – not really discussed, not really understood. Now ISLG – the Industry Safety Liaison Group – has published a survey that shines some much-needed light on the subject.

Carried out between April and May 2016, an impressive 1169 people responded. Just over a quarter called themselves senior managers, but the mix included front line, support staff, seniors and delivery managers too.

One of the positive messages is that most respondents thought industry priority was a balance of safety and performance. However, a third felt they were under pressure to deliver more than once a shift.

Also positive is the fact that pressure is making some exert more effort, ask questions and think on their feet. Yet it’s making others lose focus, cut corners, make mistakes...it’s also giving some sleepless nights, headaches and sickness, while making others more aggressive, impatient and irritable.

Many of those who work away from the front line said they put themselves under pressure. More specifically, though, pressure comes fairly evenly from three sources:

- When people haven’t done their job properly (40%);
- When others introduce changes (35%); or
- When something goes wrong (34%).

However, 30% said pressure was a constant part of the job.

Almost two-thirds said they put people under pressure at work, although the least pressurised were the support staff, which may suggest that those in such roles are not fully aware of the impact their actions can have on others.
A quarter of respondents said they were worried that work-related pressure would cause a reduction in safety controls. When coupled with those who were concerned that pressure led to corners being cut, then the figure rises to 55%.

In short, the quality, safety and timeliness of work is affected by staff who feel under pressure. It’s a real issue. It’s present at all levels and has an impact on system and workforce safety. ISLG says the industry needs to identify how to make improvements. It’s clear from the survey that the perception of pressure is as much about how we do business as what we actually do. It’s clear too that how we speak to each other, how we collaborate and how we plan our activities are key influencers.

- Are your company’s roles and responsibilities clearly defined?
- Do your staff understand each other’s roles and responsibilities?
- How well is the work plan understood?
- Is enough contingency provided if things go wrong?
- Who does the final check, are they under pressure to hand back the railway?
- Do you have a coping strategy for dealing with pressure?
- For further details, click HERE

8.5 What do the numbers say?

There were no workforce fatalities involving infrastructure staff working on or about the running line. The total level of harm arising from running line work during 2015/16 was 8.0 FWI, a decrease of 21% compared with the 10.1 FWI that occurred in 2014/15. The total harm comprised 58 major injuries, 1,323 minor injuries and seven cases of shock/trauma.

Slips, trips and falls account for the largest proportion of harm, though – at 3.6 FWI – the level of harm for 2015/16 was a reduction on the 4.5 FWI seen the previous year.

Contact with objects is the next largest contributor to running line harm, the recorded level for 2015/16 being 2.5 FWI, which is lower than the 3.0 FWI reported during 2014/15.

Infrastructure worker safety at a glance

Risk in context (SRMv8.1)

<table>
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<tr>
<th>Risk in context (SRMv8.1)</th>
<th>Trend in harm</th>
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<tbody>
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<td>Working on or about the running line (10.1 FWI; 7.2%)</td>
<td>Weighted injuries</td>
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<tr>
<td>Other accidental risk (129.4 FWI; 92.8%)</td>
<td>Fatalities</td>
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</tbody>
</table>

For more statistical analysis on infrastructure worker risk, see Chapter 4 of the ASPR.
Nobody likes to be called immature when it isn’t justified. Sometimes, though, it is – especially where safety is concerned.

Leading health and safety on Britain’s railway reckons our understanding of road risk to be low. In fact, it’s referred to therein as a ‘risk gap’.

On the whole, of course, the railway has a mature safety conscience and is quick and keen to learn from accidents and incidents. Hence the increasing crashworthiness of trains; hence our ever-improving train protection systems.

The roads don’t offer the same level of discipline, and the risk to car occupants is 20 times bigger than rail passengers. Five people die on Britain’s roads every day, some of whom will undoubtedly be on their way to or from, or travelling for work. Trains usually only go where the rails and signals tell them to; cars are driven ‘on-sight’.

There are many different occasions when rail staff need to drive on the roads. It could be to get to and from work, between worksites, offices, depots, or even to the scene of an incident. It might be in a car personally owned, or hired. It might be in the company branded works van or a taxi or minibus with someone else in control.

