



## Half-year safety performance report 2011/12

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### Executive summary

#### Introduction

This is RSSB's half-year Safety Performance Report for the financial year 2011/12, covering 1 April to 30 September 2011. RSSB produces safety performance reports on a financial year basis for consistency with Control Period 4, its associated High Level Output Specification (HLOS) and the Railway Strategic Safety Plan (SSP) for 2009-14.

#### Half-year headlines

- There were no passenger or workforce fatalities due to train accidents in the half-year.
- There was one passenger fatality, which was due to a fall from the platform edge. There was one workforce fatality, which resulted from a road traffic accident while on duty.
- At 13, the number of potentially higher risk train accidents was a slight increase on the 10 occurring in the 2010/11 half-year. The level is still much lower than any half-year prior to 2010/11.
- At the end of September 2011, the Precursor Indicator Model (PIM) indicator relating to train accidents stood at 47.5, compared with 48.1 at the end of 2010/11. The risk from signals passed at danger stands at 70% of the baseline level at September 2006.
- At 19.5 FWI (one fatality), the level of passenger harm for the half-year was an 18% decrease on the 23.8 FWI (seven fatalities) for the same period last year. There was an increase in weighted injuries (1.6 FWI) in the current half-year, especially major injuries as a result of slips, trips and falls, and incidents at the platform-train interface.
- At 11.8 FWI (one fatality) the level of workforce harm for the half-year was a 10% increase on the 10.7 FWI (one fatality) for the same period last year. There was one workforce fatality in both periods.
- Harm to members of the public increased from 13.0 FWI (11 fatalities) in the first six months of 2010/11 to 28.9 FWI (27 fatalities) in the current half-year. The harm in 2010/11 was exceptionally low and has since returned to average level seen before 2010/11; of the 27 fatalities, 22 were trespassers, three were pedestrians at level crossings and two were on station platforms.
- The total level of harm occurring during the first half-year (excluding suicides) was 60.1 FWI (29 fatalities), which is 26% higher than the level of 47.6 FWI (19 fatalities) for the same period last year, owing to the rise in the number of public fatalities.
- There were 110 suicides in the current half-year compared with 109 in the same period in 2010/11. Suicide numbers are subject to revision, as more information (e.g. from BTP or coroners' reports) becomes available.
- Overall, there is evidence that the industry is delivering on the majority of the trajectories published in the 2009-14 SSP. In addition, review of the passenger and workforce metrics defined by the HLOS show progress to be consistent with the requirement of the HLOS targets.

#### Summary

Overall, safety performance during the first half of 2011/12 was different from that seen during the same period in 2010/11. There were more public fatalities during the first six months of the year than for the previous year, although the level recorded in 2010/11 was exceptionally low. In contrast, there were fewer passenger fatalities and a relatively low number of PHRTAs. When looking at numbers over shorter, six-month, periods, statistical variation has a greater effect; the situation will continue to be monitored.



# 1 Introduction

This is RSSB's safety performance report for the first half of the financial year 2011/12. RSSB produces safety performance reports on a financial year basis for consistency with Control Period 4 (CP4), its associated High Level Output Specification (HLOS) and the Railway Strategic Safety Plan (SSP) for 2009-14.

The report reviews the performance levels achieved during the first six months of the financial year. It presents the trends in harm to passengers, the workforce and members of the public.

The aim is to present information on current railway safety performance, with reference to the trajectories identified in the SSP. The SSP is a joint statement by the companies responsible for Britain's mainline rail network, setting out an agreed industry approach to managing railway safety. The report also presents the results of monitoring against the HLOS safety metrics.

## 1.1 Report scope

The report considers safety performance on the railway network of Great Britain and is based on safety data up to the end of September 2011. It should be noted that the figures are subject to change either as a result of late reporting of events into the industry's Safety Management Information System (SMIS) or as a result of additional information, such as coroners' verdicts, becoming available.

Harm and risk is assessed in terms of reported fatalities, major injuries and minor injuries and shock and trauma. When combining injury information into a composite measure, each fatality is given a weight of unity and each major injury a weight of 0.1. RIDDOR<sup>1</sup>-reportable minor injuries and the more severe cases of shock and trauma are given a weight of 0.005, with non RIDDOR-reportable minor injuries and less severe cases of shock and trauma being given a weight of 0.001. The combined total is called 'fatalities and weighted injuries' (FWI).

The analyses mostly relate to risk from incidents on or affecting stations and Network Rail managed infrastructure (NRMI)<sup>2</sup>. They also cover workforce fatalities occurring off NRMI but during working time (e.g. in a road traffic accident).

## 1.2 Data

Most of the data used in this report come from SMIS, but it is supplemented where appropriate with data from other sources, such as British Transport Police (BTP) and Network Rail. The data period for the 2011/12 half-year report is 1 April 2011 to 30 September 2011, with the data cut-off point being 7 November 2011, after which time changes to SMIS data will not be reflected in the report. We also update and revise previous years' data in the light of any new information, as and when appropriate.

As well as using the information supplied in SMIS, RSSB uses information from other sources, such as BTP, ORR and coroners' reports. This is to try to gain as much knowledge

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<sup>1</sup> RIDDOR: The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995.

<sup>2</sup> Fatalities and injuries on High Speed 1 (HS1) infrastructure are also included.

## Introduction

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of an event as possible, especially if extra categorisation is applied to it (as in the case of fatalities, for example).

### 1.2.1 Data quality

The value of any safety performance report depends to a large degree on the quality of the data on which it is based. Poor data quality can be due to a number of factors, including under-reporting, late reporting, or poor supply of information. RSSB is currently leading a data quality project, backed by the SMIS Programme Board, Network Rail and the Association of Train Operating Companies (ATOC) Operations Council, to continue to improve data quality. The project has led to demonstrable improvements in data quality since its start, in 2007.

### Categorising fatalities

It is important to distinguish between fatalities due to accidents and those due to suicide. A coroner's verdict is taken as the ultimate arbiter of this, but the verdict is often not reached until a year after the death, and even then may be returned as 'open'. In this situation, the rail industry makes a judgment (using the Ovenstone criteria) as to whether the event is more likely to have been a suicide than an accident. If there is no evidence to the contrary, the industry classes fatalities as accidental. This means that the numbers of trespass-related deaths and suicides (including suspected suicide) can change as and when more information becomes available. RSSB seeks out historical coroners' reports with the aim of reviewing past classifications. In our experience, the number of recorded accidental fatalities tends to decrease slightly as more information becomes available, while the number of suicides tends to increase slightly.

### RIDDOR reporting

In January 2011, RSSB published an independent review of RIDDOR reporting by Network Rail and its contractors. This review found that some 500 to 600 RIDDOR lost time injuries may not have been reported by Network Rail Infrastructure Projects and Maintenance over the five years from 2005/06 to 2009/10. This equates, in FWI terms, to an under-reporting of around 0.5 FWI per year. Since the report was published, the number of RIDDOR reportable minor injuries has increased, and is closer to the number that would be expected when considering the number of major injuries.

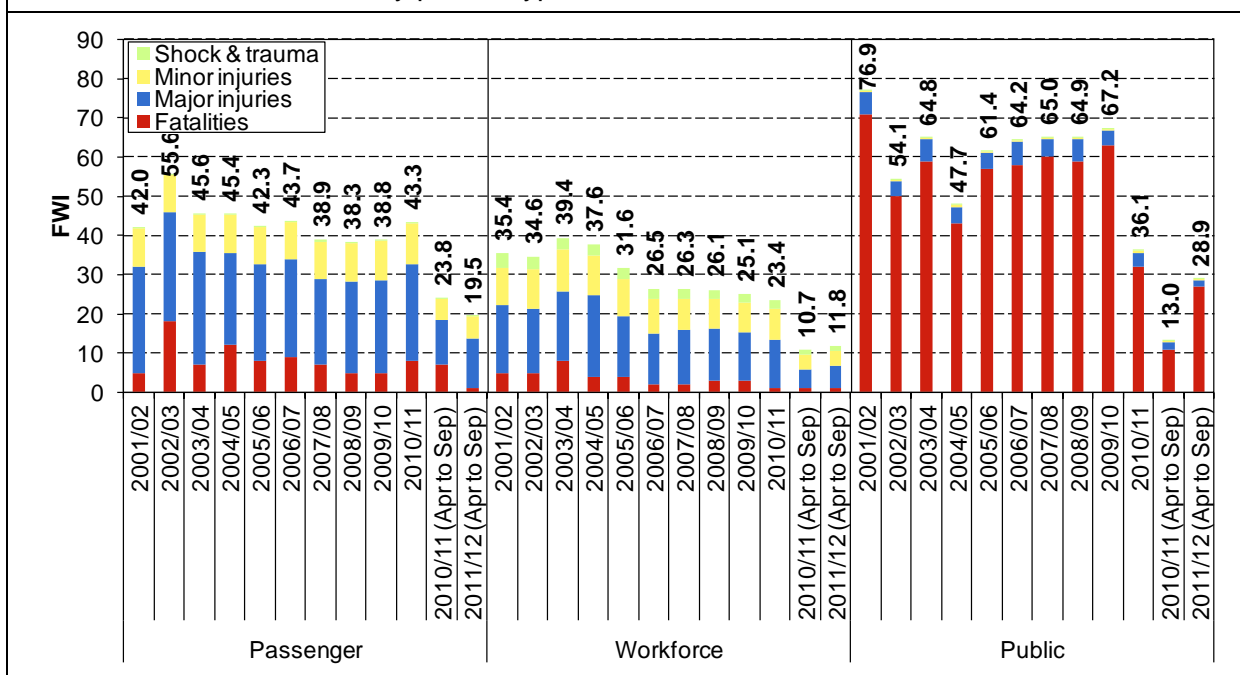
## 2 Review of trends in safety performance

This chapter presents an overall look at trends in injuries to all person types, up to the end of September 2011.

### 2.1 Overall trends in harm

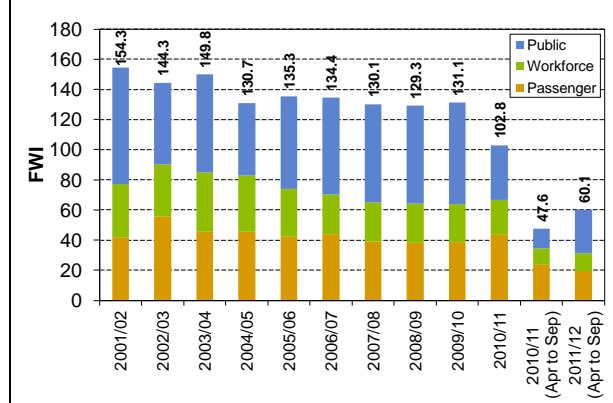
Levels of harm vary for different person types, as does the injury profile. For passengers and workforce, most of the harm arises from non-fatal injuries. The opposite is true for members of the public.

Chart 1. Trends in harm by person type



- After an increase in passenger harm in 2010/11, the current half-year shows a fall compared with the same period during 2010/11; there was one fatality in this period, compared to seven during the same period the previous year. There has been an increase in major injuries between these two periods.
- After a decrease in workforce harm in 2010/11, the harm in the current half-year is around 10% higher than the same period during 2010/11; there has been one workforce fatality during the first six months of 2011/12.
- The trend in harm to members of the public has been variable, and has been driven mostly by fluctuation in levels of trespass fatalities. Harm during current half-year is higher than last year, having seen 15 more fatalities, a level similar to years prior to 2010/11.
- At 60.1 FWI, the overall level of harm occurring during the first half-year is higher than the same period last year, due mainly to a higher number of public fatalities.

Chart 2. Trends in overall harm

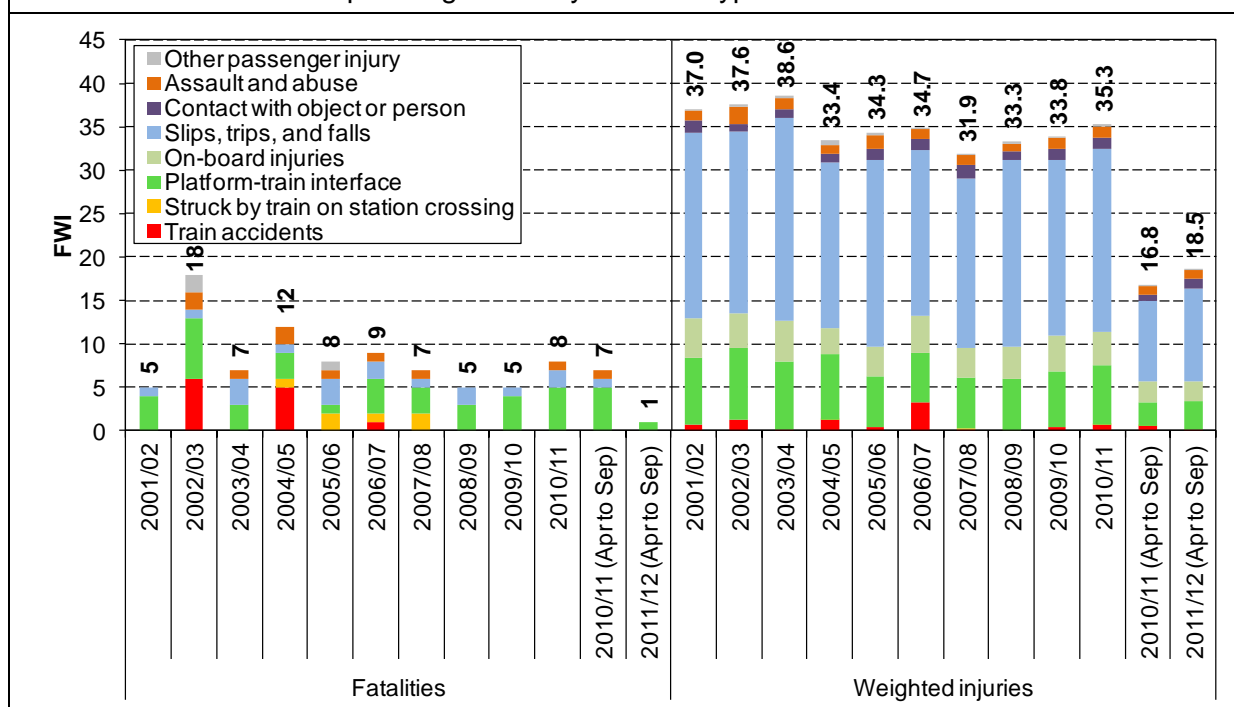


# Trends in safety performance

## 2.2 Passenger harm by accident type

During the first half-year of 2011/12, there was one accidental passenger fatality. On 3 August a passenger fell from the platform whilst under the influence and was struck by an incoming train. Appendix 1 provides more details.

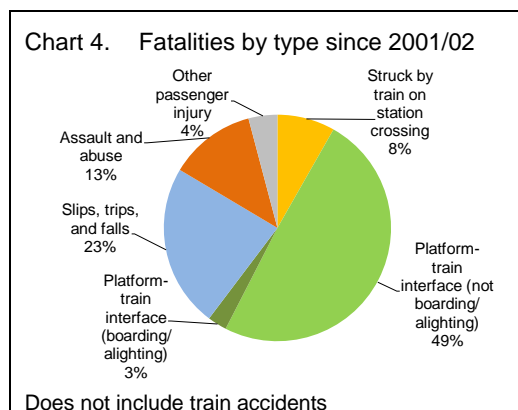
Chart 3. Trend in total passenger FWI by accident type



- The total passenger FWI is 20% lower in the current half-year compared with the same period in 2010/11, this is mainly due to there being six fewer fatalities.

- There has been an increase in weighted injuries in the current half-year, especially major injuries as a result of slips, trips and falls, and incidents at the platform-train interface (PTI). No major injuries occurred in train accidents during this period.

- The level of harm from assaults on passengers as recorded in SMIS each year averages around 2.2 FWI, which is smaller than the 8.1 FWI estimated by the SRM. This is because most non-fatal passenger assaults tend to be recorded by BTP, rather than SMIS.



