

# The Railway Strategic Safety Plan

2008 - 2010





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## Glossary of terms

ATOC	Association of Train Operating Companies
ASPR	Annual Safety Performance Report
CSI	Common Safety Indicator
CST	Common Safety Target
CSM	Common Safety Method
DfT	Department for Transport
ERA	European Rail Agency
ERTMS	European Rail Traffic Management System
FWI	Fatalities and Weighted Injuries
GSM-R	Global System for Mobile Communications - Railways
HLOS	High Level Output Specification
HMRI	Her Majesty's Railway Inspectorate
HSISE	How Safe Is Safe Enough?
KRA	Key Risk Area
ORR	Office of Rail Regulation
PIM	Precursor Indicator Model
RAIB	Rail Accident Investigation Branch
RISAS	Railway Industry Supplier Accreditation Scheme
ROGS	Railways and Other Guided Transport Systems (Safety) Regulations 2006
RSSB	Rail Safety and Standards Board
SMIS	Safety Management Information System
SMS	Safety Management System
SPAD	Signal Passed At Danger
SRM	Safety Risk Model
SSP	Railway Strategic Safety Plan
TOC	Train Operating Company
TPWS	Train Protection and Warning System
TSI	Technical Specification for Interoperability



“This Railway Strategic Safety Plan delivers an approach to safety planning in Great Britain’s railway industry based on duty holders’ initiatives and the projections of the safety benefits they will achieve.”

## executive summary

This Railway Strategic Safety Plan (SSP) delivers an approach to safety planning in Great Britain’s railway industry<sup>1</sup> based on duty holders’ initiatives and the projections of the safety benefits they will achieve.

The trajectories illustrate the cumulative effect of these initiatives as they affect the system as a whole, in terms of risk reduction. For the first time, it is possible to present quantified trajectories expressing the anticipated reduction in risk in numeric terms across seven of the nine key risk areas during the period 2008-10. The nine key risk areas account for over 95% of the total residual risk on the railway.

### In summary, these quantified trajectories are:

#### **Passengers** – at stations:

Two trajectories have been developed for this key risk area, projecting a reduction in risk to passengers of around 11% from slips, trips and falls, and about 9% from platform-train interface events.

#### **Workforce** – train crew:

A trajectory has been developed for signals passed at danger (SPADs) projecting a reduction in risk to passengers and traincrew of around 8% and one for onboard injuries predicting a reduction in risk to traincrew of around 9%.

#### **Workforce** – track workers:

A reduction in track worker injury risk of around 14% is projected.

#### **Workforce** – station staff:

A reduction in injury risk to station staff from slips, trips and falls of around 10% is projected.

#### **Engineering** – infrastructure:

A reduction in the risk arising from infrastructure (including track, structures and signalling and telecommunications equipment) to passengers and the workforce of around 6% is projected.

#### **Public Behaviour** – crime:

Separate trajectories for assaults on passengers (with a projected reduction in risk of around 6%), assaults on train crew (with a projected reduction in risk of around 10%), and assaults on station staff (with a projected reduction in risk of around 8%) have been developed.

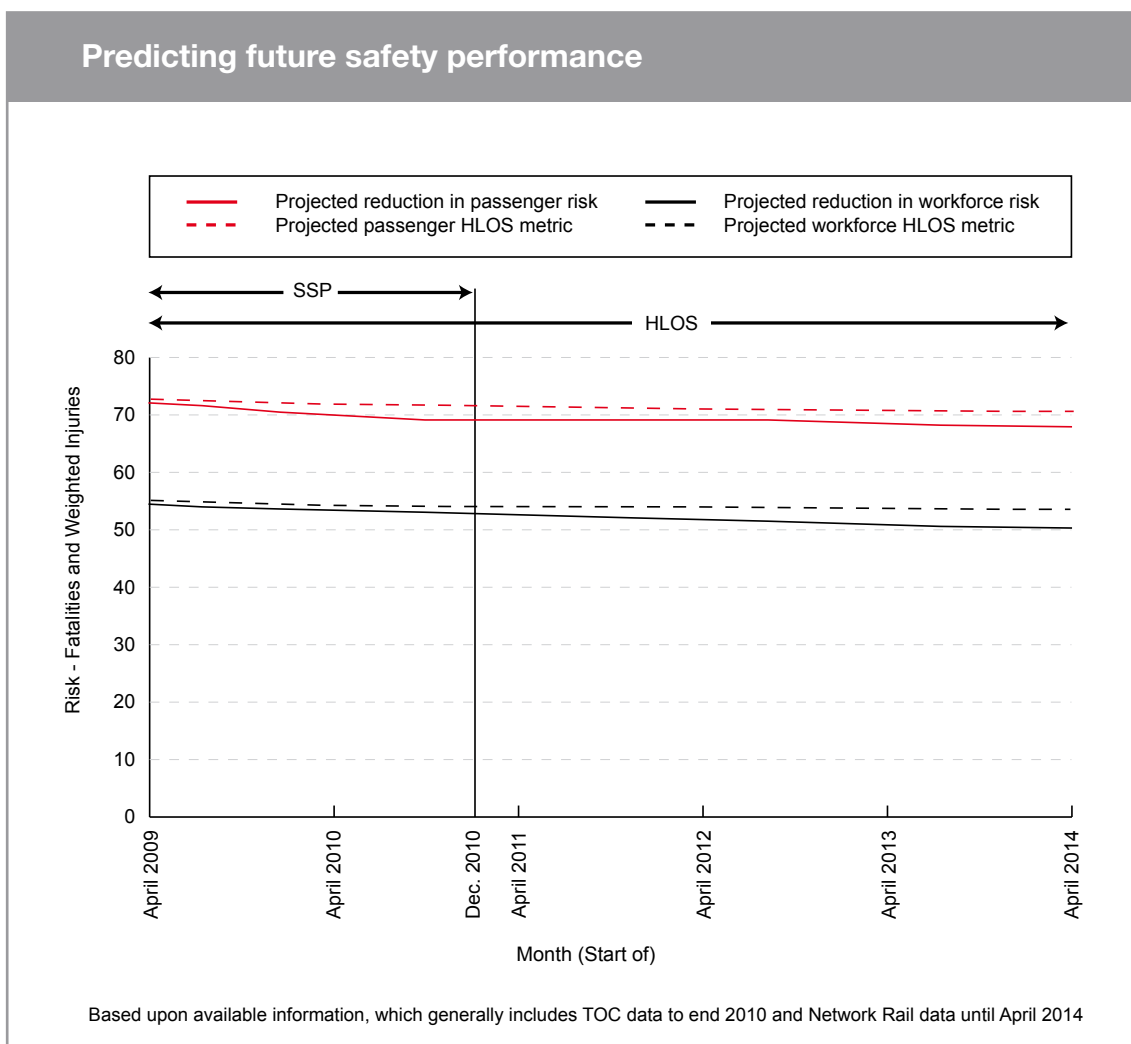
#### **Public Behaviour** – level crossings:

Approximately 2% reduction in level crossing risk is projected, both for accidents involving road vehicles and pedestrians.

<sup>1</sup>The scope of this plan is the mainline network of Network Rail Managed Infrastructure; references to the railway should be read in that context.

In addition to duty holders' individual initiatives, which have been drawn together to develop the trajectories, work is taking place at a system-wide level to develop the industry's overall approach to safety management and to respond to the external environment in which it operates. This includes participation in the development of an integrated and competitive European rail industry. The research and development programme, managed on behalf of the industry and government by RSSB and funded by the Department for Transport, aims to improve safety, health, reliability and punctuality, whilst reducing costs in the long term.

Under the Railways Act 2005, the Secretary of State has set two High Level Output Specifications (HLOS) for safety for the period 2009-2014: passenger safety risk and workforce safety risk will both reduce by 3%. The industry has considered these specifications and is confident that they can be achieved. The diagram below shows the relationship between the trajectories in this plan and the HLOS based on the current version of the Safety Risk Model (SRM).





“This plan covers the three years from January 2008 to December 2010. It develops the approach to planning set out in the 2007-2009 Strategic Safety Plan.”

## 1. introduction

This plan covers the three years from January 2008 to December 2010. It develops the approach to planning set out in the 2007-2009 Strategic Safety Plan (SSP). Duty holders have planned many of their future initiatives and quantified the safety benefits, enabling most of the trajectories in this plan to be expressed in quantitative terms. This principle will be developed further in future SSPs. Network Rail has quantified its plans for a period extending to 2014, and this plan has an initial look at what the industry can predict for the five-year period 2009-2014, covered by the Government's HLOS.