RSSB supports a strategic cross-industry Road Risk Group (RRG), which discusses the key issues, works out ways of plugging the ‘risk gap’ and looks out for good practice ideas.

- Speed is one of the main factors in fatal road accidents. Sticking to the speed limit dramatically reduces the chances of a crash. For more information, see http://think.direct.gov.uk/speed.html
- Commercial vehicle drivers are considerably less likely to wear a seat belt that private (personal use) drivers. DfT research shows that only 69% of commercial drivers wear a seatbelt, and 68% of passengers.
9.1 A question of data

Although the rail industry is taking a closer look at road driving, under-reporting continues to be a problem, and it’s hard to focus resource if you aren’t fully aware of the size of the issue you’re dealing with.

An RSSB survey of rail organisations in 2013 revealed 500 road traffic collisions, 100 injuries and 5 fatalities in one year, based on a response representing about a third of the industry. These figures are higher than the official data in SMIS.

As a result, in September 2015 RSSB clarified that employee or contractors’ employee accidents involving travelling by road vehicle for rail purposes should be input to SMIS, in line with the relevant Railway Group Standard.22

This covers an infrastructure manager or railway undertaking employee or contractor’s employee while travelling by road vehicle for work purposes – that is to say, any occasion when a road vehicle is being driven in connection with a work activity, other than commuting between the driver’s home and their normal place of work.

The map above shows how work-related journeys are covered by health and safety legislation, but different types of companies will have had different traditions and processes for reporting incidents.

22 GE/RT 8047 (Reporting of safety related information).
This means that the models and numbers used by analysts and safety directors will underestimate the risk.

The hope is that, following the clarification, we will see more comprehensive reporting of incidents into the industry’s reporting systems.

- Are you aware of your own company arrangements for managing road risk?

9.2 What do the numbers say (now)?

- There were no workforce fatalities in road traffic accidents in 2015/16. There were, however, seven major injuries, 113 minor injuries and 22 cases of shock/trauma reported. This equates to 1.1 FWI, compared with the 2.7 FWI (two fatalities) occurring in 2014/15.
- The chart below shows there to have been a notably higher level of reported harm over the latter half of the last decade; this is likely to reflect increased awareness and reporting, rather than increased risk.

Road driving safety at a glance

- All the fatalities recorded in 2015/16 involved infrastructure workers. The nature of infrastructure work involves a relatively large amount of driving to or from different sites, which may be some distance away. Although there are rules and guidelines which are there to avoid fatigue, there are challenges to managing such risks out in the field. Even with good practice in this area, the risk from road driving cannot be eliminated.
- Train crew and station staff are also exposed to road driving risk, but tend to travel less frequently by road between sites. Passengers are also subject to road driving risk when travelling on replacement bus services. Furthermore, transport is more likely to be provided by external

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23 Since the ASPR completion date (30 June 2016), there has been one in-scope workforce fatality in a road traffic accident.
companies, so they are not as likely to be exposed to the risk from fatigue (though the risk from third party action is common to all).

9.3  Good practice ideas

9.3.1  Fighting fatigue

Studies have shown fatigue to be a factor in a number of road-related accidents.

In January 2012, the ORR published Managing rail staff fatigue, a new guidance for employers, which covers all rail worker types and includes a useful checklist. RSSB has also published a fatigue management good practice guide to help industry stakeholders comply with their obligations in this area.\(^{24}\)

An industry steering group, including Network Rail, Balfour Beatty, the ORR and the Health and Safety Executive, also commissioned RSSB to undertake research to get a better understanding of road vehicle driver fatigue.

The project (T997 Managing occupational road risk associated with road vehicle driver fatigue) has led to the publication of rail industry-specific guidance documents to help staff and managers identify the risk of fatigue when driving, how to recognise the warning signs and cope with this issue. The documents have been distributed to rail companies, along with reminder sheets for staff to keep in the car and awareness-raising posters to put up in canteens, foyers and mess rooms.\(^{25}\)

Managers will also be encouraged to ensure that the potential for road vehicle driver fatigue is incorporated into job design, rostering, work risk assessments, and travel planning.