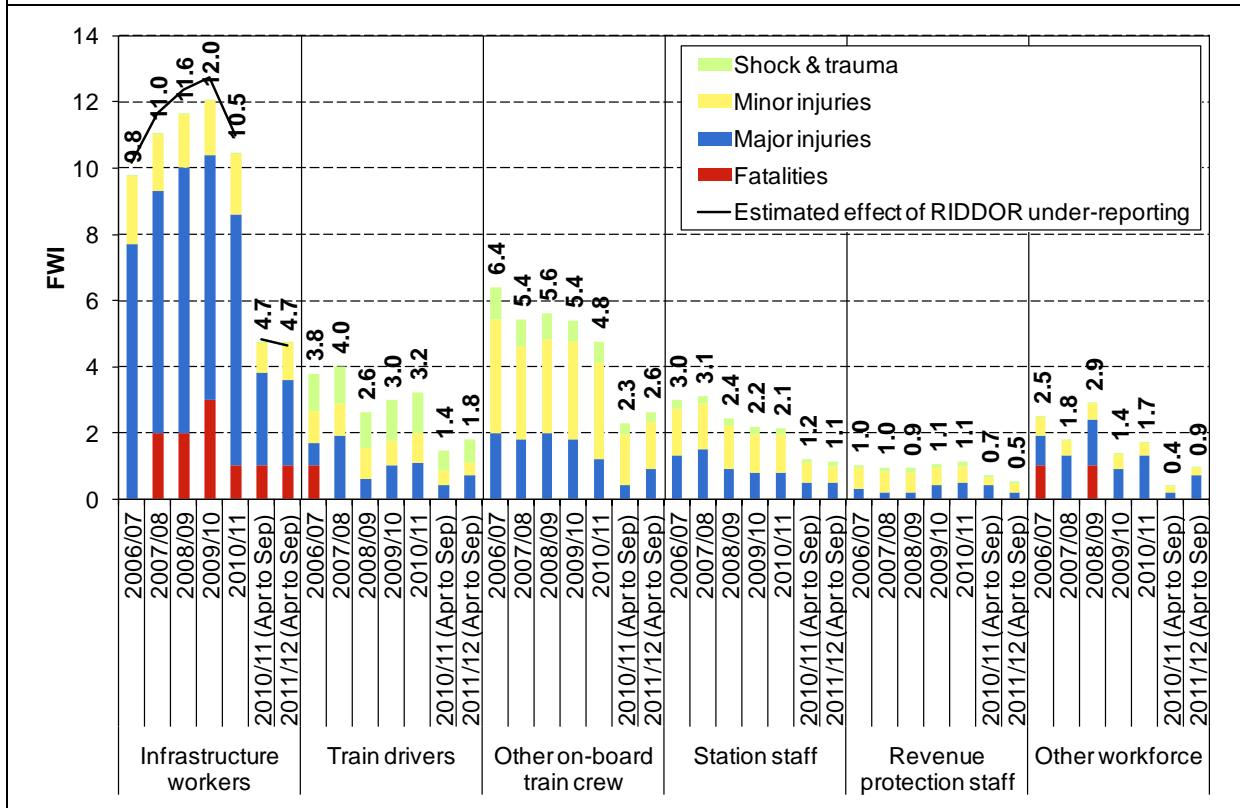
- The PTI has accounted for just over half of all passenger fatalities in personal accidents over the period shown in the chart<sup>3</sup>. The National Operations Focus Group (OFG) has established a PTI subgroup, which published a special topic report on the subject in June 2011. The OFG subgroup has now been expanded to cover the totality of passenger risk in stations with support from ATOC, and a Station Safety Project Manager has been appointed to manage the project.

<sup>3</sup> A further PTI related fatality occurred after the reporting period on 22 October, when a 16-year old girl fell between the train and the platform while running after a train.

### 2.3 Workforce harm by worker type

During the first half of 2011/12, there was one accidental workforce fatality. On 4 July, a member of staff on duty died in a road traffic accident at Kingussie.

Chart 5. Workforce fatalities and weighted injuries by type of worker



- Infrastructure workers suffer the greatest proportion of harm, with 43% of the total workforce harm over the period shown. After increasing for a number of years, the level of harm to infrastructure workers decreased in 2010/11, with an equal level in the current half-year to the same period in 2010/11<sup>4</sup>.
- Train drivers and other train crew have the next greatest proportion of harm, with 35% of the total workforce harm over the period shown, when combined. Minor injuries make up a much larger proportion of harm to these sectors of the workforce than others. The level of harm for other train crew has generally decreased since 2005/06, with a slight increase in the current half-year; the level of harm for train drivers has been increasing since 2008/09.
- Over the period shown, station staff have accounted for 10% of the total workforce harm. The level of harm to station staff has generally decreased over the period shown.
- Revenue protection staff and other staff<sup>5</sup> have recorded the lowest levels of harm over the period, at 4% and 8% respectively. However, their injury profiles are again very different, with other staff being involved in more fatalities and major injuries.

<sup>4</sup> The chart shows the estimated effects of the under-reporting of RIDDOR-reportable injuries by Network Rail and its contractors. The number of RIDDOR-reportable injuries reported in the current half-year was slightly higher than would be expected when considering the number of major injuries reported (the expected ratio is 3 RIDDOR reportable minor injuries to 1 major injury). In the previous five years there were fewer RIDDOR-reportable injuries reported than would be expected.

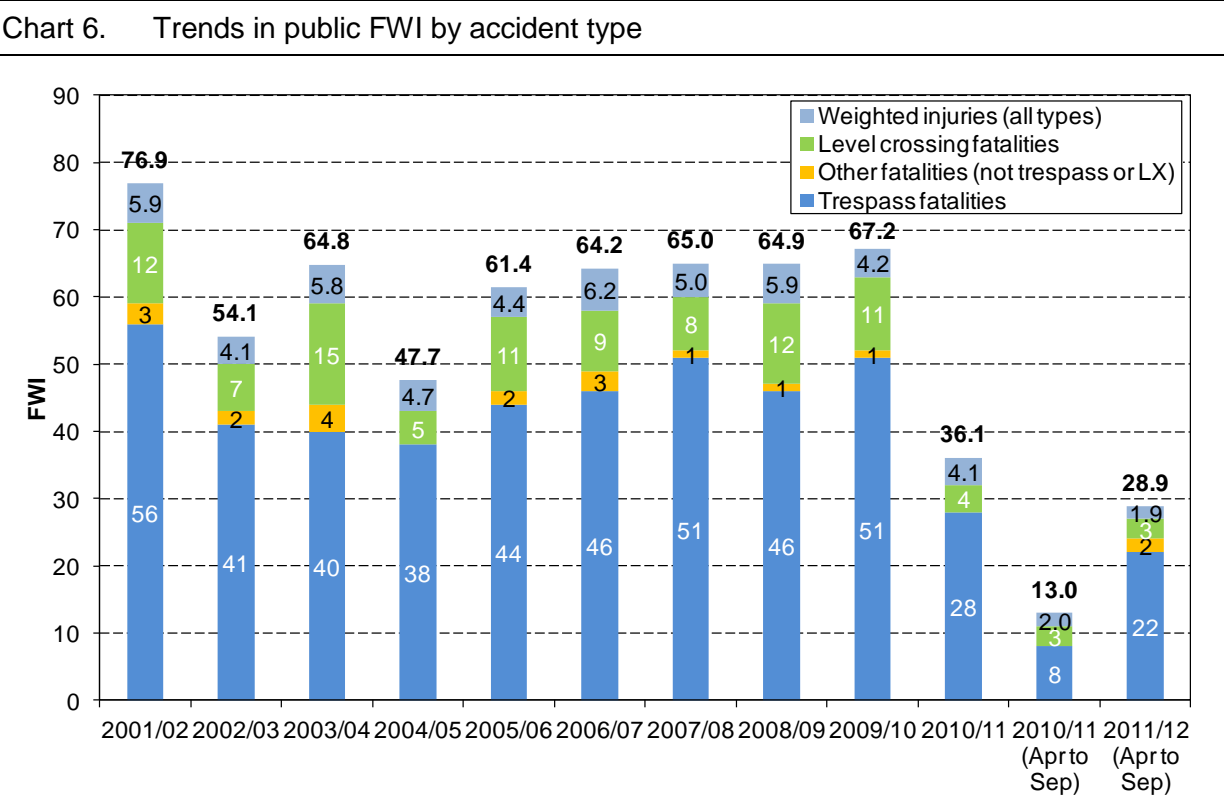
<sup>5</sup> The category *other staff* includes shunters, fitters, delivery staff, and mobile operations managers. As much work done by this category of staff is off NRMI, many injuries occurring to them are out of the scope of this report.

# Trends in safety performance

## 2.4 Harm to members of the public

In contrast to passengers and workforce, comparatively few non-fatal injuries are recorded for members of the public. This is partly because these injuries are less likely to be reported to rail companies, and partly because the hazards that account for most of the risk have a comparatively high likelihood of a fatal outcome.

The majority of accidental public fatalities are the result of trespass, with level crossing accidents forming the next largest group. A small number of fatalities occur due to other causes, for example falls from the platform, and are more similar to some passenger accidents.

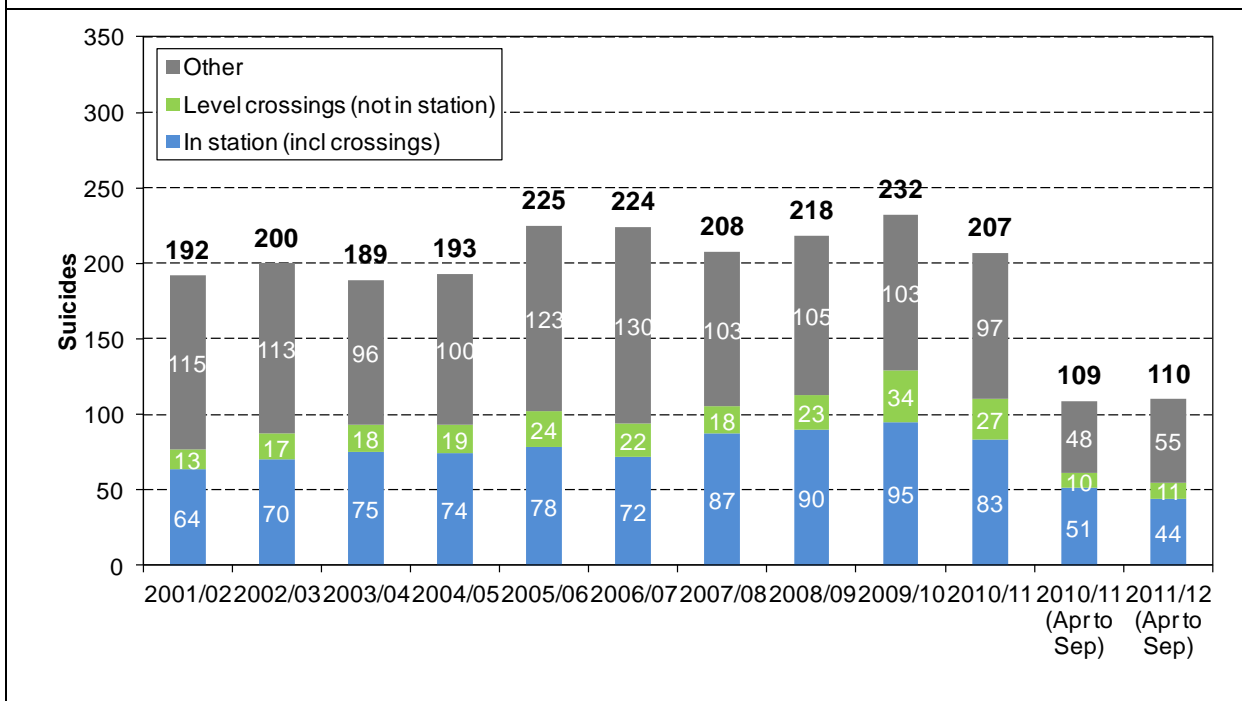


- Between 2001/02 and 2009/10, the average FWI was 62.9. The level of harm in 2010/11 was exceptionally low for reasons that are still unclear and has returned to close to the five-year average level in the current half-year.
- Much of these changes in overall FWI are due to the number of trespass fatalities, which in 2010/11 was at an exceptionally low level. The number recorded in the current half-year, while higher than the previous half-year, is still lower than average.
- Two of the three level crossing fatalities were pedestrians on footpath crossings. The other was a motorcyclist.
- The two fatalities that were not related to trespass or at level crossings were both due to the person being struck by a train due to being too close to the platform edge.
- The rail industry uses a set of criteria called the Ovenstone criteria to distinguish between trespass and suspected suicide. If there is no evidence to the contrary, a public fatality is classed as accidental. As more information is received, for example from the BTP or coroners' reports, the classification of a public fatality may change.

## 2.4.1 Suicide

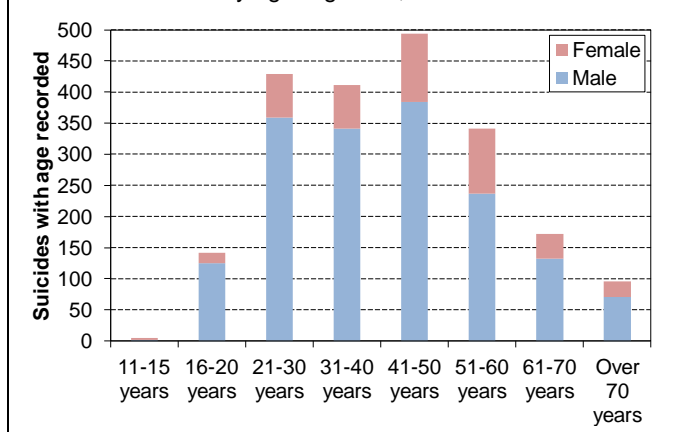
The figures in this section are based on application of the Owenstone criteria. The current data may be revised following BTP or coroners' reports. Passengers or members of the workforce who commit suicide are classed as members of the public in this report.

Chart 7. Suicides and suspected suicides by location



- There were 110 suicides in the current half-year, compared with 109 in the same period in 2010/11.
- Half of the suicides in the current half-year occurred in stations or at level crossings.
- Of the suicides occurring since 2001/02, 2188 (over 99%) have had the gender of the person recorded. Of these 2188, 79% were male and 21% were female. Among all suicides in Great Britain, about 75% are male. The age profile for both males and females peak at the 41-50 age bracket, although the suicide frequency in 50-61 year old females remains high, whereas in males it decreases.
- Railway suicides account for around 4% of all suicides in Great Britain.

Chart 8. Suicide by age & gender, since 2001/02



## Trends in safety performance

### 2.5 Risk from train accidents

The term train accident refers to a wide spectrum of events, from collisions and derailments to those with typically less serious consequences, such as trains being struck by stones. The industry monitors trends in all types of accident, but focuses most attention on those at the more serious end of the scale.

In this chapter, analysis is limited to RIDDOR-reportable train accidents. To be reportable under RIDDOR, the accident must be on or affect a running line, and additional criteria apply depending on the category of accident and whether or not a passenger train was involved.

The categories of train accident with the greatest potential for significant consequences are known as potentially higher-risk train accidents (PHRTAs). This group comprises derailments, trains striking road vehicles, buffer stop collisions, collisions between trains (excluding roll backs and open doors), trains struck by large falling objects and train explosions. PHRTAs are covered in section 2.5.2.

Train accidents resulting in passenger or staff fatalities are rare (five in the past decade) but have the potential to harm large numbers of people. It is for low-frequency but potentially high-consequence events such as train accidents that the SRM is of most value. It contains detailed models of the causes and consequences of train accidents, encompassing 18 hazardous events and around 1,600 precursors. The SRM can thus provide an estimate of the current level of risk associated with accident types that have not occurred for many years or have not occurred to this date.

The SRM provides an estimate of the risk at a point in time and is typically updated every 18-24 months. The Precursor Indicator Model (PIM) gives an indication of the trend in train accident risk between SRM updates by monitoring changes in the occurrence of accident precursors. It is benchmarked against the SRM but allows train accident risk to be monitored on a continual basis. The PIM and its output are discussed in section 2.5.4.

#### 2.5.1 Injuries in train accidents April–September 2011

The total reported harm from train accidents over the six months was 1.41 FWI. There was one fatality (in a road vehicle), three major injuries, 12 minor injuries and 16 cases of shock and trauma.

Of the number of injuries occurring in non-PHRTA train accidents, more than a third were due to trains being struck by missiles thrown by vandals.

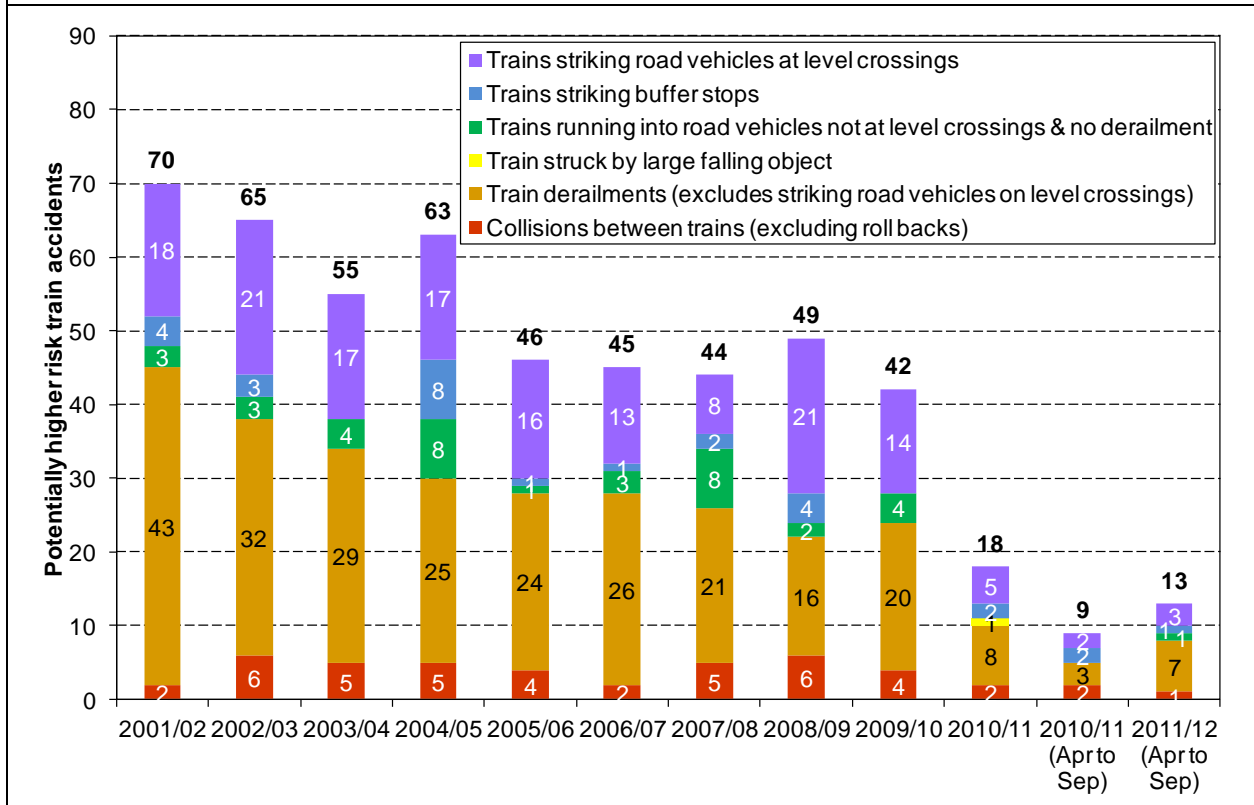
Table 1. Reported injuries from train accidents April – September 2011

	Fatalities			Major injuries			Minor injuries			Shock and trauma			FWI
	Passenger	Workforce	Public	Passenger	Workforce	Public	Passenger	Workforce	Public	Passenger	Workforce	Public	
Trains striking road vehicles at LX	0	0	1	0	1	2	0	0	1	0	0	0	1.305
Collisions between trains (excluding roll backs)	0	0	0	0	0	0	1	0	0	0	0	0	0.005
Train derailments (excludes striking RVs on LX)	0	0	0	0	0	0	0	0	0	0	1	0	0.005
Not a PHRTA	0	0	0	0	0	0	3	8	0	0	15	0	0.090
Total	0	0	1	0	1	2	4	8	0	0	16	0	1.41

## 2.5.2 Potentially higher-risk train accidents

The risk from PHRTAs is currently around 7.8 FWI per year, which is 93% of the total train accident risk of 8.4 FWI per year. While PHRTAs are the types of train accident that have the greatest potential to result in casualties, the majority result in no injury.