Section 3 of this plan shows how duty holder plans address the Key Risk Areas (KRA) on the railway. Wherever possible, the risk reduction is expressed numerically; where this is not yet possible, a broader statement of the overall intent is given.

### Key principles

The following key principles underpin the approach to safety management in the railway industry and are integral to this plan:

- The European Railway Safety Directive, which states that the current level of safety in the Community rail system is generally high, must be at least maintained, and where reasonably practicable, improved.
- The requirement of duty holders to reduce risk to a level that is as low as reasonably practicable, embodied in both the Health and Safety at Work etc Act 1974 and the European Railway Safety Directive (2004/49/EC).
- Industry stakeholder commitment to cooperation in the management of safety risk.
- In July 2007, the Secretary of State for Transport set a HLOS for the railway industry that included two safety metrics, to reduce both passenger safety risk and workforce safety risk by 3% between 2009 and 2014.



### Developing the Strategic Safety Plan

The term 'trajectory' was first used in the 2007-2009 SSP as a way of graphically illustrating expected changes in the level of safety risk as a result of the industry's actions.

A trajectory has as its starting point the current level of risk and the actions put in place to address that risk; a reasonable judgement is then made by each duty holder to estimate the changes in risk levels that can be expected over the three years of the plan as a result of the actions.

The development of the SSP is therefore rooted in the industry's safety planning process because each of the trajectories set out in section 3 is calculated from the industry's own assessment of the effects of the actions it intends to take over the three-year lifetime of this SSP. Wherever possible, duty holders have quantified these effects, although inevitably they include a degree of estimation that depends on a continuation of current trends and the operating environment. Where it has not been possible to calculate the effect on risk, qualitative statements are made to indicate the general trend that is expected from the industry's actions.

Each of the planned actions has been mapped to the key risk areas, which have been derived from the SRM. Each key risk area represents a specific type of risk under the general categories of passengers, workforce, engineering and public behaviour.

In aggregating the plans of the industry, where similar actions are common to a number of companies, these have been taken as actions the industry is undertaking (although this should not be interpreted as meaning that every industry company will take action in each area). Where quantitative trajectories have been developed from these actions, the level of risk reduction is calculated to reflect the overall effects of the aggregated actions. The set of plans, taken together, give confidence that the trajectories represent a reasonable forward projection.

Figure 1

## The Safety Planning Cycle

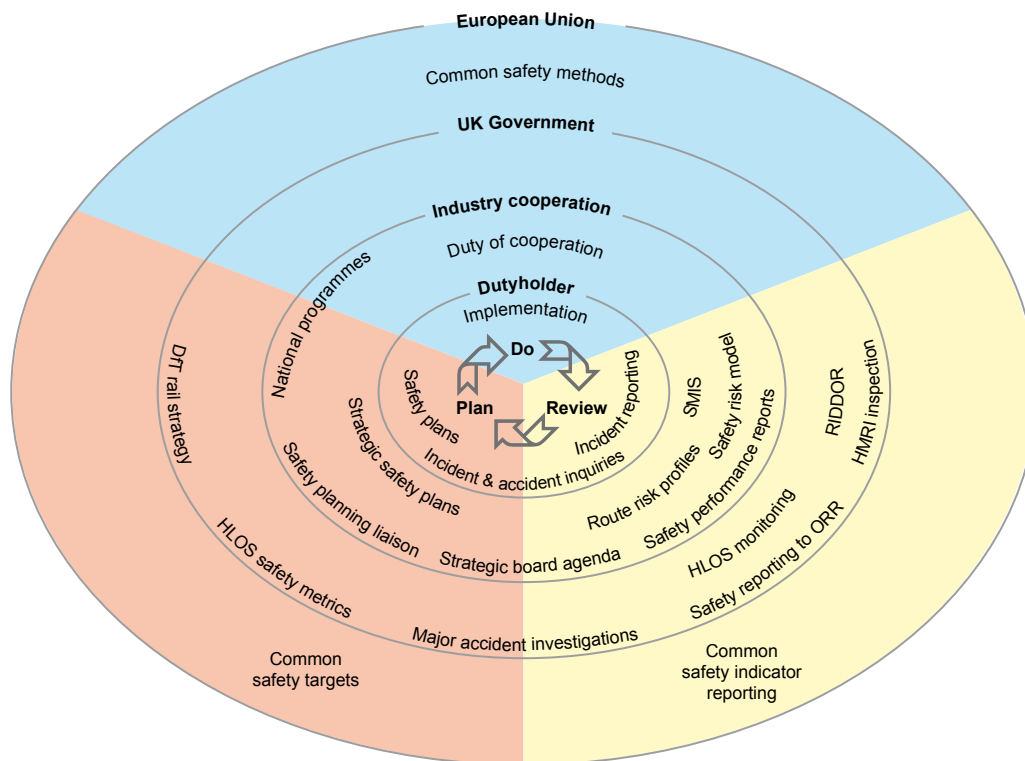


Figure 1 illustrates the industry's planning cycle, based on a plan-do-review model. The SSP fits into the 'plan' sector of the model, at the industry cooperation level, bringing together the planning work done by duty holders and taking into account the input from the UK Government and the European Community. Implementation is primarily a duty holder responsibility, although some activities are coordinated by RSSB as National Programmes.

The Annual Safety Performance Report (ASPR), published by RSSB, analyses the industry's safety performance in detail and provides information on the trends across all risk areas. The ASPR is in turn primarily informed by the industry's Safety Management Information System (SMIS), a database comprising all significant safety-related incidents on the network. From this data, the SRM is updated regularly, and it is from this model that the key risk areas are determined. As the SRM is updated, so it will expose changes in the level of risk and hence progress against the trajectories. Performance is fundamentally monitored by individual duty holders and their own systems, but it is also monitored at the national level using SMIS, the SRM and through the production of periodic and special topic reports. As a result of this monitoring, corrective actions may be initiated by individual companies, or collectively through new or revised national programmes, standards changes etc. The regular review of performance at the national level is overseen by the RSSB Board through a series of papers considered as part of the 'Strategic Board Agenda'. Individual national cooperative groups, as described in section 4, monitor performance in particular areas and agree collective actions where appropriate.



“In the areas of risk under the direct control of the industry there is a long-term improving trend.”

## 2. the overall safety performance of the railway

### The level of risk

Effective safety planning requires a detailed understanding of key risk areas – the activities or circumstances where the safety risk to passengers, the workforce and the public is greatest. This allows resources and effort to be concentrated where they will have the greatest impact. In order to identify these areas, RSSB manages the SRM on behalf of the industry. This is augmented by the Precursor Indicator Model (PIM), which analyses the trends for those events that could lead to a train accident. Analysis of the SRM estimated the risk in 16 risk areas<sup>2</sup>, the top nine of which account for over 95% of the total residual risk on the railway. These nine were selected as the key risk areas. The risk levels for the railway as a whole are shown in Figure 2. Those areas where the risk level is less than one fatality and weighted injury (FWI<sup>3</sup>) per year were not included as KRAs. Fatalities are shown as solid bars, weighted injuries are shown as shaded bars. The nine selected areas are grouped into risk from passenger behaviour (at stations and on trains), workforce behaviour (train crew, track workers and station staff), engineering (track and trains) and public behaviour (crime and level crossings). In each of these areas, a set of industry actions and initiatives has been identified (see section 3).

### Long-term trend in safety performance

There is a long-term improving trend in the areas of risk under the industry's direct control.<sup>4</sup> This is illustrated in Figure 3 by the number of fatal train accidents, which have reduced consistently since the 1950s. Indeed, in 2003, 2005 and 2006 there were no train accidents resulting in passenger deaths. This should be seen against a trend of rising passenger numbers, more freight traffic and a larger number of trains using the network.

<sup>2</sup>18 risk areas were identified in the 2007 – 2009 SSP, but these have now been reduced to 16 by combining 'track', 'structures' and 'signalling and telecommunications' into 'Engineering Infrastructure' to group together the range of events that contribute to infrastructure risk.

<sup>3</sup>The term FWI is a measure that combines fatalities and injuries. With this measure, 200 minor injuries and 10 major injuries are each considered to be equal to one fatality.

<sup>4</sup>The term 'direct control' is used to describe risk for which the industry has full responsibility rather than that arising from the behaviour of external parties – such as the public – which the industry may be able to influence but cannot fully control.