RED 35, issued in January 2013 (see panel), used its usual format of a dramatic reconstruction to focus the minds of people at briefings to the issues involved. The reality is that, although often a ‘grey area’, both company and individual have responsibilities to prevent such accidents.

By helping drivers and their managers identify risks and implement mitigations that are practical and feasible in the rail environment, this project will help reduce fatigue-related road vehicle accidents, the harm that arises from them, and their associated costs.

More information on fatigue may be found in RSSB’s special topic report, Fatigue and its contribution to railway incidents.

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\(^{24}\) Namely, Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) (ROGS) – ‘Regulation 25 – Fatigue’.

\(^{25}\) Other RSSB research projects have considered fatigue: See also T1082 (Developing fitness for duty checks and predicting the risk of experiencing fatigue), T1083 (Preparing rail industry guidance on biomathematical fatigue models) and T1084 (Preparing guidance on fatigue control options for first night shifts).
9.3.2 Tyre blowout on rail-owned road vehicle leads to near miss on M25

At around 16:45 on 7 January 2016, a Conway van pulled up on the hard shoulder of the M25, having suffered a tyre blowout.

As the driver was making a check, a lorry bore down on him.

Its wing mirror clipped the van, became dislodged and struck the Conway driver, causing minor aches and pains.

Though swerving to avoid a collision, the lorry failed to stop.

As a result of the incident, Conway has issued the following advice to drivers:

- Never get out of your vehicle on the traffic side; always use the passenger door.
- After leaving your vehicle, always place yourself in a position of safety, getting on to the non-traffic side of any safety barrier (if present).
- Contact your line manager and inform them of the situation; they will make the necessary rescue arrangements.
- Don’t try to investigate the issue or make a repair.

- Many road accidents are caused by third party action – do you include evasive and defensive driving techniques in your road driver training package?
- It’s good to be prepared, but do you even need to drive?
10 Lessons learnt in 2015/16 – level crossings

Level crossings date back to the earliest horse-drawn tramway systems. Some of Tyneside’s eighteenth-century wooden wagonways also had gated crossing points from which a ‘keeper’ would oversee manoeuvres. Originally, the gates were kept closed across the line, but in 1834 the Liverpool & Manchester Railway started to block the road during the daytime.

Some 170 years on, and level crossings remain a key interface between the public and the railway. Most of the risk arises from user behaviour, though this doesn’t diminish the industry’s need to consider reasonably practicable ways to deal with it. We also have a duty to ensure that our signs and controls are fit for purpose and that our operations allow users to understand and follow them.

10.1 Crossing design

All level crossings are designed to be safe if used correctly. Sometimes, however, the way in which new designs are introduced can cause problems. This was evident in the incident at Hixon Automatic Half-Barrier (AHB) crossing on 6 January 1968. Here, a slow-moving low loader was struck by an express at around 75 mph. Eleven people were killed.

The official investigation highlighted poor communications between both railway and police and railway and haulier about the need to telephone the signaller when taking slow-moving vehicles over an AHB. But though it cited inadequate signs and poor police training as part of the causal chain, it found the ‘origin of the accident’ to be ‘in the failure of officers of both the Ministry [of Transport] and British Railways in collaboration to appreciate the measures necessary to deal with a hazard of which they were aware’.

In short, they had not taken due account of all the risks that introducing an automatic crossing might bring.26

Collision at Oakwood Farm

On 14 May 2015, a passenger train collided with a tractor at Oakwood Farm UWC near Knaresborough. The train, which was travelling at 65 mph, did not derail, but the impact caused the front of the tractor to become detached from its cab.

The tractor driver suffered minor injuries; the train driver was treated for shock. In different circumstances, though, the consequences could have been much worse.

The tractor driver began crossing the railway after the illuminated warning at the crossing started to display a red light. This was probably because he was unfamiliar with the crossing’s operation – it is one of a small number in the country fitted with remotely operated, powered gates.

26 The first AHB came into use at Spath, near Uttoxeter, on 5 February 1961.
What did RAIB say?

It’s likely that the tractor driver did not recheck the warning lights after first stopping on the approach to the crossing to press a button to open the gates. This button had not originally been intended to open the gates (it should only have been capable of being used to close them). It was situated such a distance from the crossing that the time it took for the tractor driver to stop, open the gates and then drive on to the crossing was greater than the time between the warning light turning red and the arrival of the train.