Chart 9. Trends in the numbers of PHRTAs

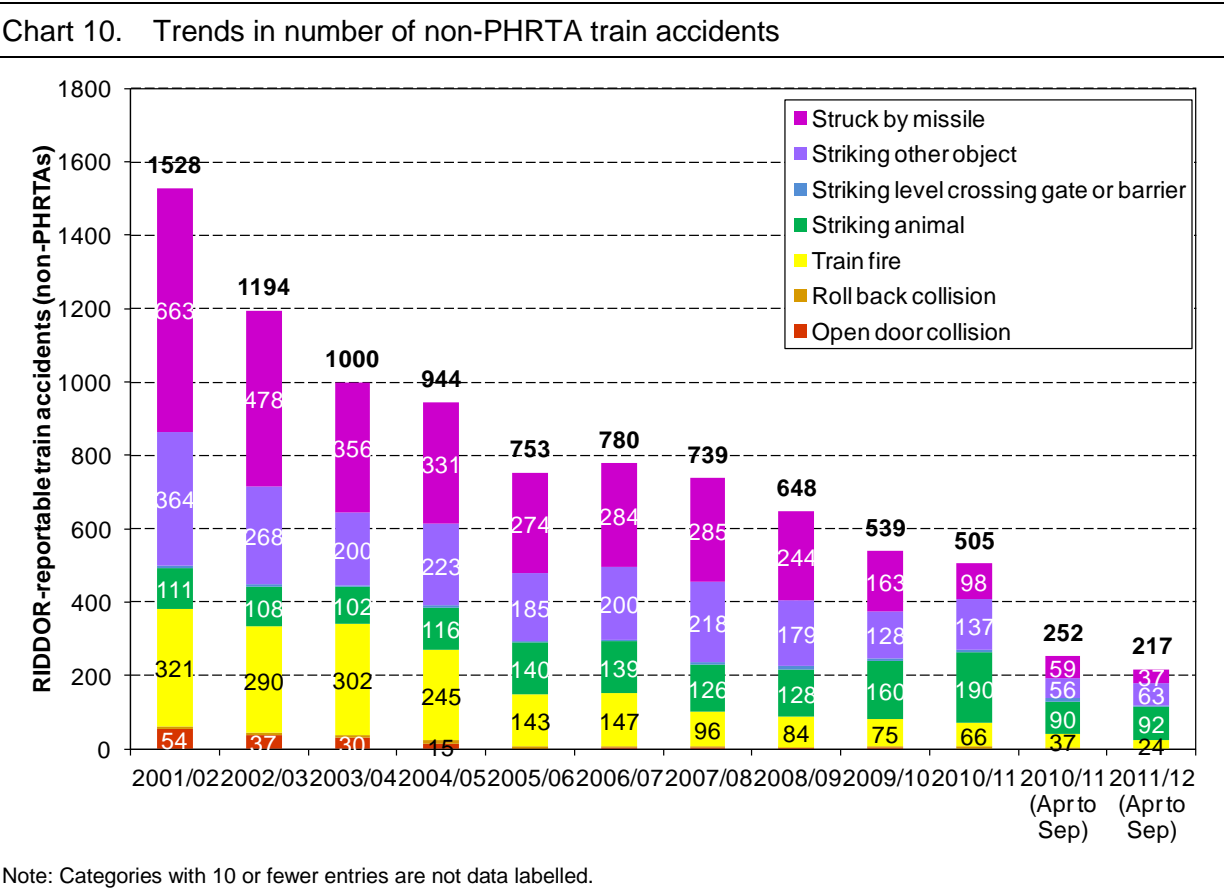


- After an improvement in the number PHRTAs in the first half of the decade and a fairly steady period in the second, the year 2010/11 saw by far the lowest levels recorded. The 13 PHRTAs recorded in the current half-year, although slightly higher than in the same period in 2010/11, was still much less than half the number recorded in any year prior to 2010/11.
- The most marked reductions seen in 2010/11 were in the numbers of train derailments and trains striking road vehicles at level crossings, which, over time, have been the most frequently seen types of PHRTA; these trends have continued into 2011/12.
- There was one fatality as a result of a PHRTA in the first half of 2011/12, when a motorcyclist skidded on the approach to a level crossing as the barriers were closing and was fatally injured after striking the side of a passenger train.
- There was one case of a train running into a road vehicle not at a level crossing during this period, the first time since 2009/10. A train struck a maintenance vehicle that was foul of the line. The road vehicle was unoccupied at the time and there were no injuries.

# Trends in safety performance

## 2.5.3 Other train accidents

Although the risk from types of train accident other than PHRTAs is relatively low (0.5 FWI per year), the potential for harm remains. A small number of injuries typically occur each year, for example as a result of trains running into objects on the line or being struck by missiles. No major or fatal injuries occurred from these these types of accidents in the current half-year.



- The number of non-PHRTAs has decreased substantially over the past decade. This decreasing trend continued in the half-year covered by this report. At 37%, the most notable decrease during the current half-year was in the number of incidents of trains being struck by missiles. Conversely, the number of incidents of trains striking animals on the line has been increasing since 2007/08, with a slight increase in the current half-year compared with the same period in 2010/11. There has also been an increase in trains striking other objects in the current half-year.
- Open door collisions and train fires have seen the largest percentage decreases over the period shown in the chart. This is due primarily to the phasing out of Mark I ‘slam door’ stock and increased use of fire-retardant materials.
- Of the 11 minor injuries caused by non-PHRTAs; three were due to stones being thrown at trains by vandals; three were due to trains striking objects placed on the line by vandals, two were due to the train striking an animal (in one incident), one was due to the train striking overhead line equipment, one was due to the train striking a tree; and one was due to the train cab window breaking as it entered a tunnel, possibly due to air pressure changes.

## 2.5.4 Trends in accident precursors

### The Precursor Indicator Model

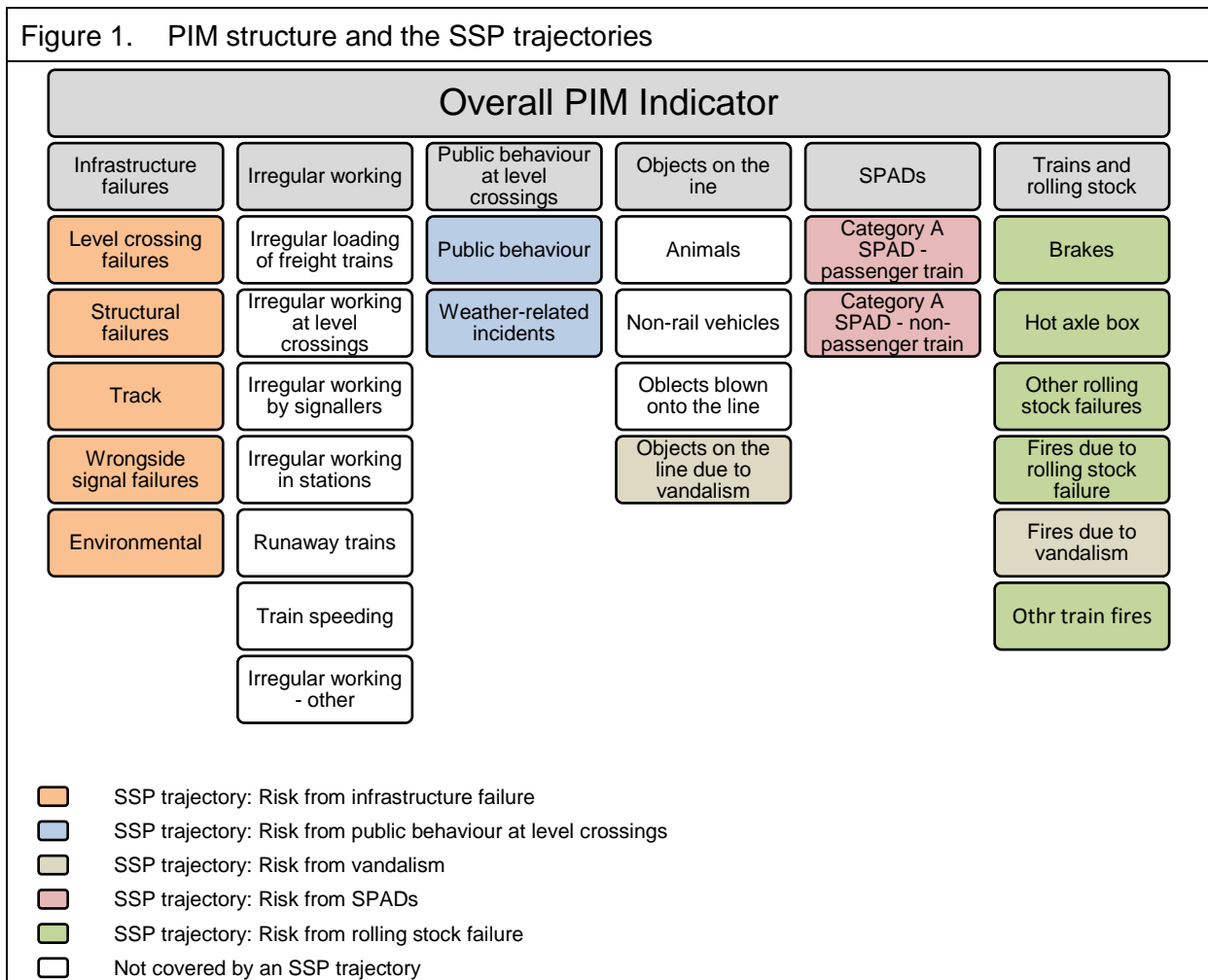
The PIM measures trends in the underlying risk from train accidents by tracking changes in the occurrence of accident precursors. It was first developed by RSSB in 1999, and there have since been a series of modelling improvements.

### Structure

The PIM monitors the trend in the risk from *train derailments, train fires and train collisions* (including those with other trains), *buffer stop collisions*, and *trains striking road vehicles* (both at and not at level crossings). The precursors covered by the PIM fall into six main groups, encompassing 27 separate subgroups and 45 lower level groups. The irregular working and SPAD components of the PIM model were updated in 2010 to incorporate risk ranking information, and the PIM has now been realigned to SRMv7.

Figure 1 shows how the PIM sub-groups relate to the trajectories set out in the 2009-14 SSP. Although most elements of the PIM are covered by one of the SSP trajectories, some – notably all those related to irregular working and some related to objects on the line – are not covered. Chapter 3 reviews performance against the SSP trajectories and also consider PIM precursors relating to causes of train accidents not covered by an SSP trajectory.

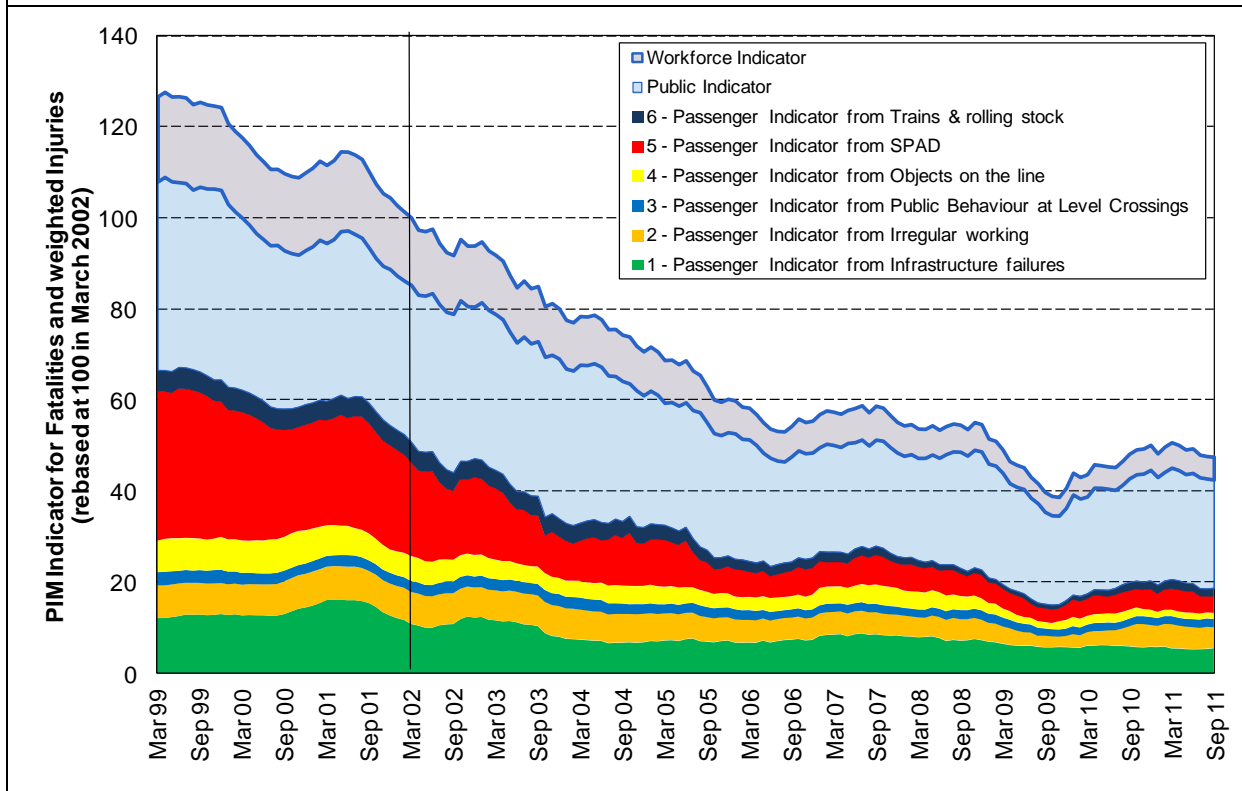
Figure 1. PIM structure and the SSP trajectories



# Trends in safety performance

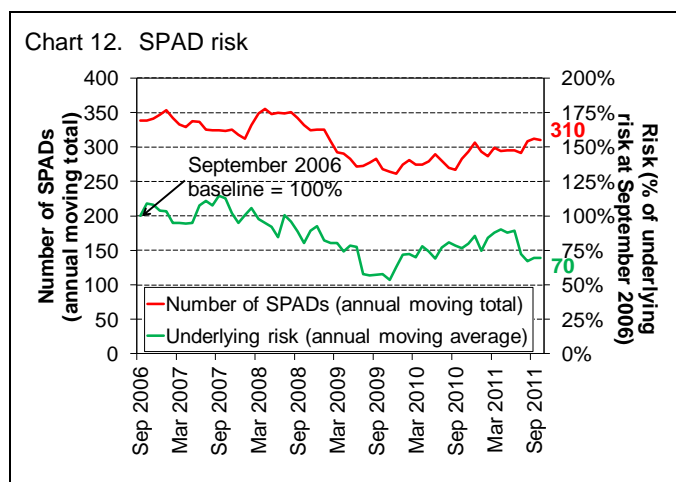
## Trends in train accident risk (PIM indicator)

Chart 11. Trends in train accident risk (PIM), with detail shown for passenger risk



- At the end of September 2011, the overall PIM measure stood at 47.5, compared with 50.6 at the end of 2010/11.
- At the end of September 2011, the PIM contribution relevant to passenger risk stood at 18.9, compared with 20.7 at the end of 2010/11; the largest PIM contribution (in risk terms) to passenger risk is currently infrastructure failures, followed by irregular working and SPADs.

- The PIM contributions relevant to passenger and workforce risk have reduced considerably over the period shown in the chart. The reduction in SPAD risk following the introduction of TPWS, as well as improvements in areas such as the condition of the track and rolling stock, has been responsible for this.



- At the end of September 2011, SPAD risk stood at 70% of the September 2006 baseline.

- The PIM contributions relevant to public risk have reduced far less over the last decade than for other person types. Road user behaviour at level crossings, which lies outside the direct control of the railway, is the primary source of train accident risk to members of the public, and has proved difficult to address.

## 3 Progress against industry trajectories and targets

This chapter investigates safety performance against the industry trajectories laid out in the 2009-2014 Strategic Safety Plan (SSP). The chapter also looks at how performance compares with the targets defined by the Department for Transport (DfT) High Level Output Specification (HLOS).

### 2010/11 half-year headlines

- For 12 of the 15 trajectories set out in the 2009-2014 SSP, performance currently satisfies the trajectory, with varying levels of stability.
- For three of the 15 SSP trajectories, current performance is not within the trajectory. These trajectories relate to passenger risk at the platform-train interface, passenger injuries on-board trains, and trespass.
- Overall trends in passenger risk and workforce risk are both within the targets for improvement set by the DfT HLOS.