Figure 2

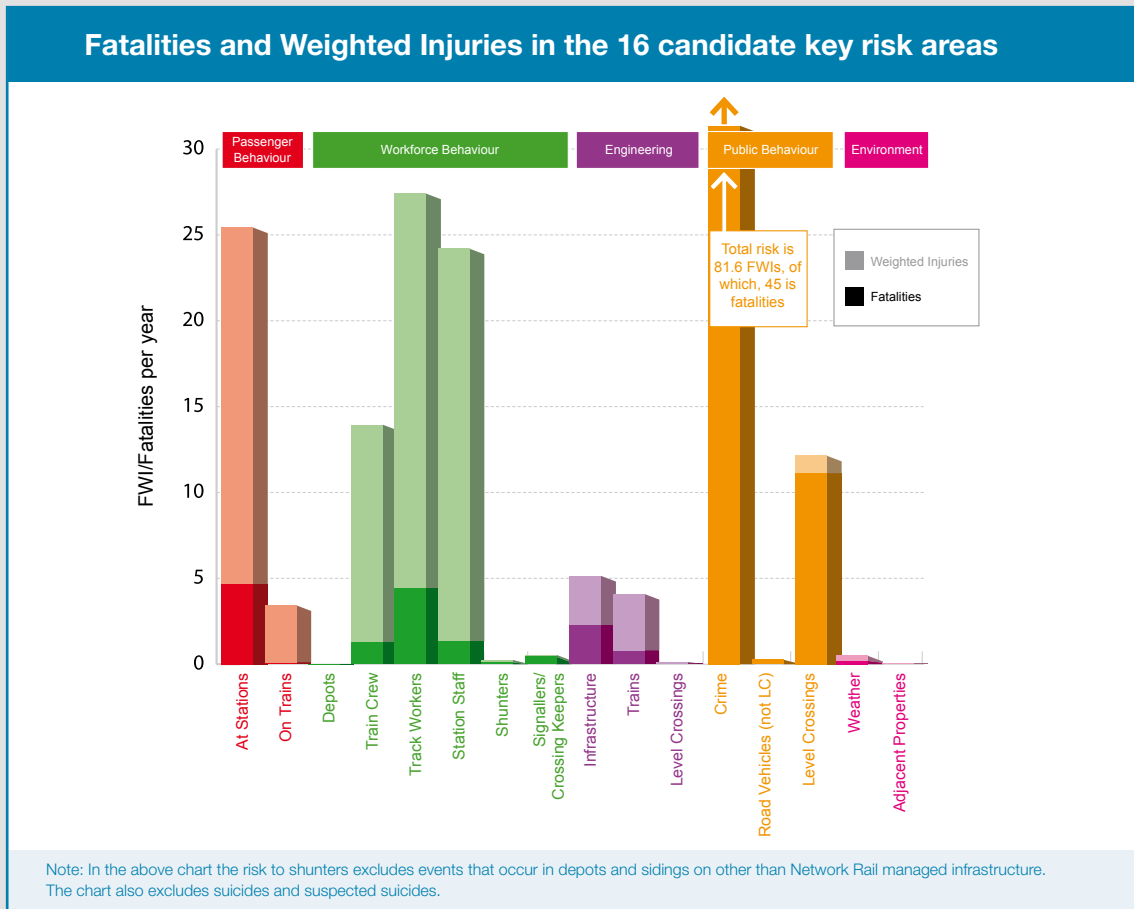
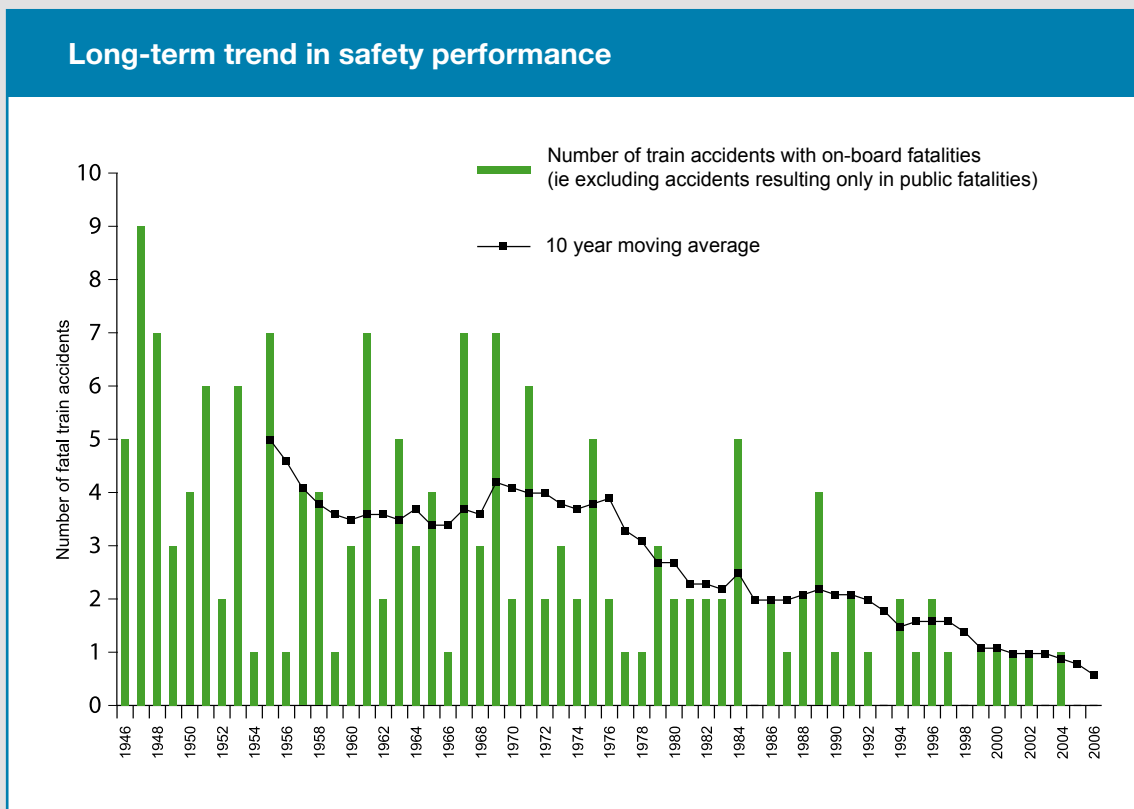


Figure 3





### Benchmarking rail's safety performance with other modes

Passenger rail services in Great Britain operate in the transport sector and can be benchmarked against other modes of transport. Passenger fatality risk for different modes is shown in Figure 4, (based on a measure of fatalities per passenger kilometre relative to rail, ie rail is set to a value of one). Rail clearly performs strongly by this measure, as it does if performance is measured in other ways (such as fatalities per journey).

### Benchmarking GB's rail safety performance with Europe

Figure 5 draws comparison between Great Britain's main line railway and equivalent railway systems abroad. It shows that British railways have a broadly similar safety performance to the major national networks in western Europe. While this is generally true, it is difficult to make detailed comparisons because data have been compiled in different countries using different base definitions. However, from 2006 the European Rail Agency began collecting data from each member state for the Common Safety Indicators (CSIs) as required by the European Railway Safety Directive. Over time, these indicators will be used to compare performance on an equivalent basis across the national rail systems. Nevertheless, it will still not be possible to make a full direct comparison, due to differences in the nature of operations.