There was no sign at the button to warn the driver to recheck the warning light before going over the crossing, and that the warning light was not conspicuous among the many signs present.

Furthermore, Network Rail did not ensure the risks at Oakwood Farm were adequately mitigated, and that the process for the introduction of the gate operating equipment was adequately managed.

Network Rail’s retention of records relating to the acceptance of the power operated gate opening (POGO) equipment was insufficient to show the basis on which decisions were made during the history of the trials, and was not in accordance with its own standard.27

The retention of records relating to the acceptance of the POGO equipment at Oakwood Farm UWC was insufficient to show the basis on which decisions were made during the history of the trials.

What’s been done?

On 22 July 2015, the route level crossing manager responsible for Oakwood Farm UWC issued a paper to the level crossing team outlining short-term and medium/long-term actions to be taken at the interface. These included:

- Meeting with the authorised user to discuss his legal responsibilities for invited crossing users, and to discuss how risks could be managed;
- Producing a briefing pack for the authorised user to enable him to brief his contractors;
- Discussing with the authorised user the options for the closure of the crossing;
- Reviewing the crossing’s signs and approaches to determine any enhancements to highlight the risks; and
- Replacing the current POGO equipment with the new nationally approved equipment.

RAIB also recommended:

- Undertaking a comprehensive review of the safety of the crossing at Oakwood Farm UWC;
- Developing and implementing a programme for a timely review of the safety of other UWCs fitted with POGO equipment and those that will be so fitted in the future; and
- Reviewing the robustness of the processes for accepting new equipment and technology to the railway.

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27 NR/L2/RSE/100/05 (Product introduction and change).
10.2 Signaller error

It is rare for a signaller to make a mistake that leads to a loss of life. Lessons learnt virtually since railways began mean that not only has our understanding of keeping trains a safe distance apart improved, but so has the technology designed to help us do it.

Occasionally, however, there can be instances when our controls break down, and when “the holes in the cheese slices” align.

Such was the case on 16 January 2010, when a collision occurred between a passenger train and two cars on the level crossing at Moreton-on-Lugg, near Hereford. A passenger in one of the cars was killed.

The signaller raised the barriers in error when the train was too close to be able to stop before reaching the crossing. He’d just been involved in a telephone call from another crossing (about the movement of sheep to a field in an area where this did not normally happen) and it had interrupted his normal task of monitoring the passage of the train. As a result, he believed that the train had already gone.

There was no safeguard in the signalling system to prevent this from happening. There was no plan to fit such a safeguard, and no industry requirement to formally consider the safety benefits of one.

Tractor collision at Hockham Road

At 12:30 on Sunday 10 April 2016 a Norwich–Cambridge service collided with a tractor and trailer at Hockham Road level crossing. The tractor driver was seriously injured; the train driver and several passengers received minor injuries. The tractor was destroyed, and the train was badly damaged.

Hockham Road level crossing, which is on a private road near Thetford, Norfolk, also carries a public footpath. Vehicle users must open and close the gates themselves and, at the time of the accident, had to use the telephone to obtain permission from a signaller at Cambridge before crossing.

In 2012, the crossing had been provided with red and green lights, which informed users whether it was safe to cross, but this equipment had been intentionally decommissioned.

The tractor driver was given permission to traverse, and had got half-way across when his vehicle was struck by the train, which was travelling at 84 mph.

The trailer separated from the tractor and struck the side of the unit several times, breaking windows and puncturing the outer body, before coming to rest at the lineside. The cab of the train was severely deformed by the impact, and the driver’s door had broken away.

As well as looking at the crossing equipment and the performance of the train, RAIB says it will also be considering ‘any factors which may have influenced the actions of the people involved [and] the method of authorising vehicles to use the crossing’.
Near miss at Dock Lane

At 13:25 on 14 June 2016, a Lowestoft–Ipswich service narrowly missed a member of the public who was in the process of opening the vehicle gates at Dock Lane user-worked crossing (UWC). There were no injuries and no damage to the train or infrastructure.

At a UWC, vehicle users must use the telephone to call the signaller to obtain permission to pass before they open the gates. At Dock Lane, the signaller is situated at Saxmundham.