### Performance at a glance

<b>2009 – 2014 Strategic Safety Plan</b>	Passenger slips, trips and falls in stations	Performance currently satisfies trajectories – ie is within or below trajectory range.  Stability of performance varies for each trajectory; see charts for details.
	Train crew injuries on board trains	
	SPADs	
	Risk to infrastructure workers	
	Station staff slips, trips and falls	
	Train accidents due to infrastructure failure	
	Assaults on passengers	
	Assaults on train crew	
	Assaults on station staff	
	Public behaviour at level crossings	
	Vandalism	
	Train accidents due to rolling stock failure	
	Passenger injuries on board trains	
Passenger accidents at the platform train interface		
Trespass		
<b>High Level Output Specification</b>	Passenger risk Workforce risk	Performance is in line with HLOS targets.

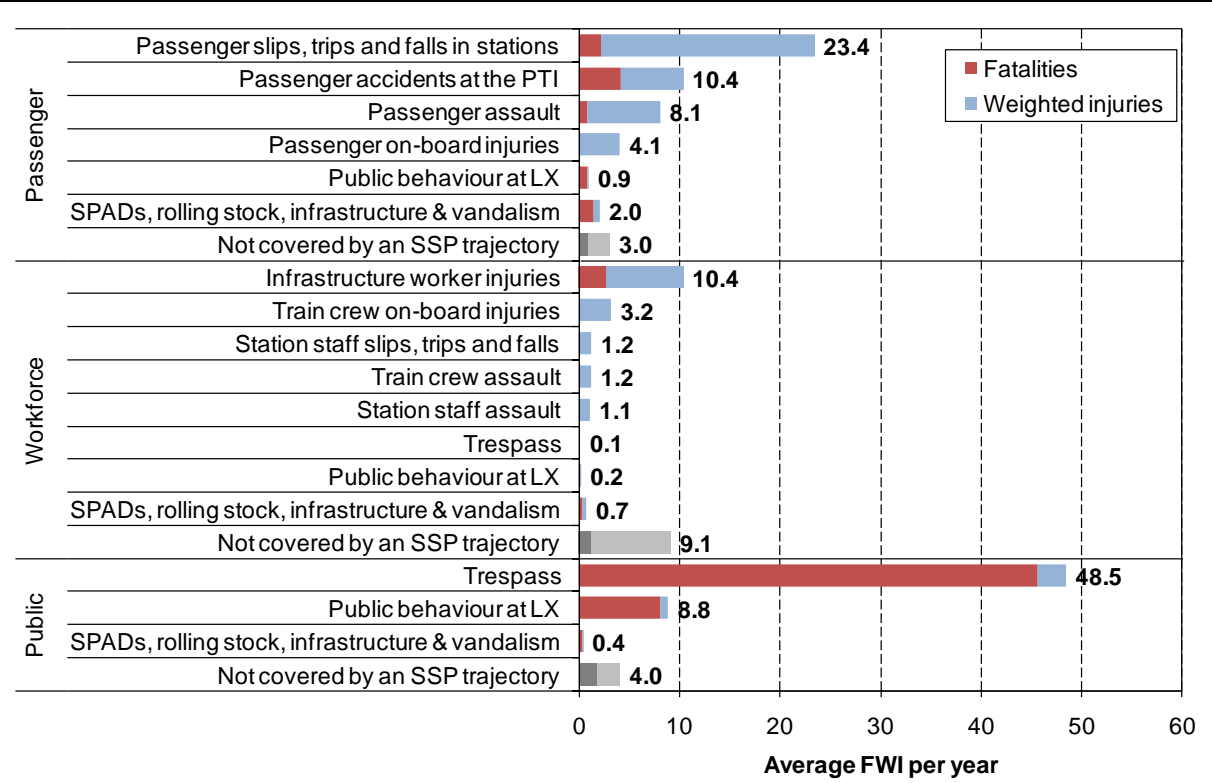
# Trajectories and targets

## 3.1 Trajectories of the 2009 – 2014 SSP

Effective safety planning requires a detailed understanding of the activities or circumstances that result in the greatest risk to passengers, the workforce and members of the public. To identify the focus areas for the 2009-2014 SSP, the sources of risk were categorised into nine Key Risk Areas (KRAs), which together account for 98% of the total FWI risk as measured by SRMv7.

The 2009-2014 SSP also defines a number of trajectories, each related to a particular aspect of system risk. Trajectories are a way of illustrating expected changes in the level of risk as a result of the initiatives being undertaken or planned by the industry over the period covered by the SSP. Trajectories have, as their starting point, the level of risk as of April 2009, as estimated by SRMv6.5. Fifteen trajectories have been defined in total. Together, they cover 89% of the total FWI risk, and 94% of the fatality risk (excluding suicide and suspected suicide).

Chart 13. Risk profile by SSP trajectories (total FWI and fatalities)



Source: SRMv7

- The SSP trajectories cover 94% of risk to passengers, 67% of risk to the workforce and 93% of risk to members of the public.
- 45% of passenger FWI risk arises from slips, trips and falls, with passenger accidents at the platform-train interface being the next largest contributor. Platform-train interface accidents are the largest contributor to passenger fatality risk.
- Infrastructure worker injuries are the largest contributor to the workforce risk profile, at 38%.
- Most of the public risk arises from trespass, with a notable amount being due to public behaviour at level crossings.

### 3.1.1 How progress towards the trajectories is measured

The SRM is being used as the primary means of measuring the performance of the industry against the SSP trajectories. However, full updates of the SRM are planned only at specific points during CP4. At interim points, an alternative methodology is being used, which is described below. The methodology was reviewed and endorsed by Safety Policy Group (SPG)<sup>6</sup> in October 2009, and is in line with the methodology being used for tracking progress against the HLOS, which was similarly endorsed by SPG.

For some trajectories, two charts are shown. This has been done in those cases where the types of events that are covered by the trajectory fall into two distinct types, for example, train accidents and personal accidents.

For each chart shown, progress against the trajectory is measured as follows:

Between April 2009 and March 2011: Comparison of the change in risk as measured by SRMv6.5 and SRMv7.

From April 2011 to September 2011: Comparison of the change in risk as measured using the interim methodology.

#### Interim methodology

The methodology differs for movement / non-movement accidents and train accidents due to modelling issues associated with low-frequency, high-consequence events.

For movement and non-movement accidents, the approach is based on the actual number of events occurring for each incident type, averaged over a three-year period, combined with the average expected consequence for that type of incident, as derived from the SRM and baselined using the latest SRM estimate. While not equal to a full SRM update, the methodology is in line with SRM modelling approaches.

For those hazardous events related to train accident risk, the PIM is used. The PIM monitors changes in train accident risk based on the actual number of precursor events, combined with the average expected consequence for that precursor event.

Some of the performance measures are particularly affected by statistical variation due to low numbers of high consequence events such as accidents at the PTI, not due to boarding or alighting.

#### Normalisation

Most of the measures have been normalised to account for changes to the use of the network. The main normalisers are the number of train km (for measures which scale with the operation of trains, such as train crew on-board injuries) and passenger journeys.

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<sup>6</sup> SPG is a cross-industry body, facilitated by RSSB, and reporting to the RSSB Board.

# Trajectories and targets

Table 2. Event types and assessment methodology for SSP trajectories

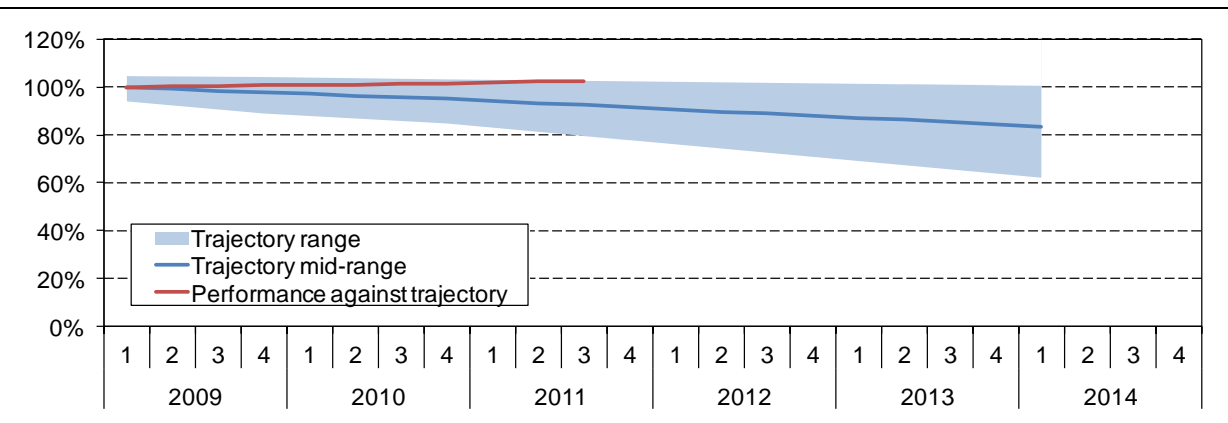
	March 2009 baseline risk	March 2011 update risk	Hazardous events (HEs) covered	Interim assessment methodology	Normaliser
	SRMv6/6.5	SRMv7			
Passenger slips, trips and falls in stations	22.44	23.42	Slips, trips and falls in stations, apart from those occurring during boarding/alighting or from the platform edge.	(i) For each hazardous event in trajectory, risk estimated by combining the actual three year moving average number of events with the SRM average consequence per event	Passenger journeys
Passenger accidents at the platform-train interface	10.10	10.42	Accidents during boarding/alighting, and falls from the platform, with or without a train present.	As (i)	Passenger journeys
Passenger on-board injuries	3.88	4.06	All injuries on-board trains, excluding assaults or resulting from train accidents.	As (i)	Passenger kms
Passenger assault	8.08	8.07	Assaults occurring anywhere on NRM1.	As (i) - number of events is taken from BTP data	Passenger journeys
Infrastructure worker injuries	12.03	10.39	All injuries occurring to infrastructure workers, wherever the location, and whatever the cause.	As (i)	Workforce hours
Train crew on-board injuries	3.70	3.18	All injuries on-board trains, excluding assaults or resulting from train accidents. Includes injuries to revenue protection staff on trains.	As (i)	Workforce hours
Station staff slips, trips and falls	1.30	1.24	Slips, trips and falls in stations, apart from those occurring during boarding/alighting or from the platform edge. Includes injuries to revenue protection staff in stations.	As (i)	Workforce hours
Train crew assault	1.73	1.20	Train crew assaults occurring anywhere on NRM1. Injuries to revenue protection staff on trains.	As (i)	Workforce hours
Station staff assault	1.37	1.07	Station staff assaults occurring anywhere on NRM1. Injuries to revenue protection staff in stations.	As (i)	Workforce hours
Public behaviour at LX	11.87	9.95	Injuries to all person types, including train accidents, occurring as a result of public misuse of level crossings, or during proper use, but where no railway cause (such as infrastructure defect or equipment failure) is implicated.	(ii) For train accidents, for each hazardous event in trajectory, risk is estimated using Precursor Indicator Model. For movement/non-movement accidents, as (i).	Train kms
Trespass	43.26	48.61	All injuries to people arising from trespass. Includes incidents of passenger trespass.	As (i)	No normaliser
Vandalism	0.42	0.46	Collisions, derailments or train fires due to vandalism.	As (ii)	Train kms
SPADs	0.88	0.86	Train accidents resulting from SPADs, where the cause of the SPAD is due to human error.	As (ii)	Train kms
Infrastructure failure	1.35	1.23	Train accidents resulting from infrastructure failure, including track defects, signalling failure, structural collapse.	As (ii)	Train kms
Rolling stock failure	0.51	0.56	Train accidents resulting from the failure of any rolling stock component.	As (ii)	Train kms
Not covered by an SSP trajectory	17.70	16.17			
Total system risk	140.6	140.9			

## 3.1.2 Progress against the trajectories of the SSP

### Risk to passengers from slips, trips and falls in stations

Passenger slips, trips and falls at stations account for 23.4 FWI per year, which is 17% of the total system risk.

Chart 14. Progress against trajectory related to passenger slips, trips and falls in stations

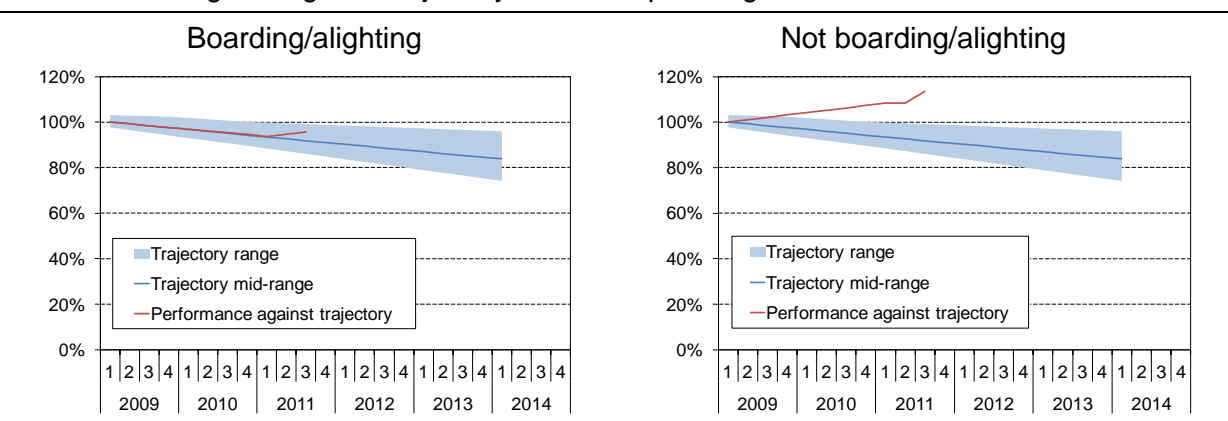


- The SSP projected a best estimate improvement of around 16% between April 2009 and March 2014.
- Based on the number and type of slips, trips and falls that have occurred, performance at the end of September 2011 lies on the boundary of the SSP trajectory.

### Risk to passengers at the platform-train interface

Passenger accidents at the platform-train interface comprise accidents during boarding & alighting, and other types, such as falls from the platform edge. Combined, they account for 10.4 FWI per year, which is 7% of the total system risk.

Chart 15. Progress against trajectory related to passenger accidents at the PTI

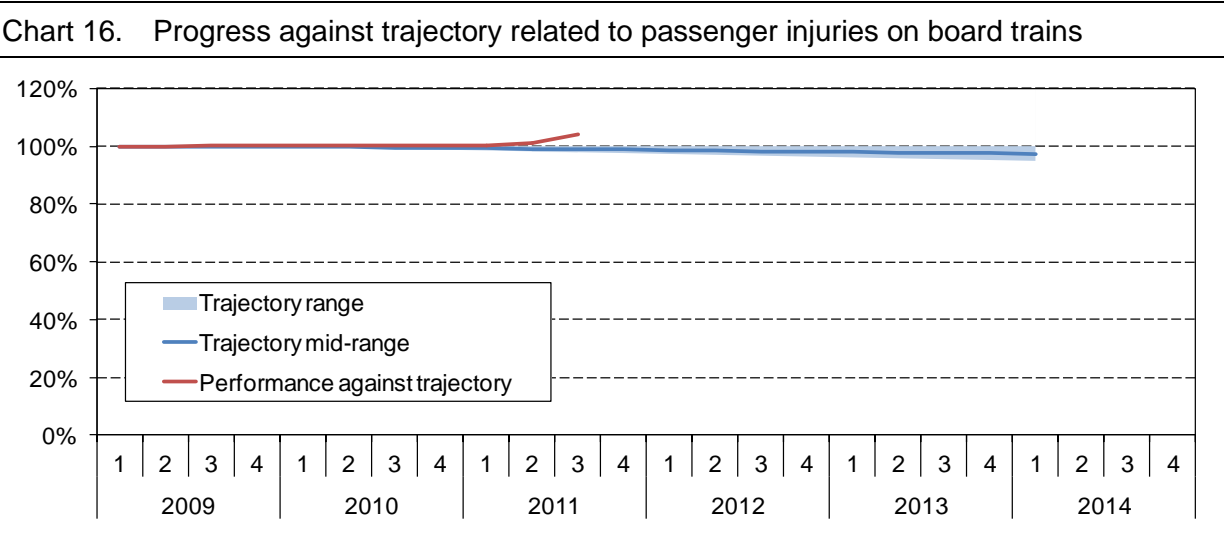


- The SSP projected a best estimate improvement of around 16% between April 2009 and March 2014.
- Based on the number and type of accidents that have occurred, performance at the end of September 2011 is within the SSP trajectory for boarding/alighting risk. For risk associated with PTI accidents not due to boarding/alighting, performance at the end of September 2011 lies outside of the SSP trajectory. Information on projects relating to this area of risk can be found in section 2.2.