Figure 4

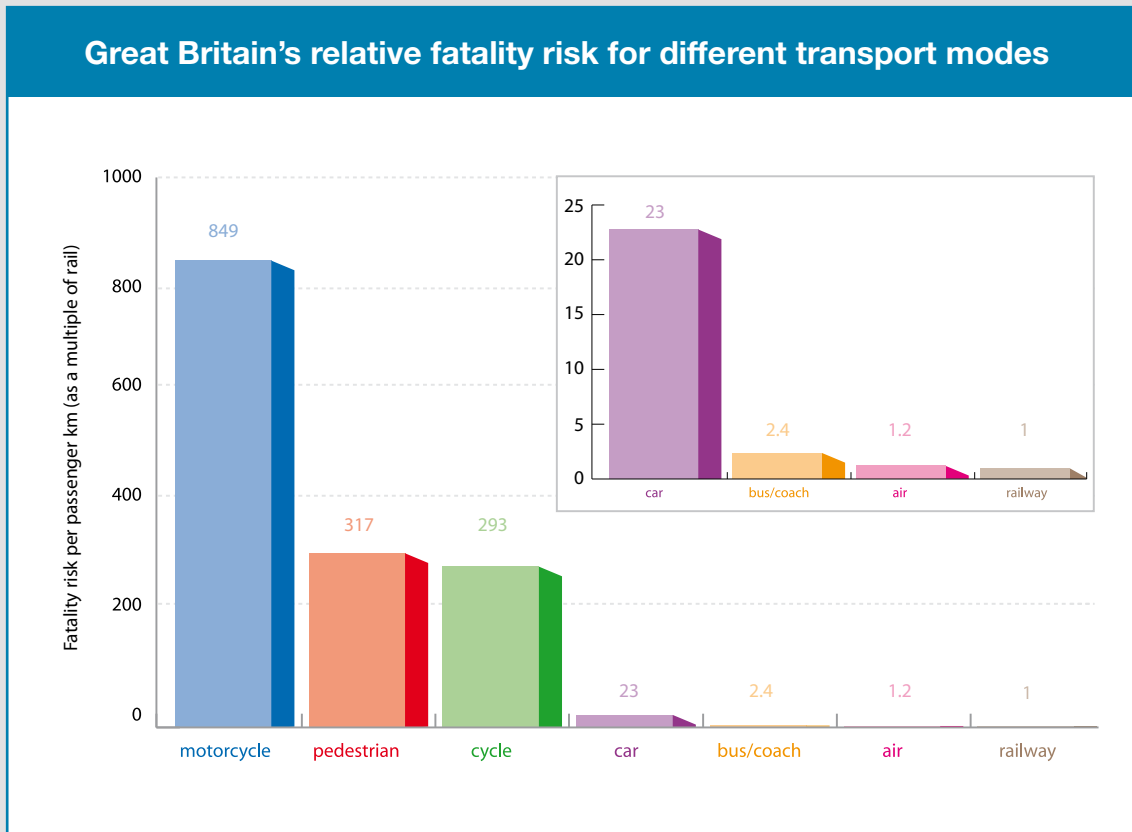
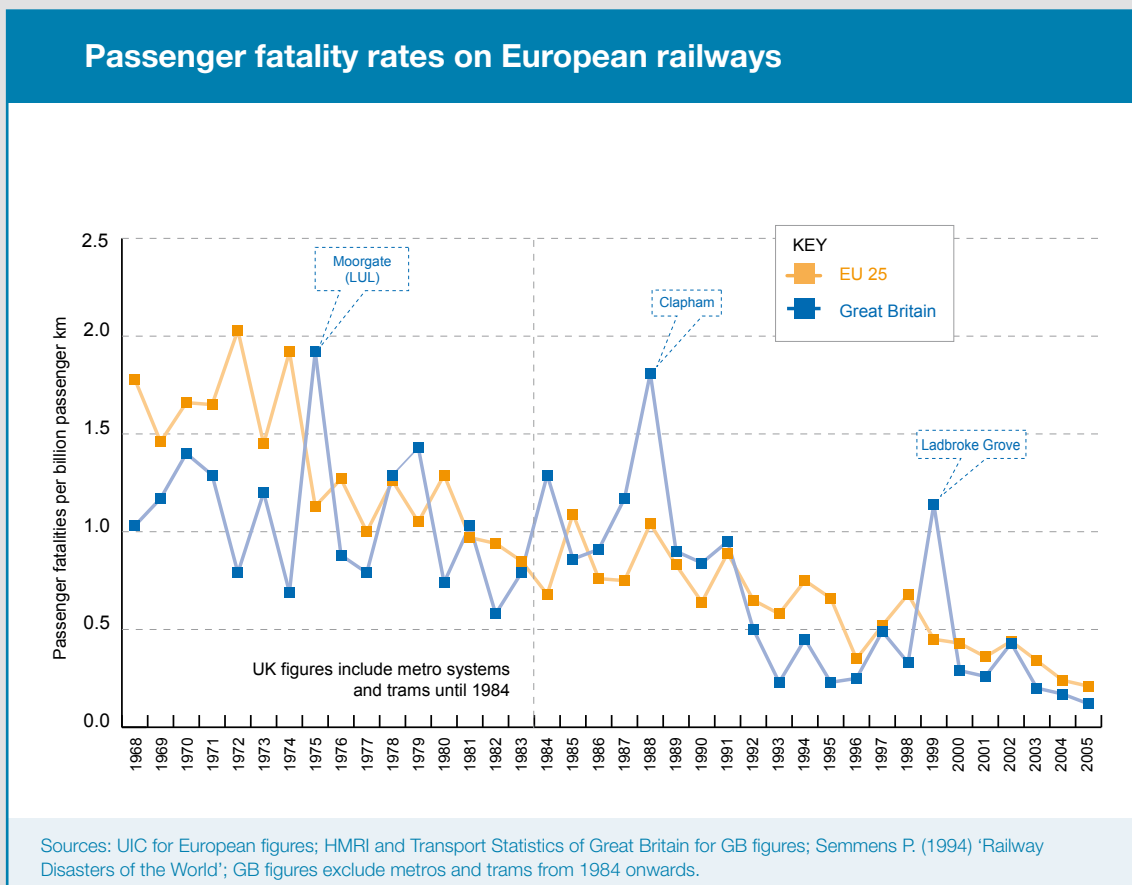


Figure 5





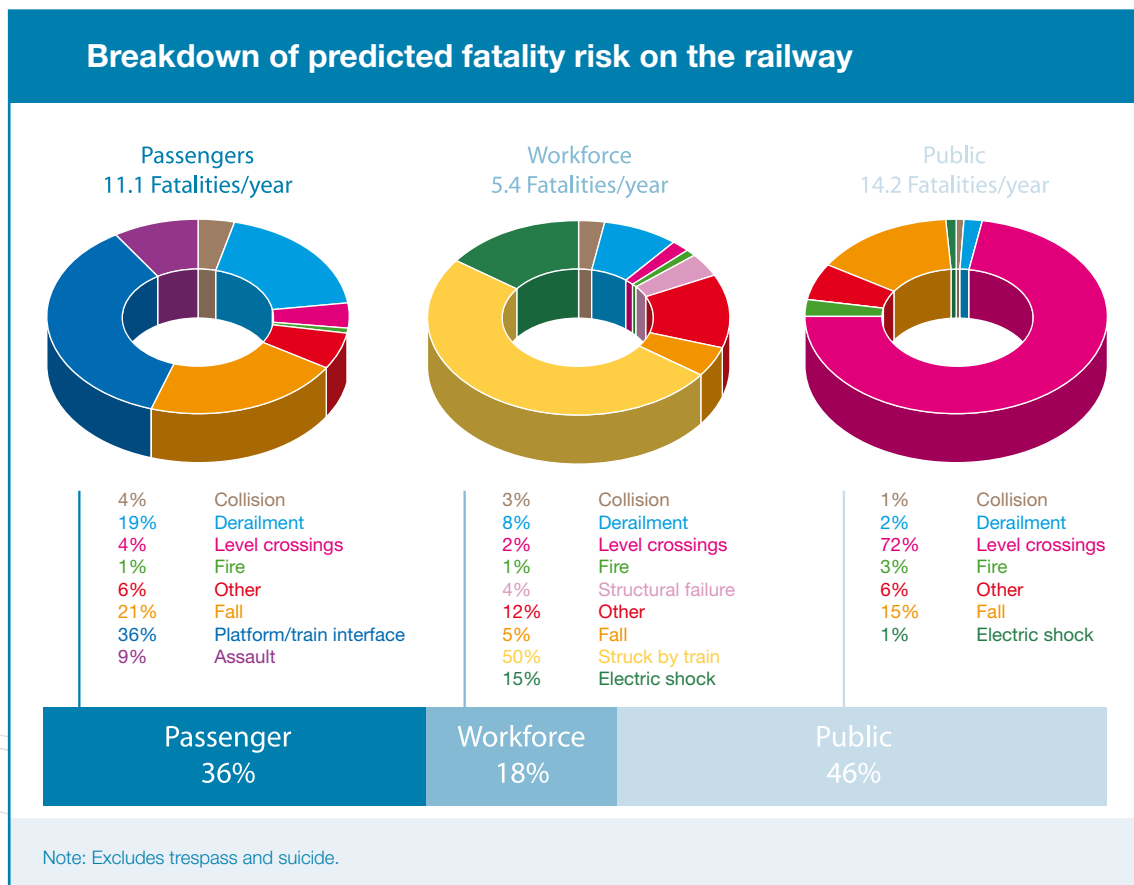
### Fatality risk on the railway

Figure 6 shows the *fatality risk to* passengers, the workforce and the public (excluding trespassers and suicides), but does not consider major or minor injuries. The SRM currently predicts a risk of 31 total fatalities per year, divided in the proportions shown.

Train accidents (derailments and collisions) contribute about a quarter of the passenger fatality risk (the total passenger fatality risk being 11.1 fatalities per year). Public fatalities are mainly associated with level crossings and this equates

to approximately 14 fatalities per year. Workforce fatalities are dominated by being struck by trains and account for half of the 5.4 fatalities per year. In section 3, risk is presented in terms of FWIs. This gives a broader overall picture of risk.