The member of the public was the driver of a vehicle waiting to cross the railway. A passenger in the car had called the signaller who gave permission for the vehicle to cross. The driver had opened the near side gate and was walking onto the crossing to open the far gate when the passenger, who had heard the approaching train, shouted, prompting the car driver to stop. The 12:07 Lowestoft–Ipswich then passed, narrowly missing the car driver.

Again, RAIB will look at the history of the crossing and its suitability. However, it will also consider ‘any factors which may have influenced the signaller’s actions, including workload’.

10.3 User behaviour

As noted at the beginning of this chapter, most level crossing risk relates to the behaviour of those using it. There are recorded cases of cars trying to race trains, people running after dogs in front of trains, and even instances of satellite navigation systems guiding car drivers to turn onto the railway instead of keeping to the road.

A case in point may have occurred at around 12:25 on 23 February 2016, when a pedestrian was struck and killed by a train on Grimston Lane footpath crossing.

The age and health of the pedestrian meant that he fell into the category of people considered, by Network Rail’s guidance, to be ‘vulnerable users’. Network Rail’s assessment of the user group for the crossing did not identify the need to make an additional time allowance for vulnerable users at the crossing. However, as the sighting time for approaching trains was sufficient even if such an allowance had been made, this was not causal to the accident.

RAIB highlighted the following learning point:

- The pedestrian may have looked for approaching trains before he reached the point at which he had the best safe view of them. This may have considerably reduced his sighting distance. RSSB research project T984 recognised that there are many factors that affect where a user...
of a passive level crossing makes a decision to cross the railway and that, in some cases, the concept of the decision point being at a single defined location is unrealistic. The adoption of findings from project T984, including the use of markings to highlight danger zones rather than designated decision points, may encourage users to make decisions when they have adequate information about approaching trains and, therefore, whether it is safe for them to cross.

RAIB also recommended:

- Identifying the effects of skewed alignment at passive level crossings on user behaviour, including the sighting of approaching trains;
- Reviewing the processes and guidance for level crossing risk management to determine whether the impact of skewed alignment is sufficiently taken into account;
- Making necessary changes to the processes, guidance and training given to level crossing managers.
- Reviewing the criteria for determining when it is appropriate to include an allowance for vulnerable users when calculating the required warning time at level crossings used by pedestrians.

10.4 What do the numbers say?

On the surface, the statistical picture is good. Indeed, the overall level of harm at level crossings was 3.7 FWI in 2015/16, which compares well with the 11.8 FWI for 2014/15.

Furthermore, there were three fatalities at level crossing during 2015/16. This is the lowest number of level crossing fatalities recorded since 1996/97. Similarly, at four, the number of train collisions with vehicles at level crossings was the lowest over the last ten years, while the recorded number of near misses with vehicles continues to show a reducing trend.

Nevertheless, RAIB notes that it is still vital that the industry continues to address some of the areas of weakness in existing risk control measures. In particular, it says, the poor audibility of train horns on the approach to certain footpath and bridleway crossings, and the need to review how the occupants of road vehicles interact with user worked crossings (including the sighting of approaching trains from inside road vehicles). Regarding the first of these, RAIB is following with interest Network Rail’s testing of audible alarms located at certain crossings to supplement the sound of the train horn.

In fact, Network Rail has been allocated a ring-fenced fund of £99 million to invest in closures and upgrades during Control Period 5 (2014-19). It has also recruited over 100 dedicated level crossing managers.

More than 800 crossings have been closed since 2010, but this is becoming increasingly difficult, it being often the case that delays occur while seeking planning approvals – sometimes in the face of local opposition.

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28 All were pedestrian users.
Level crossing safety at a glance

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<th>Risk in context (SRMv8.1)</th>
<th>Trend in harm</th>
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<tbody>
<tr>
<td>Other accidental risk (128.2 FWI; 92%)</td>
<td>Level crossing risk (11.4 FWI; 8%)</td>
</tr>
</tbody>
</table>

For more statistical analysis on public risk, see Chapter 7 of the ASPR.