# Trajectories and targets

## Risk to passengers from on-board injuries

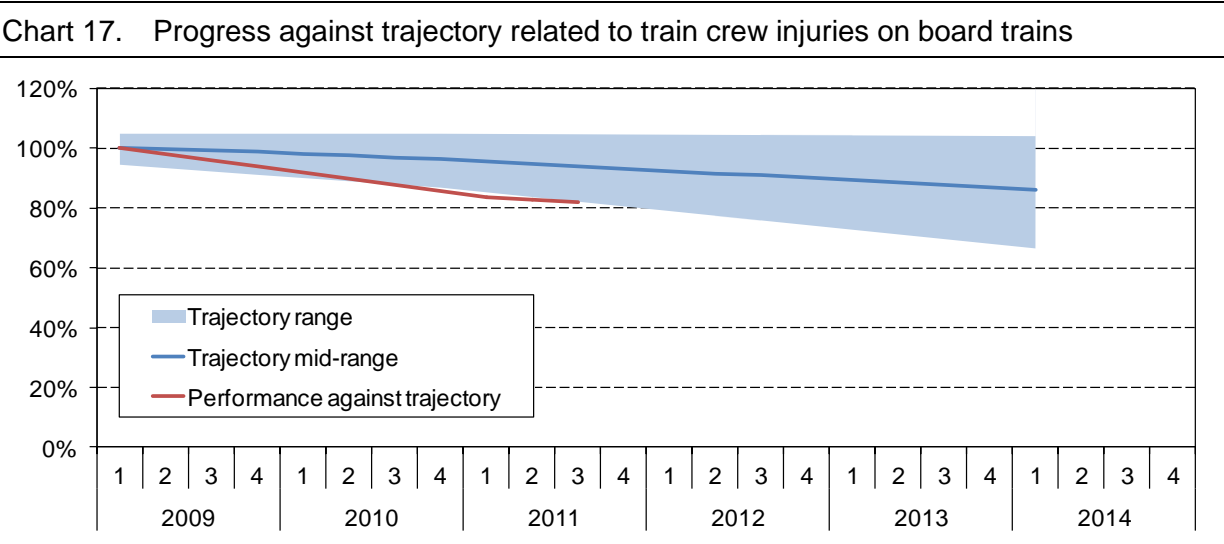
Passenger injuries on board trains account for 4.1 FWI per year, which is 3% of the total system risk.



- The SSP projected a best estimate improvement of around 3% between April 2009 and March 2014.
- Based on the number and type of on-board injuries that have occurred, performance at the end of September 2011 lies outside the SSP trajectory.

## Risk to train crew from on-board injuries

Train crew injuries on board trains account for 3.2 FWI per year, which is 2% of the total system risk.

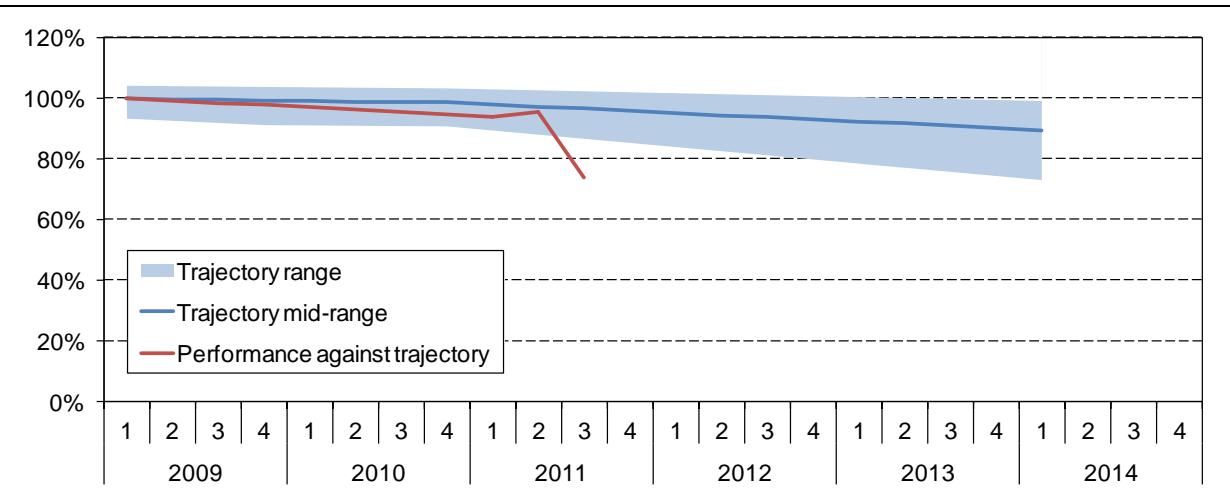


- The SSP projected a best estimate improvement of around 14% between April 2009 and March 2014.
- Based on the number and type of train crew injuries on board trains that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

## Risk from SPADs

SPADs account for 0.9 FWI per year, which is around 1% of the total system risk. All of this is train accident risk.

Chart 18. Progress against trajectory related to SPADs

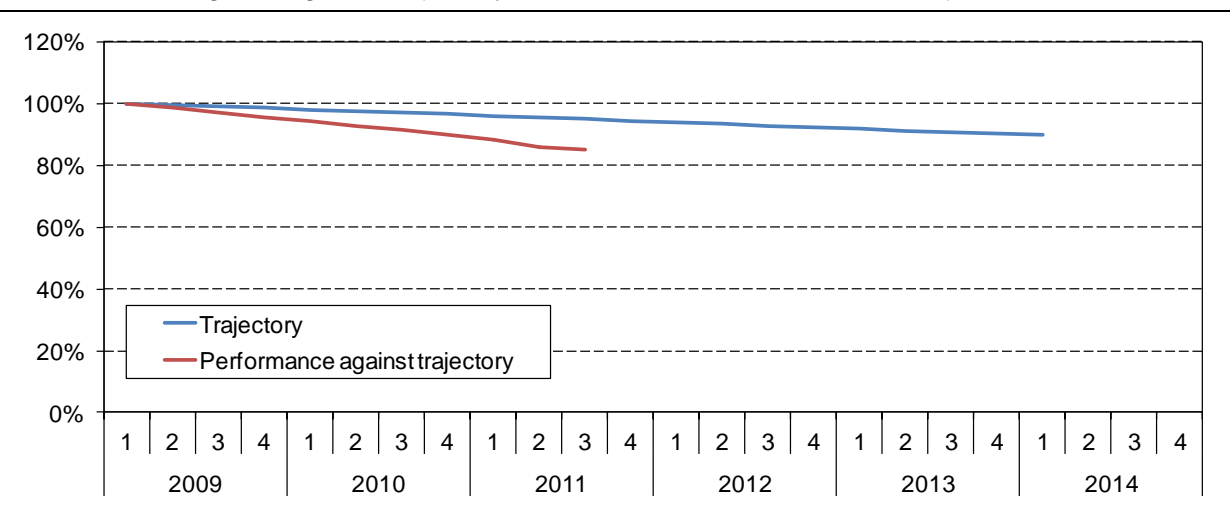


- The SSP projected a best estimate improvement of around 10% between April 2009 and March 2014.
- Based on the number and type of SPADs that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

## Risk to infrastructure workers

Infrastructure worker injuries account for 10.4 FWI per year, which is 7% of the total system risk. When the adjustment for under-reporting of RIDDOR-reportable minor injuries is taken into account, the estimated level rises to 11.1 FWI.

Chart 19. Progress against trajectory related to infrastructure worker injuries

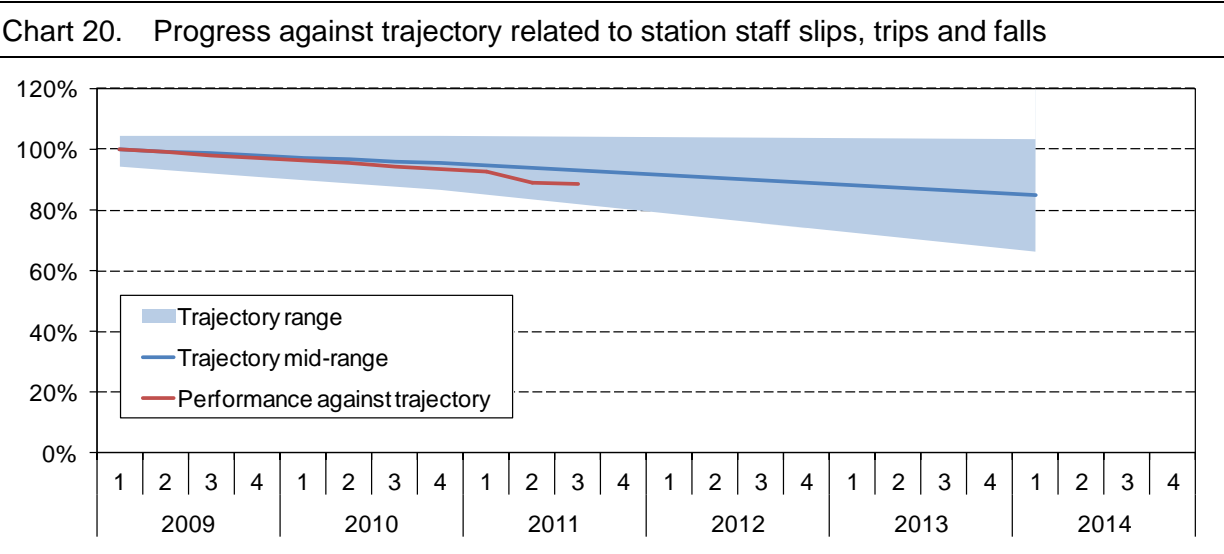


- The SSP projected a best estimate improvement of around 10% between April 2009 and March 2014.
- Based on the number and type of infrastructure worker injuries that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

# Trajectories and targets

## Risk to station staff from slips, trips and falls

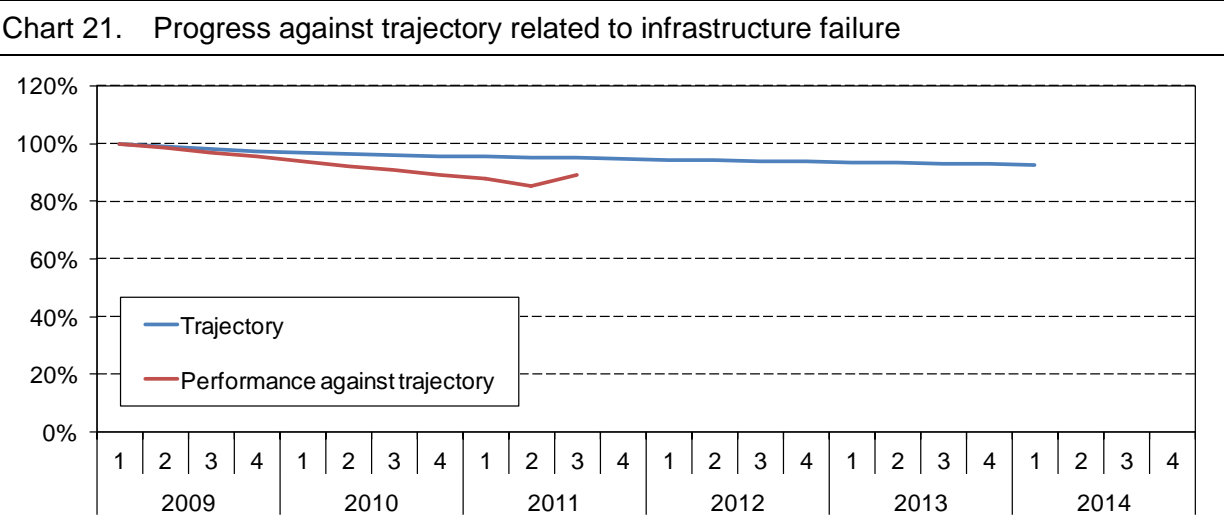
Station staff slips, trips and falls at stations account for 1.2 FWI per year, which is around 1% of the total system risk.



- The SSP projected a best estimate improvement of around 15% between April 2009 and March 2014.
- Based on the number and type of station staff slips, trips and falls that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

## Risk from train accidents caused by infrastructure failure

Infrastructure failure accounts for 1.4 FWI per year, which is around 1% of the total system risk. Of this, 1.2 FWI is train accident risk, with the remaining 0.2 FWI arising from personal accidents, such as slips, trips and falls on substandard surfaces.

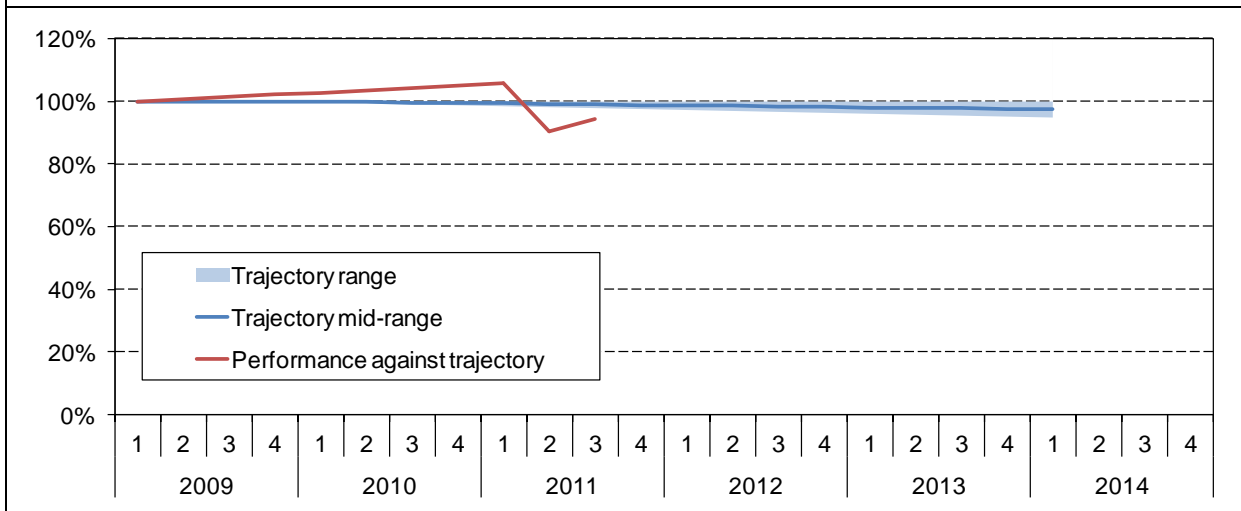


- The SSP projected a best estimate improvement of around 7% between April 2009 and March 2014.
- Based on the number and type of infrastructure-related train accident precursors that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

## Risk from train accidents caused by rolling stock failure

Rolling stock failure accounts for 0.6 FWI per year, which is less than 1% of the total system risk. The majority of this is train accident risk.

Chart 22. Progress against trajectory related to rolling stock failure

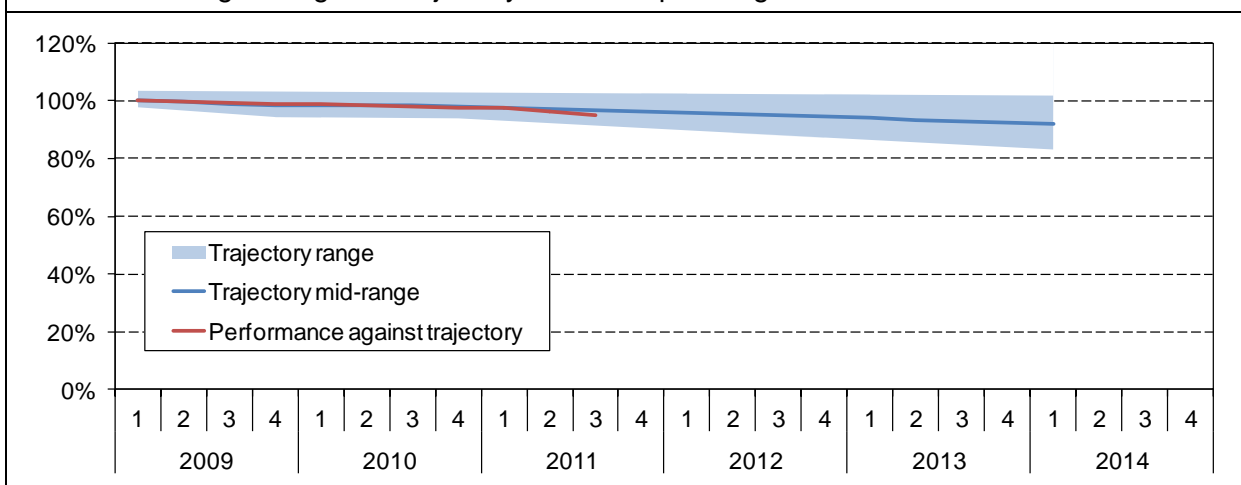


- The SSP projected a best estimate improvement of around 3% between April 2009 and March 2014.
- Based on the number and type of rolling stock precursors that have occurred, performance at the end of September 2011 satisfies the SSP trajectory. The rolling stock contribution to the PIM is very low, and small changes in absolute value can have large percentage changes. RSSB's data quality project has also resulted in more rolling stock safety-related defects being reported.

## Risk to passengers from assault

Assaults on passengers account for 8.1 FWI per year, which is 6% of the total system risk.

Chart 23. Progress against trajectory related to passenger assaults



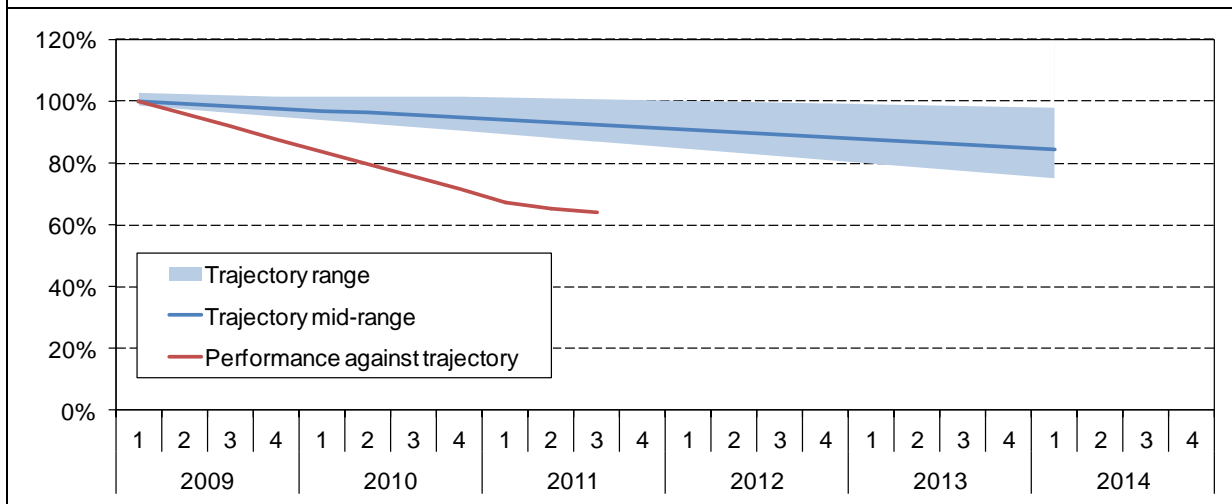
- The SSP projected a best estimate improvement of around 8% between April 2009 and March 2014.
- Based on the number of passenger assaults recorded by BTP, performance at the end of September 2011 satisfies the SSP trajectory.