Figure 6





“The allocation of the risk into the key risk areas has been based upon the cause of the risk expressed in FWIs.”

### 3. key risk areas and trajectories

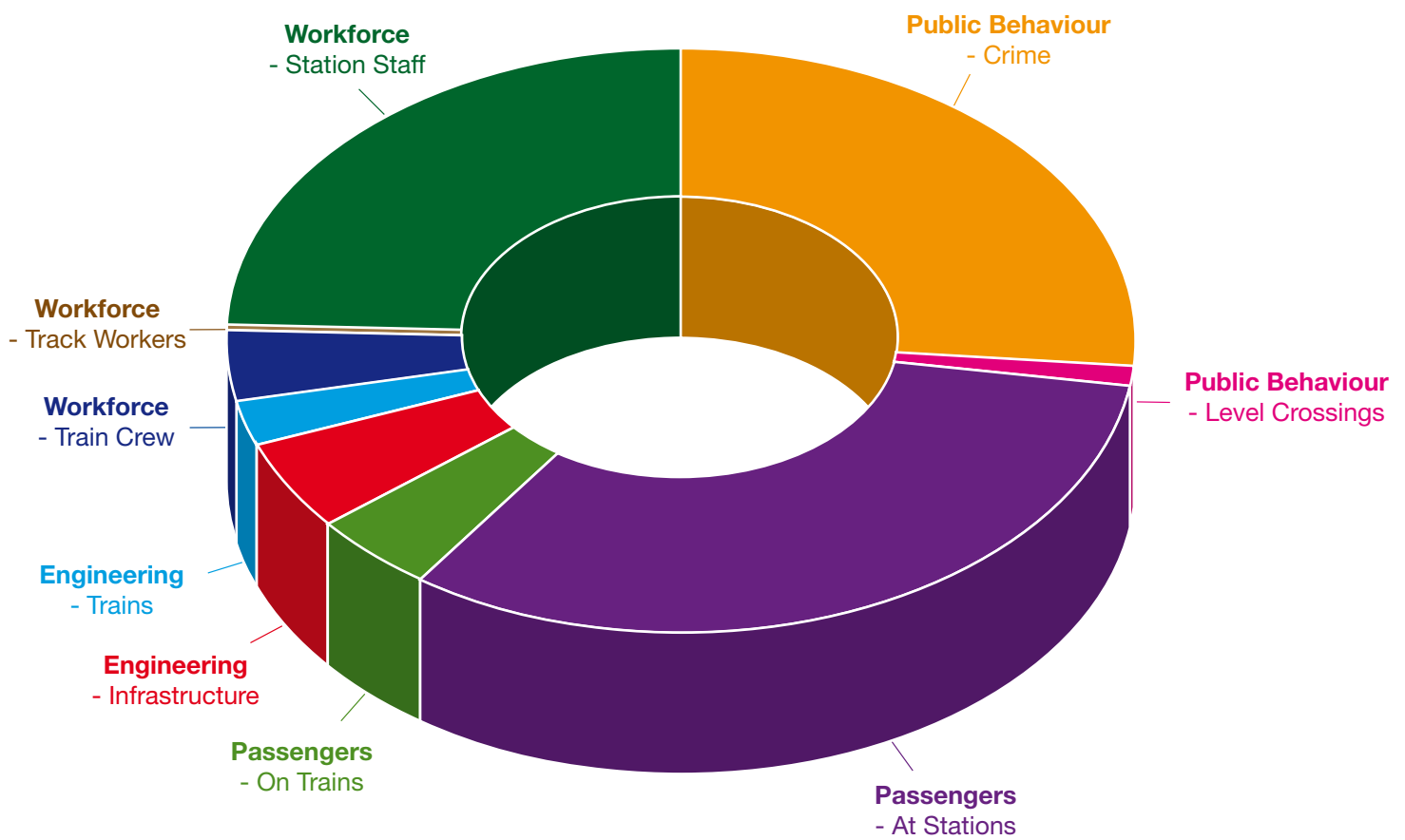
The diagrams on the following pages illustrate the relative risk of the nine key risk areas. There are also separate diagrams for the three groups at risk: passengers, the workforce and the public (eg level crossing users). The breakdown of the risk into the nine areas has been based upon the industry's Safety Risk Model.

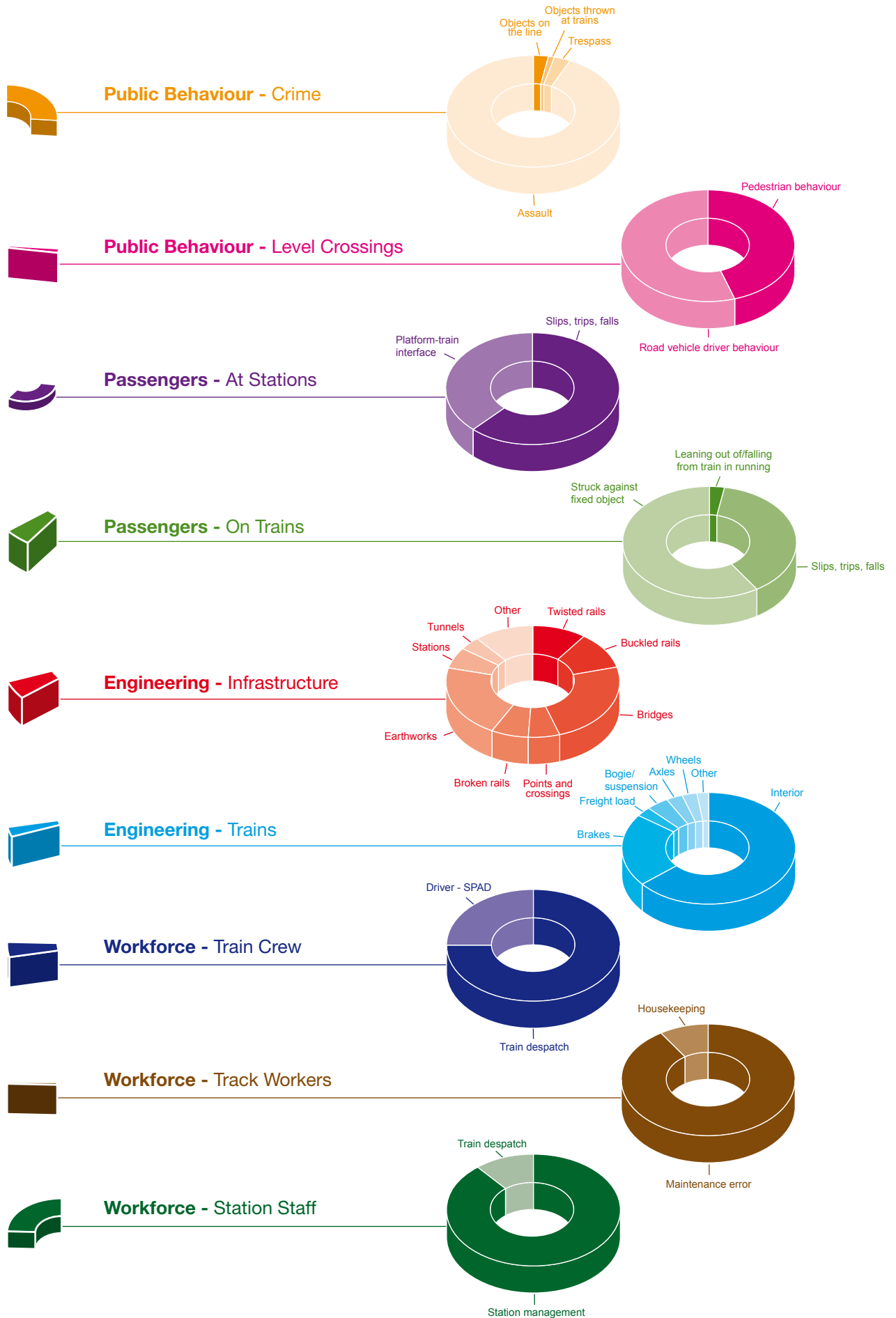
**The allocation of the risk into the key risk areas has been based upon the cause of the risk expressed in FWIs.**

Therefore, the risk to passengers from a vandal placing an object on the line is presented in the *Public Behaviour – crime* category rather than a category relating to passengers. Of the nine key risk areas, two refer to passengers, three refer to the workforce, two relate to engineering topics, and two relate to public behaviour.