10.5 Research and development

Since 2001, RSSB has managed and published 42 research reports related to level crossings and other road rail interface issues such as bridge strikes, mainly focussed on improving safety at the interface. A list of all the research is below. One project is still in progress, namely T936 Enhancing the accuracy and functionality of the All Level Crossing Risk Model (ALCRM). This is designed to update the algorithms which drive the risk model used by Network Rail to understand the risk profile at each of its 6000+ level crossings and to manage them efficiently, reducing risk so far as is reasonably practical. Once the research has been completed, the intention is that the model’s ownership will be transferred (from RSSB/Network Rail joint ownership) to Network Rail, which will be solely responsible for future upgrades and development. The assumption is that RSSB will cease research on this area in the future, leaving Network Rail to lead any further activities, given its sole responsibility for implementation.

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<td>T1006</td>
<td>Enhancing the accuracy and functionality of the AXIAT level crossing tool</td>
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<tr>
<td>T936</td>
<td>Enhancing the accuracy and functionality of the All Level Crossing Risk Model (ALCRM)</td>
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</table>
11 Lessons learnt – health and wellbeing

We all want to feel healthy. We all want to feel well. That’s what our passengers and paymasters want too, as a healthy worker is a good, efficient worker. But what exactly do we in the rail industry mean by ‘health and wellbeing’?

Essentially, we consider it to have three fundamental elements:

- The effect of work on health (eg airborne contaminants, asbestos, musculoskeletal disorders, mental health)
- Fitness for work (eg safety critical tasks, drugs and alcohol testing, health assessments)
- General wellbeing (eg obesity, smoking, sickness absence management, rehabilitation)

11.1 What are the risks?

Chapter 6 presented ISLG’s findings on work-related pressures, much of which led to health and wellbeing issues for those involved. Below, however, are the main health and wellbeing issues faced by the wider GB rail industry:

**Individual mental health** – In any working week, almost 1-in-6 people of working age have a diagnosable mental health condition. Furthermore, 19% of long-term sickness absence in England is attributed to mental ill health, meaning that each year mental ill-health costs the economy an estimated £70 billion.

**Work-related ill health** – Work-related ill health in rail is at a similar level to that seen in construction, which is one of the highest health-risk industries. Rail workers have higher rates of work-related respiratory diseases than the wider working population, while 33% of English long-term sickness absence is attributed to musculoskeletal disorders.

**Health risk management** – Because of how data on work-related ill health is currently reported by specialist physicians and consultants, it’s thought that the number of occupational cancer cases reported by physicians or assessed for compensation cases is only the tip of the iceberg.

**Individual physical health** – Long-term conditions and limiting long-term conditions are more prevalent in older people. In the coming years, our workforce is projected to get older. In 2016, the average age was 39; by 2030, it will be 43. By 2030, 40% of the working age population will have a long-term health condition – this will effect availability and performance at work.

**Productivity** – The UK has an employee engagement deficit. Survey after survey had shown that only around one-third of UK workers say they are engaged – a figure that leaves the UK ranked ninth for engagement levels amongst the world’s twelfth largest economies. Wellbeing and engagement have been shown to be inextricably linked.

**Safety and health** – It has been identified that approximately 70% of common work-related stressors are also potential root causes of accidents.

**Health Data** – Industry research agrees that the true cost of occupational ill health to business does not seem to be well understood, and that accurate data on occupational ill health within the rail industry are difficult to obtain. In regards to the management of safety within rail, the benefits
of cross-industry safety data collection over the last two decades can quite clearly be seen. This performance is desirable for health.

Should activity increase in health and wellbeing, GB rail companies can begin to access some of the £316 million estimated to be lost to the industry each year through direct and indirect sickness absence. This figure rises to £790 million a year when the additional costs of health are brought into consideration. Health and wellbeing activities will also mitigate the predicted huge increase of the costs identified as the effects of an aging, less healthy and longer working workforce become a strain on society.

A 5% cut in the overall costs of impaired health through the capability improvements found within LSHBR would realise a saving of £40 million a year to industry, whilst improving the working lives of its staff.

Better performance in health and wellbeing will reduce industry health and safety risk, improve employee engagement and employee relationships and therefore improve customer satisfaction.