## Trajectories and targets

### Risk to train crew from assault

Assaults on train crew account for 1.2 FWI per year, which is around 1% of the total system risk.

Chart 24. Progress against trajectory related to train crew assaults

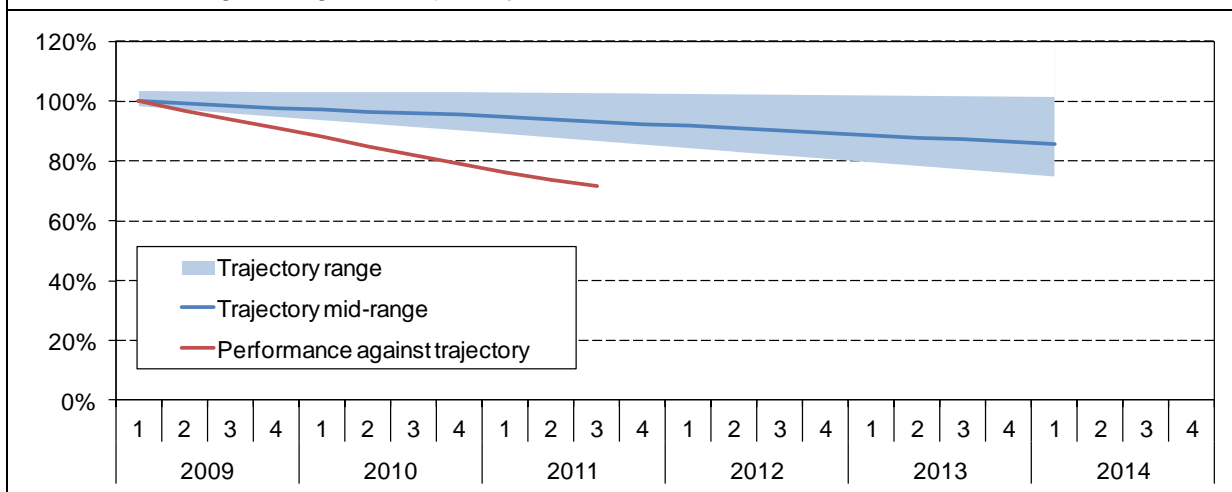


- The SSP projected a best estimate improvement of around 16% between April 2009 and March 2014.
- Based on the number and type of assaults on train crew that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

### Risk to station staff from assault

Assaults on station staff account for 1.1 FWI per year, which is around 1% of the total system risk.

Chart 25. Progress against trajectory related to station staff assaults

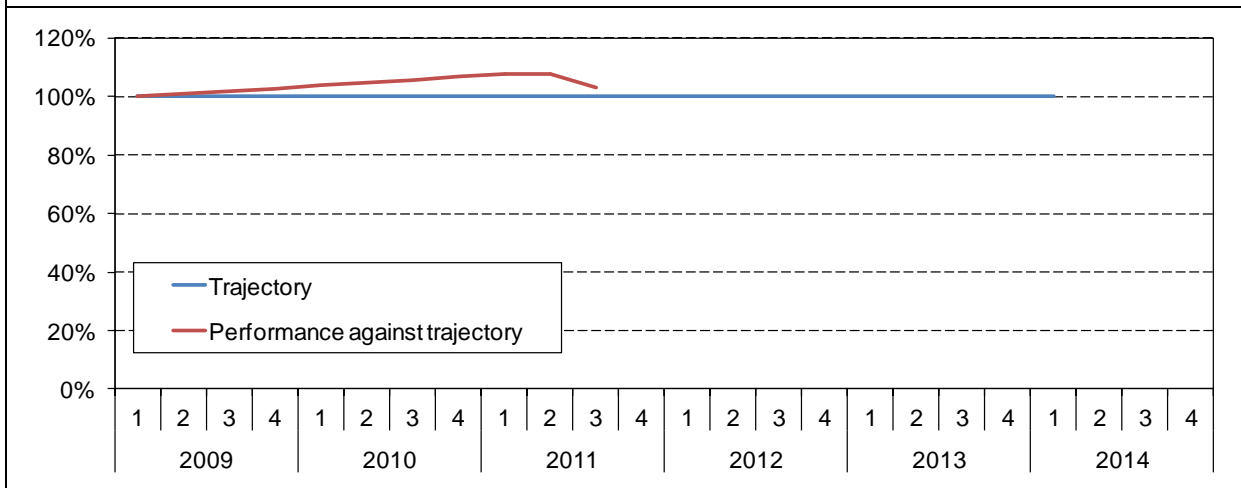


- The SSP projected a best estimate improvement of around 14% between April 2009 and March 2014.
- Based on the number and type of assaults on station staff that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

## Risk from trespass

Trespass accounts for 48.6 FWI per year, which is 35% of the total system risk.

Chart 26. Progress against trajectory related to trespass

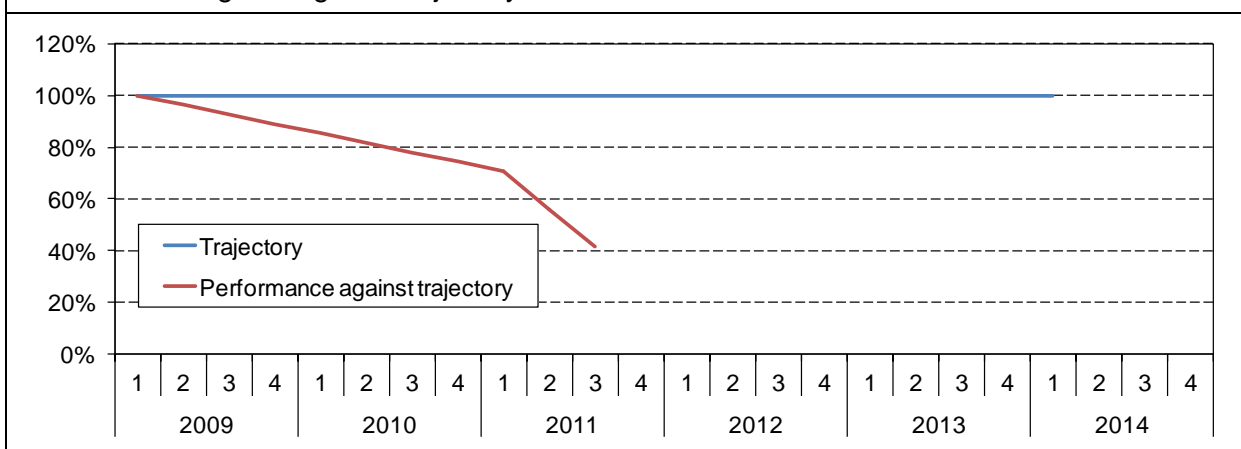


- The SSP projected a level trend in trespass between April 2009 and March 2014.
- Based on the number and type of trespass injuries that have occurred, performance at the end of September 2011 is above the SSP trajectory. The increase in the performance measure between SRM updates may seem surprising given the reduction in trespass fatalities in 2010/11 noted in section 2.4. The reason for this difference is the data periods covered by SRMv6.5 and SRMv7, which, for trespass risk, correspond to the three-year periods ending September 2008 and September 2010 respectively. Over these periods, trespass injuries increased.

## Risk from vandalism

Vandalism is estimated to account for 0.5 FWI per year, which is less than 1% of the total system risk. This is all train accident risk, and does not include personal accidents arising to those engaged in vandalism, which would usually be categorised as trespass.

Chart 27. Progress against trajectory related to vandalism



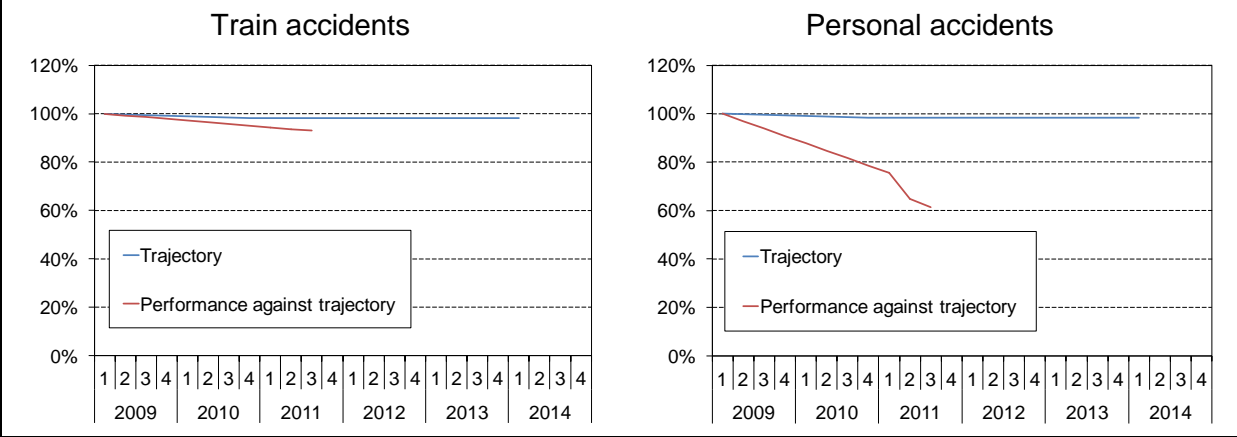
- The SSP projected a level trend in vandalism between April 2009 and March 2014.
- Based on the number and type of vandalism-related train accident precursors that have occurred, performance at the end of September 2011 satisfies the SSP trajectory.

# Trajectories and targets

## Risk from public behaviour at level crossings

Public behaviour at level crossings accounts for 9.9 FWI per year, which is 7% of the total system risk. Of this, 3.0 FWI arises from train accidents (2.6 of which occurs to members of the public) and 6.9 FWI arises from personal accidents.

Chart 28. Progress against trajectory related to public behaviour at level crossings

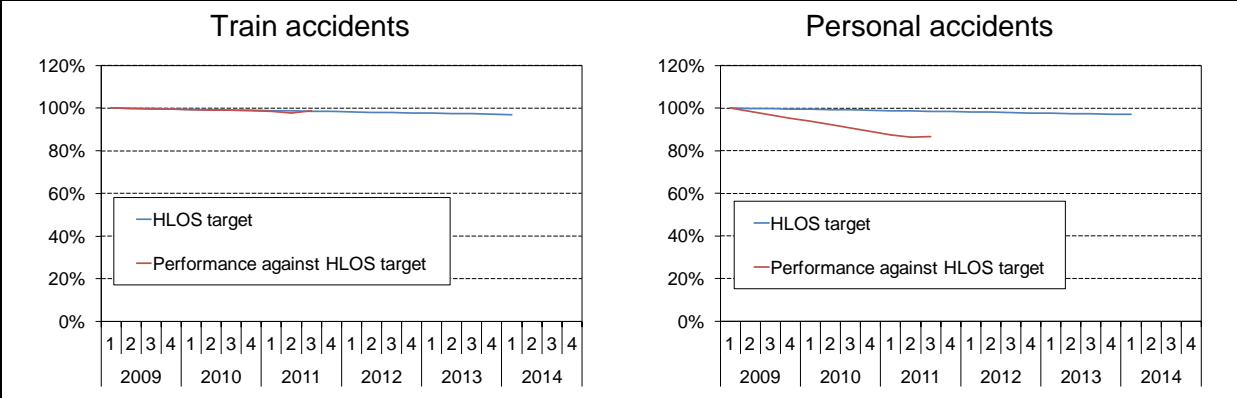


- The SSP projected a best estimate improvement of around 2% between April 2009 and March 2014.
- Based on the number and type of train accident precursors that have occurred, performance at the end of September 2011 satisfies the SSP trajectory. Based on the number and type of personal accidents that have occurred, performance at the end of September 2011 also satisfies the SSP trajectory.

## Trends in performance within categories not covered by an SSP trajectory

Around 16.0 FWI arises from causes that are not covered by an SSP trajectory; this is 11% of the total system risk, excluding suicide. Of this, 2.3 FWI arises from train accidents, and 13.7 FWI arises from personal accidents.

Chart 29. Performance within categories not covered by an SSP trajectory



- By definition, no trajectory exists for these areas of risk. The HLOS target of a 3% reduction by March 2014 has therefore been used to track performance.
- Based on the number and type of train accident precursors that have occurred, performance at the end of September 2011 is almost equal to HLOS target. Based on the number and type of personal accidents that have occurred, performance at the end of September 2011 is better than the HLOS target.

### 3.2 DfT High Level Output Specification

In the HLOS, the DfT established safety metrics for both passenger risk and workforce risk and specified a requirement for a 3% reduction in both categories over CP4, which runs from 1 April 2009 to 31 March 2014.

The HLOS metrics are:

Passenger metric: Baseline at April 2009: 0.988 FWI per billion passenger km  
Target at March 2014: 0.959 FWI per billion passenger km

Workforce metric: Baseline at April 2009: 0.135 FWI per million workforce hours  
Target at March 2014: 0.131 FWI per million workforce hours

It has been agreed by the DfT, the ORR and the industry that the safety metrics will be monitored using the SRM. The approach for doing so is the same as for the monitoring of the SSP trajectories (as outlined in section 3.1.1).

The HLOS targets for both risk categories are shown as an index starting at 100% at the beginning of CP4, with a target of 97% for March 2014. Both of the measures will comprise two elements: train accident risk and movement/non-movement risk, as defined by the SRM.

The calculation of the HLOS is subject to additional data restrictions over and above normal SRM and ASPR scope. The following are excluded from the calculation:

- All injuries entered by Eurostar
- Workforce injuries due to being involved in road traffic accidents while on duty
- Suicide, suspected suicide and attempted suicide<sup>7</sup>
- Verbal assaults and threats

Results from the latest interim review for the passenger and workforce metrics are shown in Chart 30 and Chart 31. It can be seen that the trend in passenger risk, to the end of September 2011, is consistent with the requirement of the HLOS target. For workforce risk, the initial indication suggests a rate of risk reduction somewhat better than that required by the HLOS target. Trends will continue to be monitored throughout the period.

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<sup>7</sup> Any physical injuries, or shock/trauma, arising to third parties as a result of these events are included.

# Trajectories and targets

Chart 30. Progress against HLOS target for passenger risk (FWI per billion passenger km)