# Key Risk Areas for Passengers

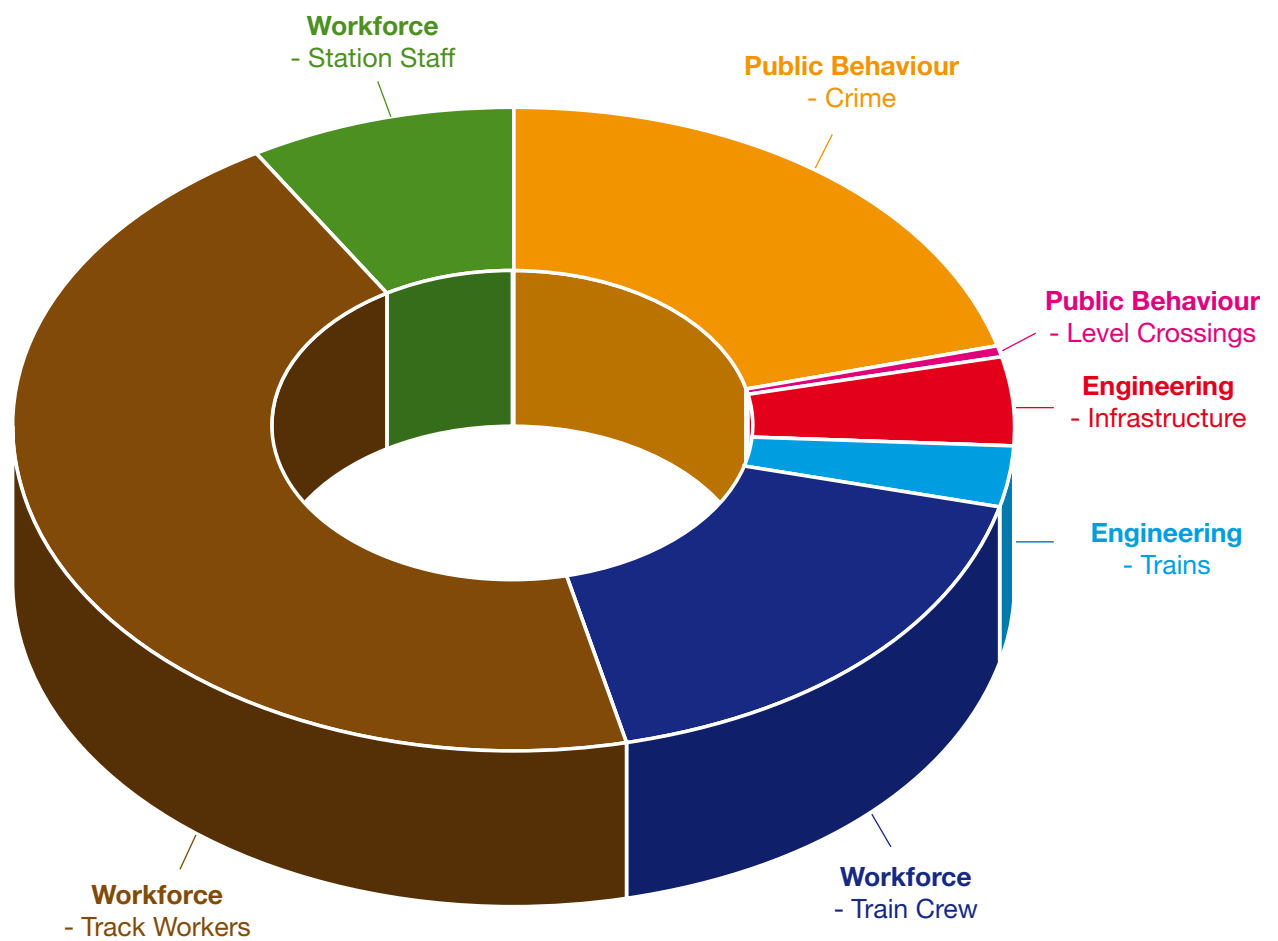
The diagram below shows the breakdown of risk to passengers arising from the key risk areas.