11.2 Case studies

11.2.1 The trouble with depression?

*It happened at the weekend. You were out in the garden, digging the weeds when you stood up a bit too fast and did your back in. When you got to work on Monday morning, you got nothing but sympathy.*

*It happened at the weekend. You look at the garden and know you should be out digging up the weeds, but you just can’t get going. You’re meant to be meeting friends later, but you think you might cancel. You don’t want to let people down, but you just can’t get excited about anything at the moment.*

The two cases are similar, there being little difference between a physical condition and a mental one, but how different the reaction. One gets offers of a chair, a nice up of tea, a soft cushion. The other, more likely, gets told to ‘get on with it’. That’s if anyone mentions it at all...

The Germanwings plane crash of March 2015 brought to light many inaccurate attitudes to mental health, but it also raised certain questions for us. Many operators started asking if a similar incident could happen on the railways: could a driver deliberately choose to crash a train and potentially harm, injure or kill the passengers and crew on board? Though TPWS makes that unlikely, some suggested that all safety critical staff should be screened.

However, we need to remember that the Germanwings incident – though catastrophic – was exceptionally rare.

We also need to understand that depression is one of the most common mental health issues, so it’s very unlikely indeed to have been the sole cause of the pilot’s actions.
Furthermore, the type of mild-moderate depression that would be picked up by a generic screening measure would not provide any further information on the likely risk levels. It would do little other than eat into your safety budget, with little to show for it.

So what can be done? The green box below presents the recommendations of the rail industry’s Health and Wellbeing Professions Committee, which has been set up to provide specialist/expert advice to enhance rail industry’s health and wellbeing strategies.

### Recommendations of the Health and Wellbeing Professions Committee (HWProC)

- **Unannounced drug and alcohol testing** – All safety critical employees should be subject to a programme of unpredictable, mandatory unannounced drug and alcohol testing with no warning given about when the testing will take place.
- **Employer requirement for disclosure** – The employee contract, code of conduct or similar requires disclosure of medications and illnesses which may affect safe working.
- **Employer provision of safe reporting** – Employees can report medical concerns as required above, other issues that may affect safety and any ‘near-misses’, having an assurance that their treatment will be proportionate, fair and equitable.

### Additional consideration

The HWProC highlights an additional ‘best practice’ recommendation, which it would encourage the railway industry to consider:

- Introducing the ‘sign off’ of an employee’s pre-employment questionnaire by their GP.

As part of a pre-employment assessment, an employee applying for a safety critical role will complete a health declaration questionnaire and then obtain confirmation from their GP that the contents are accurate and complete. The GP will also be asked if they have any concerns about suitability. This is routine practice in other industries where safety is paramount.

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### 11.2.2 Glasgow bin lorry

On 22 December 2014, a 26-tonne dustcart collided with pedestrians in Queen Street, Glasgow, killing six and injuring 15 others.

Via RSSB, the GB rail industry has considered the incident from the perspective of:

- Train driving and other safety critical operational roles, and
- Road vehicle driving by rail employees.
What happened?

The accident occurred at around 14:30. The driver of the council-owned vehicle, 58-year-old Harry Clarke, said he passed out at the wheel. He’d also blacked out while driving a bus in April 2010, but did not disclose the incident on his heavy goods vehicle (HGV) licence renewal application.

Clarke was later diagnosed as having suffered neurocardiogenic syncope, a fainting episode caused by drop in blood pressure that is difficult to diagnose, and may therefore not have shown up on his medical history and featured in any risk assessment involving his fitness to drive. However, the Driver and Vehicle Licensing Agency (DVLA) policy was that, had it been notified of his becoming unconscious at the wheel in 2010, it may have revoked his licence for 12 months.

After the police investigation, the Crown Office concluded that no criminal charges would be brought against either Clarke or the council. It had been determined that Clarke did not have the necessary criminal intent. There was also insufficient evidence to prove it was foreseeable that he would lose consciousness whilst driving that day. There had been no indication of his being unwell that day either.

Furthermore, there was insufficient evidence to establish that Clarke had intended to cover up a condition which made him unsafe to drive, for the purposes of deceiving his employers and the DVLA. He had advised his Occupational Health doctor of the April 2010 incident at the time and this information was available in his medical and employment records. Furthermore, he had never been advised of being unfit to drive or to notify the DVLA of the earlier incident.