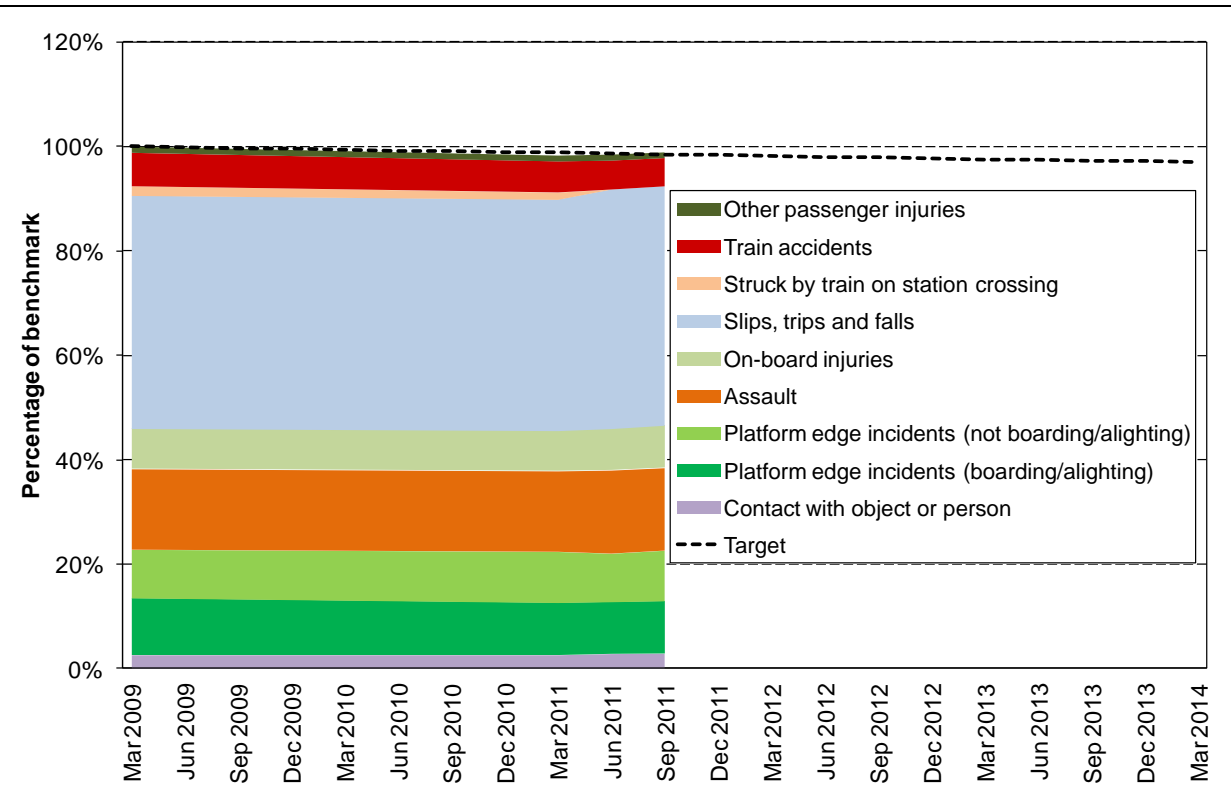
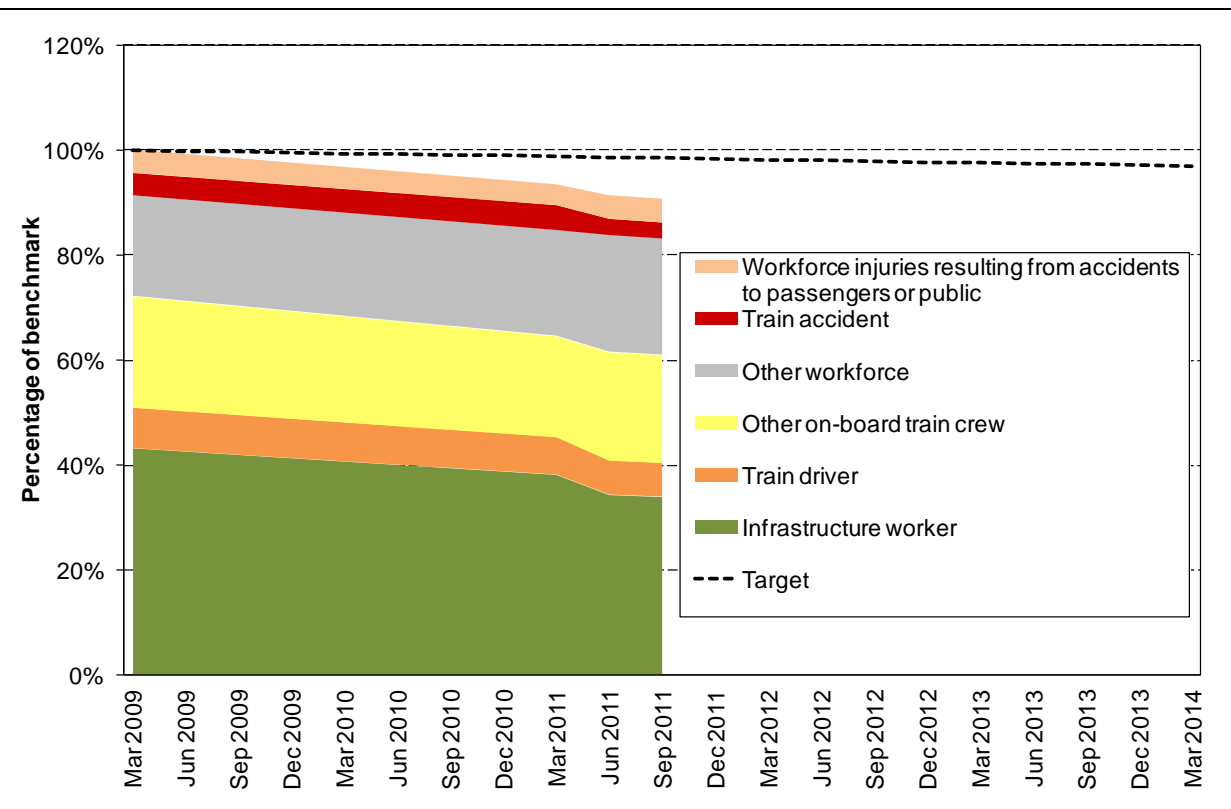


Chart 31. Progress against HLOS target for workforce risk (FWI per million workforce hours)



## Appendix 1. List of fatalities

This appendix lists all fatalities in the period April to September 2011 occurring to passengers, workforce or public, other than those due to trespass or suicide.

### Passenger fatalities

Date	Location	Accident type	Description
03/08/2011	Clapham Junction station	Platform edge incidents (not boarding/alighting)	A passenger fell from the platform and was struck by an incoming train. The passenger was unsteady on their feet and intoxication is believed to have been a contributory factor.

### Workforce fatalities

Date	Location	Accident type	Description
04/07/2011	Kingussie	Road traffic accident	A member of staff on duty died in a road traffic accident. Another member of staff in the same rail-owned vehicle was injured and a member of the public in another vehicle was killed.

### Public fatalities not related to trespass or suicide

Date	Location	Accident type	Description
19/07/2011	Hayes & Harlington station	Platform edge incidents (not boarding/alighting)	A member of public was fatally injured after being struck by a train due to being too close to the platform edge.
26/07/2011	Balderton AHB Crossing	Train accidents: collisions with road vehicles at level crossings	A motorcyclist skidded on the approach to the crossing as the barriers were closing and was fatally injured after striking the side of a passenger train.
24/08/2011	Gipsy Lane Footpath Crossing	Struck/crushed by train	A pedestrian was struck by a train and fatally injured.
29/09/2011	Branston Footpath Crossing,	Struck/crushed by train	A pedestrian was struck and fatally injured by an empty coaching stock train.
30/09/2011	Urmston station	Platform edge incidents (not boarding/alighting)	A male was sitting on the platform, with his legs hanging over the platform edge, when he was struck and fatally injured by a passenger train. Intoxication is believed to have been a contributory factor.

## Appendices

### Appendix 2. Key safety facts tables

#### Passengers

Passengers	2006/07	2007/08	2008/09	2009/10	2010/11	2010/11 (Apr-Sep)	2011/12 (Apr-Sep)
<b>Fatalities</b>	<b>9</b>	<b>7</b>	<b>5</b>	<b>5</b>	<b>8</b>	<b>7</b>	<b>1</b>
Train accidents	1	0	0	0	0	0	0
Slips, trips, and falls	2	1	2	1	2	1	0
Platform-train interface	4	3	3	4	5	5	1
Assault and abuse	1	1	0	0	1	1	0
On-board injuries	0	0	0	0	0	0	0
Contact with object or person	0	0	0	0	0	0	0
Struck by train on station crossing	1	2	0	0	0	0	0
Other type of passenger injury	0	0	0	0	0	0	0
<b>Major injuries</b>	<b>249</b>	<b>220</b>	<b>233</b>	<b>236</b>	<b>246</b>	<b>113</b>	<b>126</b>
Train accidents	29	0	0	3	6	4	0
Slips, trips, and falls	138	139	157	144	152	63	76
Platform-train interface	39	40	40	43	45	15	21
Assault and abuse	7	9	6	9	10	8	8
On-board injuries	29	22	24	29	26	18	15
Contact with object or person	7	9	4	7	5	3	6
Struck by train on station crossing	0	1	0	0	0	0	0
Other type of passenger injury	0	0	2	1	2	2	0
<b>Minor injuries</b>	<b>4889</b>	<b>5040</b>	<b>5240</b>	<b>5293</b>	<b>5595</b>	<b>2916</b>	<b>3017</b>
RIDDOR reportable	1140	1107	1117	1171	1212	623	680
Non-RIDDOR reportable	3749	3933	4123	4122	4383	2293	2337
<b>Incidents of shock</b>	<b>325</b>	<b>330</b>	<b>260</b>	<b>205</b>	<b>228</b>	<b>117</b>	<b>132</b>
Class 1	10	13	5	3	7	3	1
Class 2	315	317	255	202	221	114	131
<b>Fatalities and weighted injuries</b>	<b>43.71</b>	<b>38.85</b>	<b>38.29</b>	<b>38.79</b>	<b>43.30</b>	<b>23.84</b>	<b>19.47</b>
Train accidents	4.28	0.12	0.03	0.39	0.74	0.51	0.01
Slips, trips, and falls	21.17	20.61	23.45	21.12	23.09	10.14	10.83
Platform-train interface	9.63	8.89	8.98	10.48	11.82	7.75	4.34
Assault and abuse	2.08	2.19	0.84	1.19	2.31	1.95	0.97
On-board injuries	4.28	3.38	3.68	4.13	3.83	2.49	2.26
Contact with object or person	1.22	1.51	1.05	1.35	1.24	0.75	1.05
Struck by train on station crossing	1.00	2.10	0.00	0.00	0.01	0.01	0.00
Other type of passenger injury	0.04	0.05	0.26	0.13	0.27	0.23	0.03

## Workforce

Workforce	2006/07	2007/08	2008/09	2009/10	2010/11	2010/11 (Apr-Sep)	2011/12 (Apr-Sep)
<b>Fatalities</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>
Infrastructure worker	0	2	2	3	1	1	1
Train driver	1	0	0	0	0	0	0
Other on-board train crew	0	0	0	0	0	0	0
Station staff	0	0	0	0	0	0	0
Revenue protection	0	0	0	0	0	0	0
Other workforce	1	0	1	0	0	0	0
<b>Major injuries</b>	<b>129</b>	<b>140</b>	<b>131</b>	<b>123</b>	<b>125</b>	<b>47</b>	<b>56</b>
Infrastructure worker	77	73	80	74	76	28	26
Train driver	7	19	6	10	11	4	7
Other on-board train crew	20	18	20	18	12	4	9
Station staff	13	15	9	8	8	5	5
Revenue protection	3	2	2	4	5	4	2
Other workforce	9	13	14	9	13	2	7
<b>Minor injuries</b>	<b>6202</b>	<b>5692</b>	<b>5449</b>	<b>5306</b>	<b>5364</b>	<b>2718</b>	<b>2676</b>
RIDDOR-reportable	713	565	585	553	582	296	310
Non RIDDOR-reportable	5489	5127	4864	4753	4782	2422	2366
<b>Incidents of shock</b>	<b>1455</b>	<b>1439</b>	<b>1333</b>	<b>1138</b>	<b>1127</b>	<b>583</b>	<b>659</b>
Class 1	266	231	223	274	278	139	149
Class 2	1189	1208	1110	864	849	444	510
<b>Total FWI</b>	<b>26.47</b>	<b>26.32</b>	<b>26.11</b>	<b>25.05</b>	<b>23.43</b>	<b>10.74</b>	<b>11.77</b>
Infrastructure worker	9.77	11.05	11.63	12.05	10.47	4.72	4.71
Train driver	3.79	4.00	2.61	2.99	3.21	1.45	1.80
Other on-board train crew	6.39	5.43	5.61	5.40	4.76	2.28	2.64
Station staff	3.00	3.11	2.43	2.19	2.14	1.19	1.14
Revenue protection	1.03	0.96	0.94	1.06	1.13	0.71	0.54
Other workforce	2.50	1.77	2.89	1.38	1.73	0.40	0.94

## Appendices

### Public

	2006/07	2007/08	2008/09	2009/10	2010/11	2010/11 (Apr-Sep)	2011/12 (Apr-Sep)
<b>Public</b>							
<b>Trespass</b>							
Fatalities	46	51	46	51	28	8	22
Major injuries	38	30	33	19	18	10	7
Minor injuries	33	26	20	34	29	20	9
Shock/trauma	1	0	1	0	0	0	0
<b>Total trespass FWI</b>	<b>49.91</b>	<b>54.09</b>	<b>49.38</b>	<b>53.03</b>	<b>29.91</b>	<b>9.07</b>	<b>22.73</b>
<b>Level crossings</b>							
Fatalities	9	8	12	11	4	3	3
Major injuries	8	4	9	7	5	1	2
Minor injuries	34	18	19	24	19	13	14
Shock/trauma	0	1	3	2	1	0	1
<b>Total level crossings FWI</b>	<b>9.89</b>	<b>8.44</b>	<b>12.97</b>	<b>11.75</b>	<b>4.56</b>	<b>3.13</b>	<b>3.24</b>
<b>Non-trespass non-LX</b>							
Fatalities	3	1	1	1	0	0	2
Major injuries	12	12	13	12	13	6	7
Minor injuries	92	97	88	130	138	72	65
Shock/trauma	2	6	3	1	2	1	0
<b>Total non-trespass non-LX FWI</b>	<b>4.39</b>	<b>2.43</b>	<b>2.52</b>	<b>2.45</b>	<b>1.64</b>	<b>0.77</b>	<b>2.89</b>
<b>Total public accidental FWI</b>							
Fatalities	58	60	59	63	32	11	27
Major injuries	5.80	4.60	5.50	3.80	3.60	1.70	1.60
Minor injuries	0.39	0.35	0.35	0.42	0.49	0.28	0.25
Shock/trauma	0.00	0.01	0.02	0.01	0.01	0.00	0.00
<b>Total accidental FWI</b>	<b>64.19</b>	<b>64.96</b>	<b>64.86</b>	<b>67.23</b>	<b>36.10</b>	<b>12.98</b>	<b>28.85</b>
<b>Suicide</b>							
Fatalities	224	208	218	232	207	109	110
Major injuries	34	28	34	25	36	14	12
Minor injuries	8	10	18	13	15	10	12
Shock/trauma	1	0	0	1	0	0	1
<b>Total suicide FWI</b>	<b>227.43</b>	<b>210.84</b>	<b>220.48</b>	<b>234.57</b>	<b>209.67</b>	<b>109.44</b>	<b>110.25</b>

## Train accidents

Train accidents	2006/07	2007/08	2008/09	2009/10	2010/11	2010/11 (Apr-Sep)	2011/12 (Apr-Sep)
<b>Fatalities (excluding suicides)</b>	<b>5</b>	<b>0</b>	<b>2</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>1</b>
Passengers	1	0	0	0	0	0	0
Workforce	0	0	0	0	0	0	0
Members of the public	4	0	2	7	0	0	1
<b>Weighted injuries (excluding suicides)</b>	<b>4.21</b>	<b>0.97</b>	<b>0.57</b>	<b>1.18</b>	<b>1.44</b>	<b>1.04</b>	<b>0.41</b>
Passengers	3.28	0.12	0.03	0.39	0.74	0.51	0.01
Workforce	0.82	0.64	0.33	0.57	0.51	0.42	0.20
Members of the public	0.10	0.21	0.21	0.21	0.20	0.10	0.21
<b>Total train accidents</b>	<b>825</b>	<b>783</b>	<b>697</b>	<b>581</b>	<b>523</b>	<b>261</b>	<b>230</b>
<b>PHRTAs</b>	<b>45</b>	<b>44</b>	<b>49</b>	<b>42</b>	<b>18</b>	<b>9</b>	<b>13</b>
Involving passenger trains	24	20	31	26	14	7	6
Collisions between trains	1	4	6	4	1	1	1
Derailments	11	3	3	8	5	2	0
Collisions with road vehicles (not at LC)	2	5	0	2	0	0	1
Collisions with road vehicles (at LC)	9	7	18	12	5	2	3
Striking buffer stops	1	1	4	0	2	2	1
Struck by large falling object	0	0	0	0	1	0	0
Not involving passenger trains	21	24	18	16	4	2	7
Collisions between trains	1	1	0	0	1	1	0
Derailments	15	18	13	12	3	1	7
Collisions with road vehicles (not at LC)	1	3	2	2	0	0	0
Collisions with road vehicles (at LC)	4	1	3	2	0	0	0
Striking buffer stops	0	1	0	0	0	0	0
Struck by large falling object	0	0	0	0	0	0	0
<b>Non-PHRTA train accidents</b>	<b>780</b>	<b>739</b>	<b>648</b>	<b>539</b>	<b>505</b>	<b>252</b>	<b>217</b>
Involving passenger trains	665	621	552	471	443	224	182
Open door collisions	2	3	3	1	0	0	0
Roll back collisions	4	3	2	4	4	1	0
Striking animals	126	112	116	144	169	79	82
Struck by missiles	221	225	198	141	90	54	32
Train fires	136	87	73	69	57	34	20
Striking level crossing gates/barriers	3	4	6	2	7	6	0
Striking other objects	173	187	154	110	116	50	48
Not involving passenger trains	115	118	96	68	62	28	35
Open door collisions	0	0	0	1	0	0	0
Roll back collisions	0	0	0	0	2	2	0
Striking animals	13	14	12	16	21	11	10
Struck by missiles	63	60	46	22	8	5	5
Train fires	11	9	11	6	9	3	4
Striking level crossing gates/barriers	1	4	2	5	1	1	1
Striking other objects	27	31	25	18	21	6	15
<b>PIM index (at year end)</b>	<b>57.3</b>	<b>53.7</b>	<b>49.1</b>	<b>43.6</b>	<b>50.6</b>	<b>48.1</b>	<b>47.5</b>
Infrastructure failures	11.5	10.6	8.5	7.8	7.2	7.5	7.3
Irregular working	8.7	7.8	7.1	6.4	9.5	8.6	8.1
Public behaviour at level crossings	21.4	20.1	23.2	19.8	22.3	20.7	22.1
Objects on the line	5.0	5.2	2.7	2.5	2.3	2.7	2.3
Signals passed at danger	7.5	7.7	6.2	5.3	6.6	5.9	5.1
Trains and rolling stock	3.1	2.2	1.5	1.8	2.8	2.6	2.5

## Appendices

### Train accident precursors

Train accident precursors	2006/07	2007/08	2008/09	2009/10	2010/11	2010/11 (Apr-Sep)	2011/12 (Apr-Sep)
<b>Infrastructure failures</b>							
Environment: adhesion	93	81	138	104	201	0	10
Environment: flooding	62	138	108	105	39	10	8
Environment: landslips	27	37	31	34	11	3	2
Level crossing failures	2636	2376	2238	2017	1579	730	767
Other structural failures	80	74	66	51	92	23	61
Track: broken rails	192	181	165	152	171	39	32
Track: buckled rails	85	4	17	27	29	29	11
Track: level 2 exceedences per mile	0.80	0.81	0.68	0.72	0.71	0.74	0.70
Wrongside signalling failures	589	593	826	763	784	267	370
<b>Irregular working</b>							
Runaway trains	13	7	4	9	6	4	3
Train speeding	73	111	78	216	144	87	75
Objects foul of the line	0	0	185	152	203	93	97
Track management/maintenance issues	0	0	156	112	109	54	53
Irregular working affecting level crossings	0	0	92	81	91	57	42
Misrouting	0	0	2346	2214	2107	1077	1008
Other signaller errors	0	0	86	62	92	46	48
<b>Level crossing incidents</b>							
Near misses with road vehicles	195	171	197	159	149	88	94
<b>Objects on the line</b>							
Trains striking objects blown onto the line	278	237	207	215	122	35	80
Trains striking objects due to vandalism	71	46	36	26	31	9	26
Animals on the line (including train strikes)	2390	1923	1857	1300	1527	1012	980
Road vehicle incursions	77	87	67	50	59	22	26
<b>Category A SPADs</b>							
Total number of cat A SPADs	334	349	292	274	299	137	151
Risk ranked 20+	18	21	17	19	18	6	5
Risk ranked 16+	106	93	89	80	88	41	45
<b>Trains and rolling stock</b>							
Brakes	49	13	8	5	23	14	22
Hot axle boxes	888	636	730	664	395	172	135
Fires due to rolling stock failures	74	58	49	47	52	28	14
Fires due to vandalism	65	35	29	21	8	6	8
Other rolling stock failures	88	67	30	34	57	36	25
Other train fires	9	3	8	7	5	2	2
<b>Dangerous goods incidents</b>							
All incidents involving dangerous goods trains	128	163	164	169	99	53	41
Confirmed dangerous goods incidents	96	142	125	150	81	43	39

### Appendix 3. Definitions

The following is a list of definitions used generally in RSSB's safety performance reports. Not all will appear in the current report.