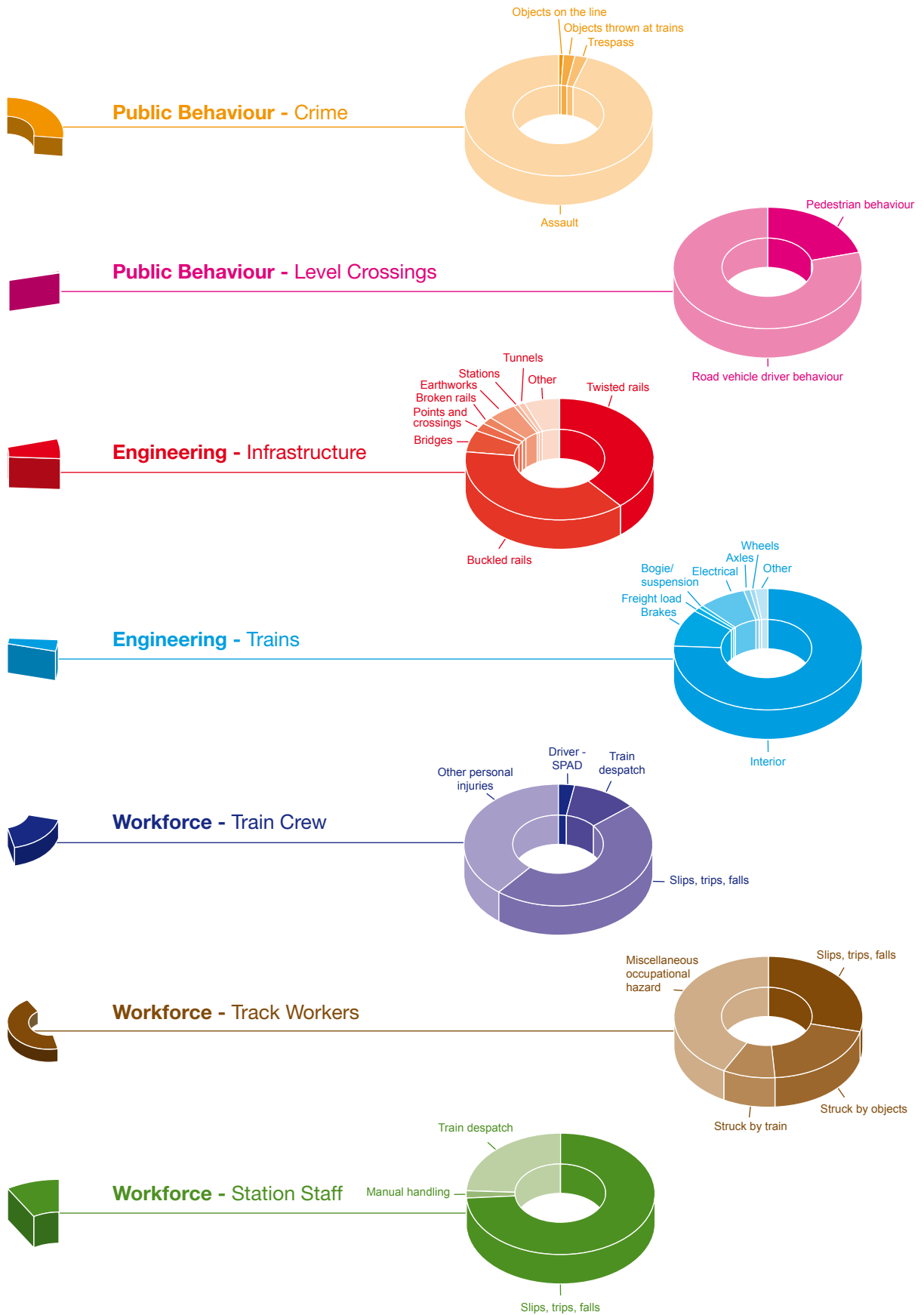




# Key Risk Areas for the Workforce

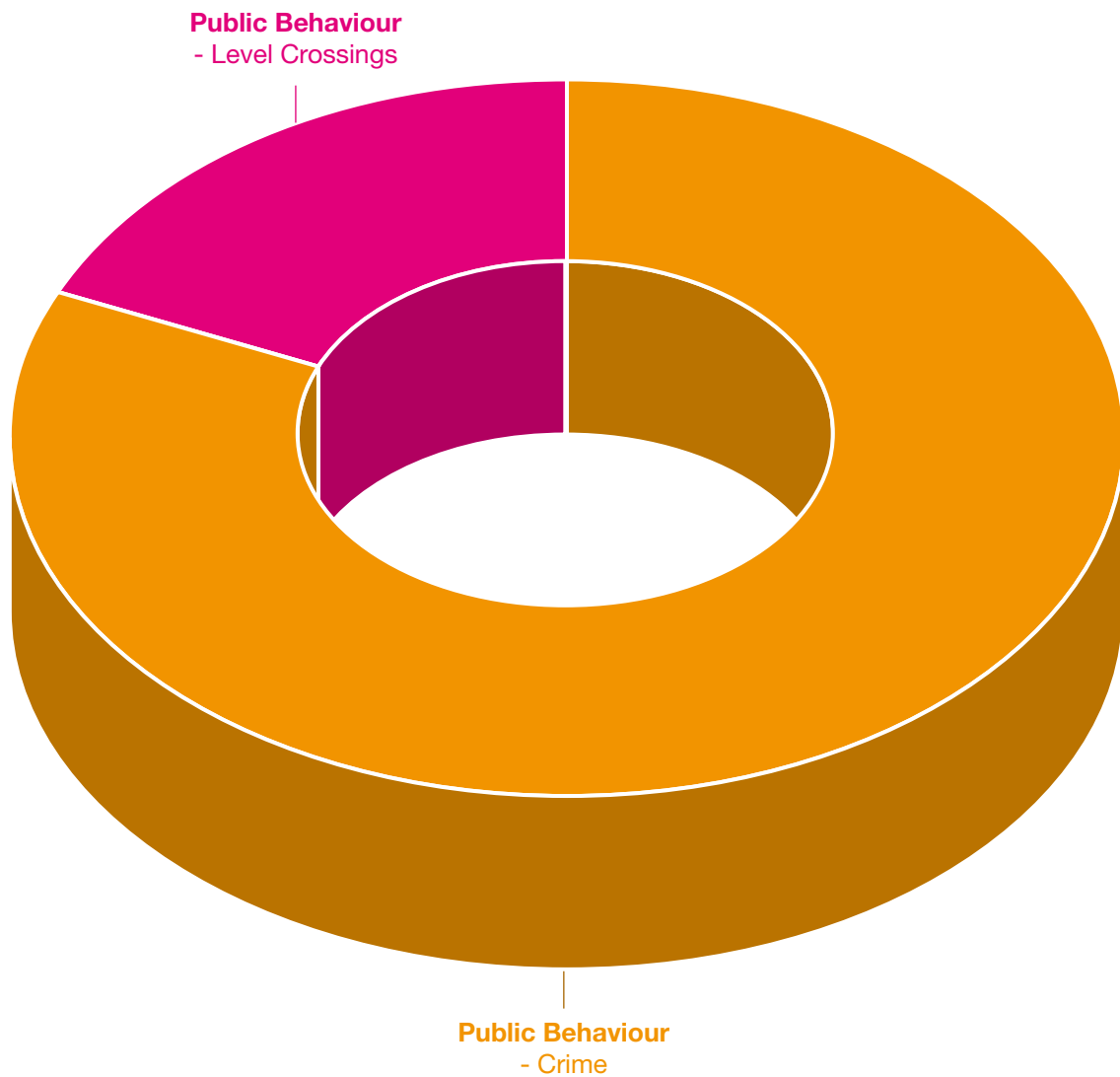
The diagram below shows the breakdown of risk to the workforce arising from the key risk areas.





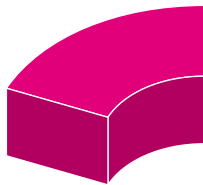
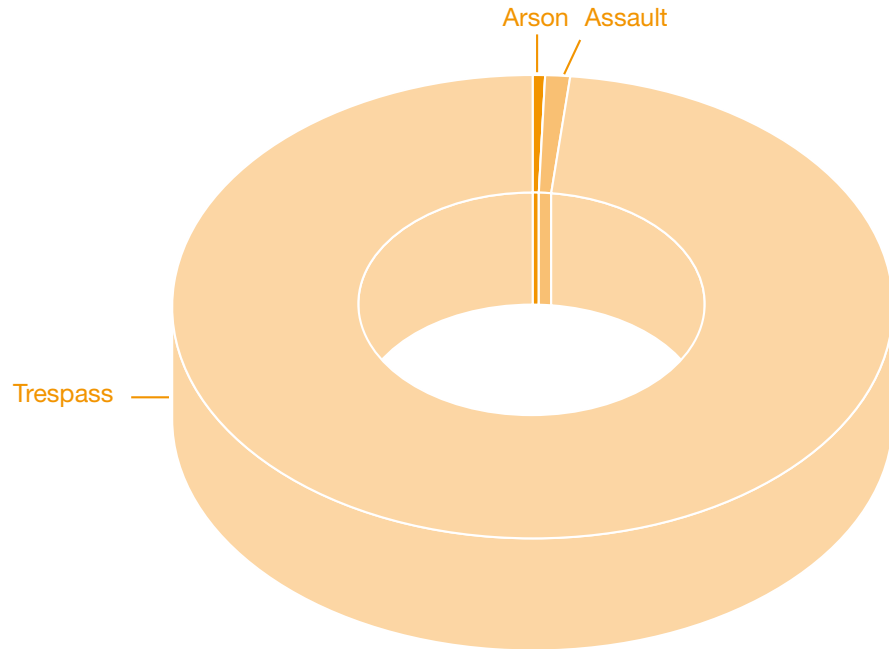
# Key Risk Areas for the Public

The diagram below shows the breakdown of risk to the public arising from the key risk areas.

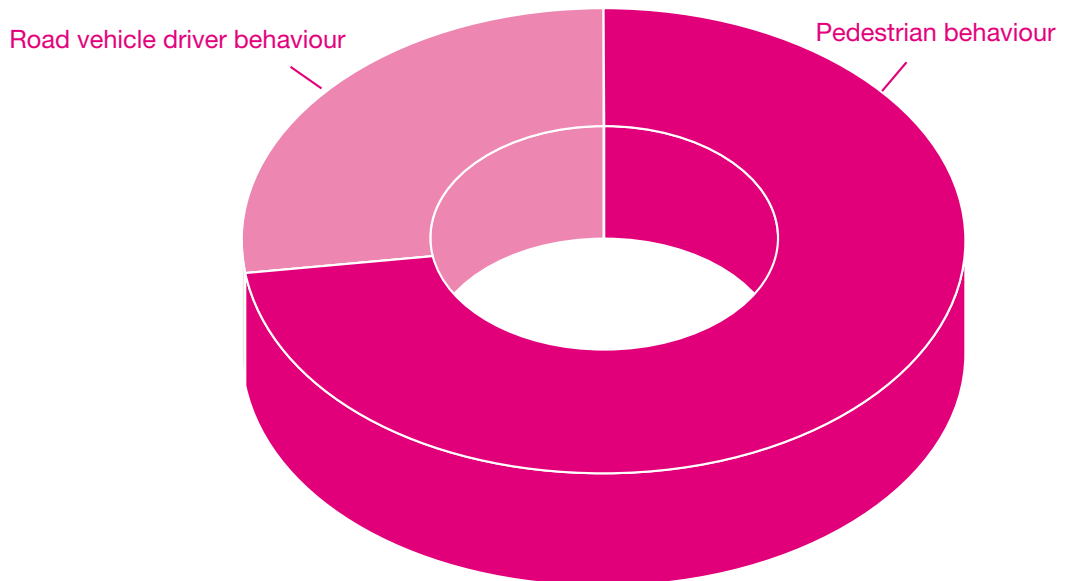




**Public Behaviour - Crime**



**Public Behaviour - Level Crossings**





## The trajectories

The 2007-09 SSP made a commitment for an evolutionary approach to providing quantitative trajectories for each of the key risk areas. This plan represents the first step towards quantification, providing quantitative trajectories for 11 topics in seven of the nine key risk areas.