On 25 June 2015, the DVLA withdrew Clarke’s car-driving licence for medical reasons and banned him from driving HGVs for ten years.

Consistent with the Work Related Death’s Protocol (Scotland), it was decided that a Fatal Accident Inquiry (FAI) would be held to determine the cause of the crash and establish what lessons could be learned.

The inquiry

The FAI began at Glasgow Sheriff Court on 22 July 2015 before Sheriff John Beckett QC. It found that there were no mechanical faults with the vehicle and that the other two crew members present would have been unable to apply the handbrake as they were wearing seatbelts. No other safety devices were fitted to the vehicle that would have allowed a crew member not in the driver’s seat to stop the vehicle.

- This incident has highlighted the importance of the employee’s responsibility to disclose health and wellbeing issues that may affect them in the course of their (safety critical) work, a point which was also a feature of RAIB’s investigation into the collision at Norwich on 21 July 2013.
- There is a risk from the hiding of medical conditions, but the encouragement of honest disclosure is vital, and should be supported by consistent standards across all sectors of the industry.
- Are your policies for dealing with these issues sufficiently robust?
### Glossary

For a full list of definitions, see the *Annual Safety Performance Report*.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Expansion</th>
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<tr>
<td>AHB</td>
<td>automatic half-barrier crossing</td>
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<tr>
<td>AOCL</td>
<td>automatic open crossing, locally monitored</td>
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<tr>
<td>ASPR</td>
<td>Annual Safety Performance Report</td>
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<td>BTP</td>
<td>British Transport Police</td>
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<td>CCS</td>
<td>Close call system</td>
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<td>CIRAS</td>
<td>Confidential Incident Reporting and Analysis System</td>
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<td>COSS</td>
<td>controller of site safety</td>
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<td>ERTMS</td>
<td>European Rail Traffic Management System</td>
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<td>FWI</td>
<td>fatalities and weighted injuries</td>
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<td>GB</td>
<td>Great Britain</td>
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<td>GSM-R</td>
<td>Global System for Mobile communications – Railway</td>
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<td>HSE</td>
<td>Health &amp; Safety Executive</td>
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<td>IFCS</td>
<td>Incident Factor Classification System</td>
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<td>ISLG</td>
<td>Infrastructure Safety Liaison Group</td>
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<td>LHSBR</td>
<td>Leading health and safety on Britain’s railway</td>
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<td>LOE</td>
<td>Learning from operational experience</td>
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<tr>
<td>LUL</td>
<td>London Underground Ltd</td>
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<tr>
<td>MOM</td>
<td>mobile operations manager</td>
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<td>NRMI</td>
<td>Network Rail managed infrastructure</td>
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<td>OFG</td>
<td>Operations Focus Group</td>
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<td>OHLE</td>
<td>overhead line equipment</td>
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<td>ORR</td>
<td>Office of Rail and Road</td>
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<td>PHRTA</td>
<td>potentially higher-risk train accident</td>
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<td>PICOP</td>
<td>person in charge of possession</td>
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<td>PIM</td>
<td>Precursor Indicator Model</td>
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<td>PTI</td>
<td>platform train interface</td>
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<td>RAIB</td>
<td>Rail Accident Investigation Branch</td>
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<td>RGS</td>
<td>Railway Group Standard</td>
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<td>RIDDOR</td>
<td>Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995</td>
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<td>RRV</td>
<td>road–rail vehicle</td>
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<td>RSSB</td>
<td>Rail Safety and Standards Board</td>
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<tr>
<td>SMIS</td>
<td>Safety Management Information System</td>
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<tr>
<td>SPAD</td>
<td>Signal Passed at Danger (without authority)</td>
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<tr>
<td>TOC</td>
<td>train operating company</td>
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<tr>
<td>TARG</td>
<td>Train Accidents Risk Group</td>
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<td>TPWS</td>
<td>train protection and warning system</td>
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<tr>
<td>UK</td>
<td>United Kingdom of Great Britain and Northern Ireland</td>
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<tr>
<td>UWC</td>
<td>user-worked crossing</td>
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