Term	Definition
<b>Accidental</b>	<p>In the ASPR, this term refers to an event that causes harm or damage that was not intended by its victims. Suicides are not therefore classed as accidental fatalities. However, injuries sustained as a result of other people's behaviour (for example, from assaults or trains striking objects that have been deliberately placed on the line) are classed as accidental if the injured party did not intend to come to harm.</p> <p><b>Train accidents</b> are accidents occurring to trains and rolling stock.</p> <p><b>Individual accidents</b> are accidents to people on railway premises or on trains, but excluding injuries sustained in train accidents.</p>
<b>Assault</b>	<p>SMIS records incidents in which '<i>in circumstances related to their work, a member of staff is assaulted, threatened or abused, thereby affecting their safety or welfare.</i>'</p> <p>BTP records and categorises criminal assaults in accordance with Home Office rules. In the ASPR, BTP crime codes have been grouped into higher level categories.</p>
<b>Child</b>	This term is used in the ASPR to describe a person aged 15 years or below.
<b>Fatalities and weighted injuries (FWI)</b>	<p>The aggregate amount of safety harm. One FWI is equivalent to:</p> <ul style="list-style-type: none"> <li>• one fatality, or</li> <li>• 10 major injuries, or</li> <li>• 200 RIDDOR-reportable minor injuries, or</li> <li>• 200 Class 1 shock/trauma events, or</li> <li>• 1,000 non-RIDDOR-reportable minor injuries, or</li> <li>• 1,000 Class 2 shock/trauma events.</li> </ul>
<b>Fatality</b>	Death within one year of the causal accident.
<b>Hazardous event</b>	An incident that has the potential to be the direct cause of safety harm.
<b>Infrastructure worker</b>	A member of workforce whose responsibilities include engineering or technical activities associated with railway infrastructure. This includes track maintenance, civil structure inspection and maintenance, S&T renewal/upgrade, engineering supervision, acting as a controller of site safety (COSS), hand signaller or lookout and machine operation.
<b>Irregular working</b>	Irregularities affecting, or with the potential to affect, the safe operation of trains or the safety and health of persons. The term irregular working applies to a disparate set of human actions involving an infringement of relevant rules, regulations or instructions.
<b>Key Risk Area (KRA)</b>	A concept introduced by the Strategic Safety Plan. There are currently nine KRAs, covering causes of risk from engineering and workforce, passenger & public behaviour. Individually, the KRAs make a significant contribution to the overall safety risk profile of the railway; collectively they represent around 98% of the residual risk on the railway.
<b>Level crossing</b>	A junction between the road and the railway, where both are at ground-level.

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Term	Definition
<b>Major injury</b>	An injury as defined in Schedule 1 of RIDDOR. This includes most fractures, amputations and losses of consciousness, or where the injury resulted in hospital attendance for more than 24 hours.
<b>Minor injury</b>	Physical injuries that are not major injuries. For the workforce, minor injuries are <b>RIDDOR-reportable</b> if they result in the staff member being unable to return to their normal duties for more than three days. For passengers and members of the public, minor injuries are <b>RIDDOR-reportable</b> if the injured person was taken directly to the hospital from the accident site. Other minor injuries are not reportable under RIDDOR, but must still be reported for compliance with <i>GE/RT8047</i>
<b>National Reference Values (NRVs)</b>	NRVs are reference measures indicating, for each Member State, the maximum tolerable level for particular aspects of railway risk. NRVs are calculated and published by the European Railway Agency, using Eurostat and CSI data.
<b>Network Rail managed infrastructure (NRMI)</b>	All structures within the boundaries of Network Rail's operational railway, including the permanent way, land within the lineside fence, and plant used for signalling or exclusively for supplying electricity for railway operations. It does not include stations, depots, yards or sidings that are owned by, or leased to, other parties. It does, however, include the permanent way at stations and plant within these locations.
<b>Ovenstone criteria</b>	An explicit set of criteria, adapted for the railway, which provides an objective assessment of suicide if a coroner's verdict is not available. The criteria are based on the findings of a 1970 research project into rail suicides and cover aspects such as the presence (or not) of a suicide note, the clear intent to commit suicide, behavioural patterns, previous suicide attempts, prolonged bouts of depression and instability levels.
<b>Passenger</b>	A person on railway infrastructure, who either intends to travel on a train, is travelling on a train, or has travelled on a train. This does not include passengers who are trespassing or who commit suicide – they are included as members of the public.
<b>Passenger train</b>	A train that is in service and available for the use of passengers. Note that a train of empty coaching stock brought into a terminal station, for example, becomes a passenger train in service as soon as it is available for passengers to board.
<b>Pedestrian</b>	This refers to a person travelling on foot, on a pedal cycle, on a horse or using a mobility scooter.
<b>Possession</b>	The complete stoppage of all normal train movements on a running line or siding for engineering purposes. This includes protection as defined by the Rule Book ( <i>GE/RT8000</i> ).
<b>Potentially higher-risk train accidents (PHRTA)</b>	Accidents that are RIDDOR-reportable and have the most potential to result in harm to any or all person types on the railway. They comprise train derailments, train collisions (excluding roll backs), trains striking buffer stops, trains striking road vehicles at level crossings, trains running into road vehicles not at level crossings (with no derailment), train explosions, and trains being struck by large falling objects.
<b>Precursor</b>	A system failure, sub-system failure, component failure, human error or operational condition which could, individually or in combination with other precursors, result in the occurrence of a hazardous event.
<b>Precursor Indicator Model (PIM)</b>	An RSSB-devised model that measures the underlying risk from train accidents by tracking changes in the occurrence of accident precursors. See section 2.5.4 for further information.

Term	Definition
<b>Public (members of)</b>	Persons other than passengers or workforce members. This includes passengers who are trespassing (eg when crossing tracks between platforms), and anyone who commits, or attempts to commit suicide.
<b>RIDDOR</b>	<i>The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995</i> (RIDDOR) is a set of health and safety regulations that require any major injuries, illnesses or accidents occurring in the workplace to be formally reported to the enforcing authority. It defines major injuries and lists notifiable diseases – many of which can be occupational in origin. It also defines notifiable dangerous occurrences, such as collisions and derailments.
<b>Running line</b>	A line that runs between two distinct locations, as shown in Table A of the appropriate Sectional Appendix.
<b>Safety Management Information System (SMIS)</b>	A national database used by railway undertakings and infrastructure managers to record any safety-related events that occur on the railway. SMIS data is accessible to all of the companies who use the system, so that it may be used to analyse risk, predict trends and focus action on major areas of safety concern.
<b>Safety Risk Model (SRM)</b>	A quantitative representation of the safety risk that can result from the operation and maintenance of the GB rail network. It comprises 120 individual models, each representing a type of <b>hazardous event</b> .
<b>Shock/trauma</b>	Shock or traumatic stress affecting an employee, passenger or member of the public who has been involved in, or a witness to, a <b>hazardous event</b> . <b>Class 1</b> Shock or trauma resulting from being involved in or witnessing events that have serious potential of a fatal outcome eg train accidents such as collisions and derailments, or personal accidents involving being struck by train. <b>Class 2</b> refers to all other causes of Shock or trauma resulting from other causes, such as verbal abuse and near misses, or personal accidents of a typically non-fatal outcome.
<b>Signal passed at danger (SPAD)</b>	An incident when any part of a train has passed a stop signal at danger without authority or where an in-cab signalled movement authority has been exceeded without authority. A <b>category A SPAD</b> occurs when the stop aspect, end of in-cab signalled movement authority or indication (and any associated preceding cautionary indications) was displayed correctly, in sufficient time for the train to stop safely.
<b>SPAD risk ranking tool</b>	A tool that gives a measure of the level of risk from each SPAD. It enables the industry's total SPAD risk to be monitored and can be used to track performance and inform SPAD investigations. The score for each SPAD ranges from zero (no risk) to 28 (a very high risk) and is based on both the potential for the SPAD to lead to an accident and the potential consequences of any accident that did occur. SPADs with risk rankings between 16 and 19 are classified as potentially significant, and those with risk rankings of 20 and above are classified as potentially severe.
<b>Statistical significance</b>	A concept used to determine whether a change in accident statistics implies that the safety of the system has really altered, or whether the change <i>could</i> be explained by 'statistical variation'.
<b>Strategic Safety Plan</b>	This is a joint statement by the companies responsible for Britain's mainline rail network setting out an agreed industry approach to managing safety. The 2009-2014 plan was developed by bringing together commitments made by industry companies in their own individual safety plans, thus creating a linkage with the duty holder planning process.

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Term	Definition
<b>Suicide and suspected suicide</b>	A fatality is classified as a suicide where a coroner's verdict has returned a verdict of suicide. It is classified as a suspected suicide where the coroner has yet to return a verdict or returns an open verdict, but where objective evidence of suicide exists based on the application of the <b>Ovenstone criteria</b> .
<b>Trackside</b>	A collective term referring to the running line, Network Rail managed sidings and depots.
<b>Train</b>	Any vehicle (with flanged wheels on guided rails), whether self powered or not, on rails within the uk rail network. This includes locomotives, tramcars, trolley vehicles and other guided transport vehicles. This also includes the train carriages themselves.
<b>Train accident</b>	Reportable train accidents are defined in <b>RIDDOR</b> . The main criterion is that the accident must be on or affect the running line. There are additional criteria for different types of accident, and these may depend on whether the accident involves a passenger train.
<b><i>Derailment</i></b>	<i>This includes all passenger train derailments, derailments of non-passenger trains on running lines and any derailment in a siding that obstructs the running line. Accidents in which a train derails after a collision with an object on the track (except for another train or a road vehicle at a level crossing) are included in this category, as are accidents in which a train derails and subsequently catches fire or is involved in a collision with another rail vehicle.</i>
<b><i>Train fire</i></b>	<i>This includes fires, severe electrical arcing or fusing on any passenger train or train conveying dangerous goods, or on a non-passenger train where the fire is extinguished by a fire brigade.</i>
<b><i>Train striking road vehicle</i></b>	<i>All collisions with road vehicles on level crossings are RIDDOR-reportable. Collisions with road vehicles elsewhere on the running line are reportable if the train is damaged and requires immediate repair, or if there was a possibility of derailment.</i>

Term	Definition
<b>Collision between trains</b>	<p><i>This term describes collisions involving two (or more) trains. Accidents in which a collision between trains results in derailment or fire are included in this category.</i></p> <p><b>Roll back</b> collisions occur when a train rolls back (while not under power) into a train on the same line (including one from which it has decoupled).</p> <p><b>Setting back</b> collisions occur when a train making a reversing movement under power collides with a train on the same line, usually as part of a decoupling manoeuvre.</p> <p><b>Shunting movement/coupling collisions</b> arise when the locomotive or unit causing a collision is engaged in marshalling arrangements. While they characteristically occur at low speed and involve the rolling stock with which the locomotive or unit is to be coupled, accidents may involve a different train that could be travelling more quickly.</p> <p><b>Coming into station</b> collisions occur between two trains that are intended to be adjacent to one another (for example, to share a platform) but are not intended to couple up or otherwise touch. Normally, but not always, the collision speed will be low, because one train is stationary and the approaching train will be intending to stop short of the stationary train (rather as for a buffer stop). This operation is known as permissive working.</p> <p><b>In running (open track)</b> collisions occur in circumstances where trains are not intended to be in close proximity on the same line. The speed of one or both of the trains involved may be high.</p> <p>Collisions <b>in a possession</b> occur where there is a complete stoppage of all normal train movements on a running line or siding for engineering purposes. These collisions are only RIDDOR-reportable if they cause injury, or obstruct a running line that is open to traffic.</p>
<b>Open door collision</b>	<i>This occurs when a train door swings outward, coming into contact with another train.</i>
<b>Buffer stop collision</b>	<i>This occurs when a train strikes buffer stops. Accidents resulting in only superficial damage to the train are not reportable under RIDDOR.</i>
<b>Trains running into objects</b>	<i>This includes trains running into or being struck by objects anywhere on a running line (including level crossings) if the accident had the potential to cause a derailment or results in damage requiring immediate repair.</i>
<b>Trains striking animals</b>	<i>This includes all collisions with large-boned animals and flocks of sheep, and collisions with other animals that cause damage requiring immediate repair.</i>
<b>Trains being struck by missiles</b>	<i>This includes trains being struck by airborne objects, such as thrown stones, if this results in damage requiring immediate repair.</i>
<b>Train Protection and Warning System (TPWS)</b>	<p>A safety system that automatically applies the brakes on a train which either passes a signal at danger, or exceeds a given speed when approaching a signal at danger, a permissible speed reduction or the buffer stops in a terminal platform.</p> <p>A <b>TPWS intervention</b> is when the system applies the train's brakes without this action having been taken by the driver first.</p> <p>A <b>TPWS activation</b> is when the system applies the train's brakes after the driver has already initiated braking.</p> <p><b>TPWS reset and continue</b> incidents occur when the driver has reset the TPWS after an activation (or intervention) and continued forward without the signaller's authority.</p>

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Term	Definition
<b>Trajectory</b>	A concept developed for the Strategic Safety Plan. There are three aspects to a trajectory: a statement of current safety performance in a particular risk area, details of the actions being taken to address the risk and an estimation of the safety performance improvement that the actions are expected to deliver.
<b>Trespass</b>	Trespass occurs when people go where they are never authorised to be, rather than where they behave inappropriately (either from error or violation) at places where they are allowed to go at certain times and under certain conditions, such as level crossings.
<b>Workforce</b>	Persons working for the industry on railway operations (either as direct employees or under contract).

## Appendix 4. Glossary

The following is a list of acronyms used generally in RSSB's safety performance reports. Not all will appear in the current report.

Acronym	Expansion
ABCL	automatic barrier crossing locally monitored
AHB	automatic half-barrier crossing
AOCL	automatic open crossing, locally monitored
AOCR	automatic open crossing, remotely monitored
ASPR	Annual Safety Performance Report
ATOC	Association of Train Operating Companies
ATP	Automatic Train Protection
BTP	British Transport Police
CCTV	closed-circuit television
COSS	controller of site safety
CP	control period; we are currently in the fourth period, CP4
CSI	common safety indicator
CST	common safety target
DfT	Department for Transport
EC	European Commission
ERA	European Railway Agency
ERTMS	European Rail Traffic Management System
EU	European Union
FWI	fatalities and weighted injuries
FWSI	fatalities and weighted serious injuries
GB	Great Britain
GSM-R	Global System for Mobile communications – Railway
HEM	hazardous event movement
HEN	hazardous event non-movement
HET	hazardous event train
HGV	heavy goods vehicle
HLOS	High Level Output Specification
HSE	Health and Safety Executive
HST	High Speed Train
KRA	Key Risk Area
LC	level crossing
LX	level crossing
MCB	manually controlled barrier crossing
MCG	manually controlled gate crossing
MOM	mobile operations manager
MOP	member of the public
MWL	miniature warning light
NHS	National Health Service
NPS	National Passenger Survey
NR	Network Rail

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Acronym	Expansion
NRMI	Network Rail managed infrastructure
NRT	National Rail Trends
NRV	national reference values
NTS	National Travel Survey
OC	open crossing
OFG	Operations Focus Group
ORR	Office of Rail Regulation
OTP	on-track plant
PICOP	person in charge of possession
PHRTA	potentially higher-risk train accident
PIM	Precursor Indicator Model
PTI	Platform-train interface
RAIB	Rail Accident Investigation Branch
RGS	Railway Group Standard
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
ROGS	Railway and Other Guided Transport Systems (Safety) Regulations 2006
RSSB	Rail Safety and Standards Board
S&T	signal and telecommunications
SMIS	Safety Management Information System
SOCA	Serious Organised Crime Agency
SPAD	signal passed at danger
SPG	safety Policy Group
SPI	safety performance indicator
SRM	Safety Risk Model
SRP	Sustainable Rail Programme
SSP	Strategic Safety Plan
TOC	train operating company
TPWS	train protection and warning system
TSAG	Technical Strategy Advisory Group
UWC	user-worked crossing
UWC-T	user-worked crossing with telephone