The trajectories have been developed by aggregating future safety benefits projected by dutyholders: TOCs, Network Rail and their suppliers. There are two types of trajectory presented in the following section and Figure 7 shows the type of trajectory developed for each key risk area:

### 1. Charts

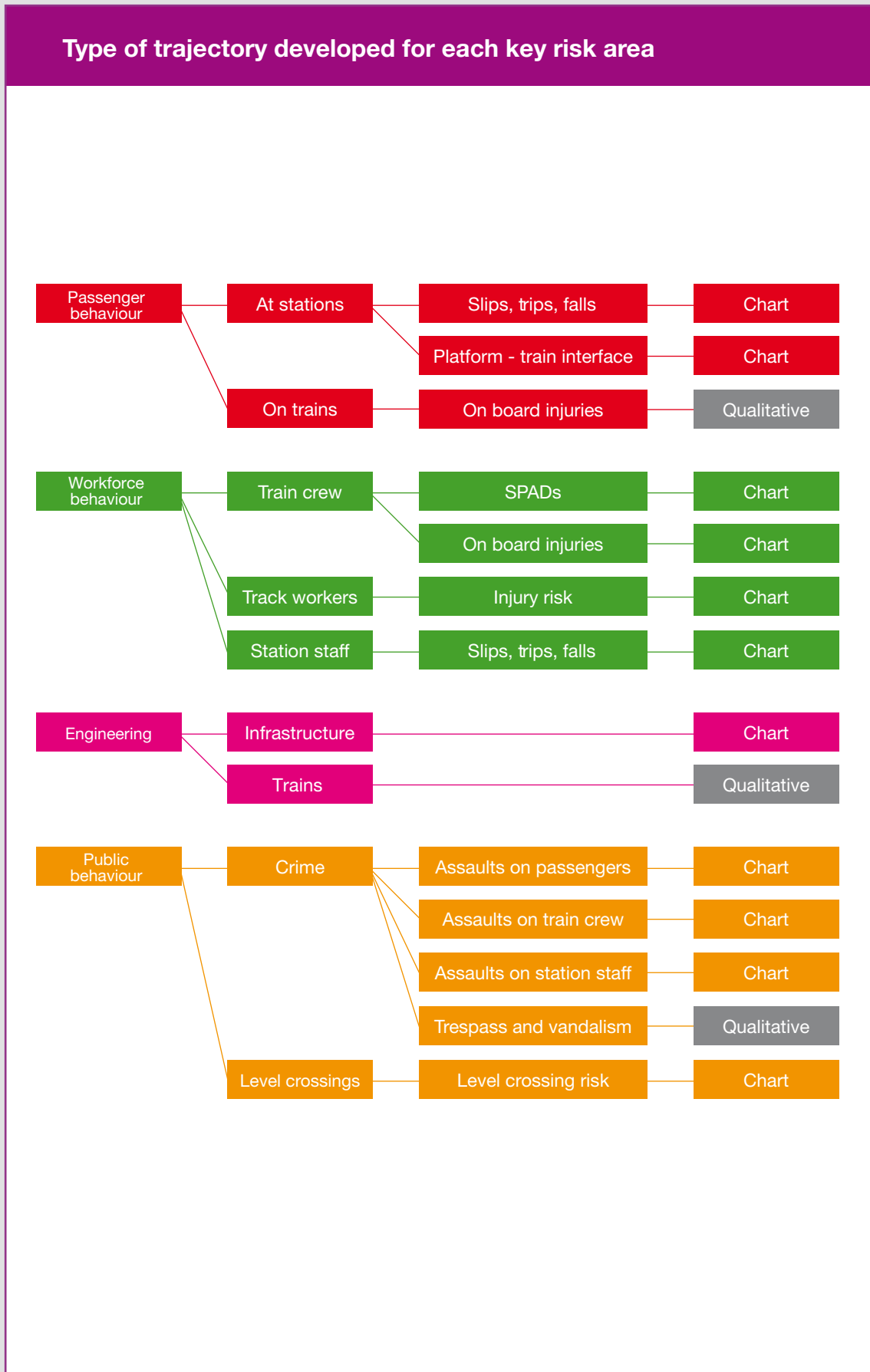
Charts have been developed where either duty holders have made a range of different quantitative projections of future safety performance or where a single duty holder has responsibility for a particular topic and has predicted a safety improvement in that key risk area. In cases of multiple duty holder predictions, data have been analysed to identify upper and lower bounds for the safety performance improvement expected over the next three years. These bounds have been used to calculate the broad range of safety performance improvement anticipated by 2010.

### 2. Qualitative trajectories

Where there is insufficient information to form a quantified trajectory, a qualitative trajectory is presented, similar to the 2007 - 2009 plan.

For some key risk areas, more than one trajectory has been developed to reflect fully the range of issues. In *Public Behaviour – Crime*, for example, there are separate trajectories for different types of assault and level crossing misuse. The industry's performance against all these trajectories will be monitored by RSSB and published in the ASPR. Throughout this section, risk is presented in terms of FWIs. On this basis, one fatality is considered equivalent to 10 major injuries or 200 minor injuries.

Figure 7



## KEY RISK AREA

## Passengers - at stations

### Risk Information

The risk from passenger behaviour at stations represents approximately 25 FWIs per year, which includes approximately five fatalities. The risk is dominated by accidents at the platform-train interface and slips, trips and falls. It is important to note that the cause of platform-train interface and slips, trips and fall risk is shared between passenger behaviour and the management of stations by staff by providing effective train despatch and responding to station hazards such as wet and slippery platforms.

The risk profile mainly comprises minor injuries, although there is some potential for fatal accidents at the platform-train interface. There has been a downward trend in recent years in serious boarding and alighting accidents; slips, trips and falls; and accidents at the platform edge.

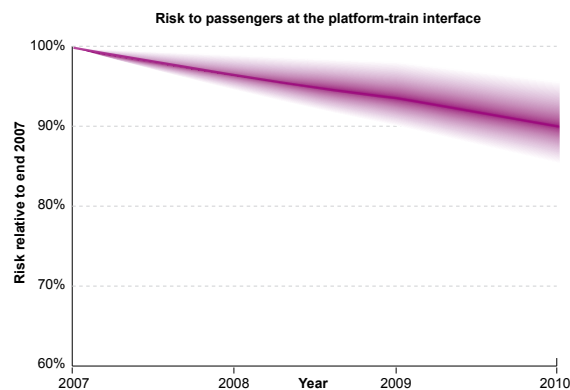
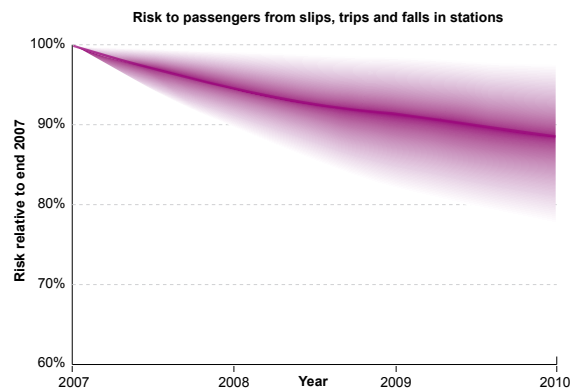
### Passengers at stations

### Actions

Examples of the key initiatives to improve the safety of passengers at stations include:

- Improving footbridge surfaces.
- Providing additional passenger lifts at stations.
- Raising passenger awareness of luggage handling facilities.
- Extending the use of the slip, trip and fall toolkit.
- Extending the programme of stair nose painting.
- Providing improved passenger information, including signage, at stations.
- Identifying locations with selective door opening problems and developing remedial actions.

### Trajectory



## KEY RISK AREA

## Passengers - on trains

### Risk Information

The risk from passenger behaviour on trains is caused by passengers falling against fixed objects and being struck whilst leaning out of trains or falling from a train in motion. The risk from these events, in total, equates to approximately 3.4 FWIs per year, which has a negligible contribution from fatalities with the risk from falling from a train in motion having been practically eliminated by the removal of Mark 1 slam-door stock. Between 2001 and 2004 there were 22 fatal accidents of this type and none since 2005. The risk from falling against objects is contributed to by passengers losing their balance or tripping whilst moving about within trains.

Note that passenger-on-passenger and passenger-on-staff assaults are covered under *Public Behaviour - Crime*.

### Passengers on trains

### Actions

Examples of how the risk to passengers on trains will be managed include:

- Identifying “rough ride” sites and developing remedial action plans.
- Designing new train interiors to reduce the number of fixed objects that act as an obstacle when people fall or when there is a train accident.
- Introducing additional rolling stock, as specified in the Government’s white paper *Delivering a Sustainable Railway*, which will reduce crowding.

### Trajectory

*Given the recent improvements in this key risk area, the aim is to maintain the current level of safety, improve it where reasonably practicable and take opportunities to reduce risk when trains are refurbished or procured.*

## KEY RISK AREA

## Workforce - train crew

### Risk Information

The risk from train crew error is approximately 14 FWIs per year, of which approximately one relates to fatalities. There are three main categories of risk from train crew error:

**SPADs**, which represent approximately 1.2 FWIs per year.

**Train despatch**, which represents approximately 3.4 FWIs per year.

**Train crew individual personal accidents**, which comprise the remainder of the risk. This category of accident includes events such as slips, trips and falls.

Each of these events is very different; SPADs are the only type of event that may result in catastrophic accidents, train despatch incidents typically result in minor injuries to passengers and train crew. Personal injuries to train crew members include incidents such as accidents involving catering trolleys and when boarding and alighting from trains.

The introduction of TPWS and measures to improve train driver performance means that SPADs are now a relatively small risk on the railway; current estimates indicate that the current level of risk is less than 10% of the 2001 level. The occurrence rate of serious train despatch accidents has significantly decreased since 2004. The number of individual personal accidents has remained relatively constant in recent years.

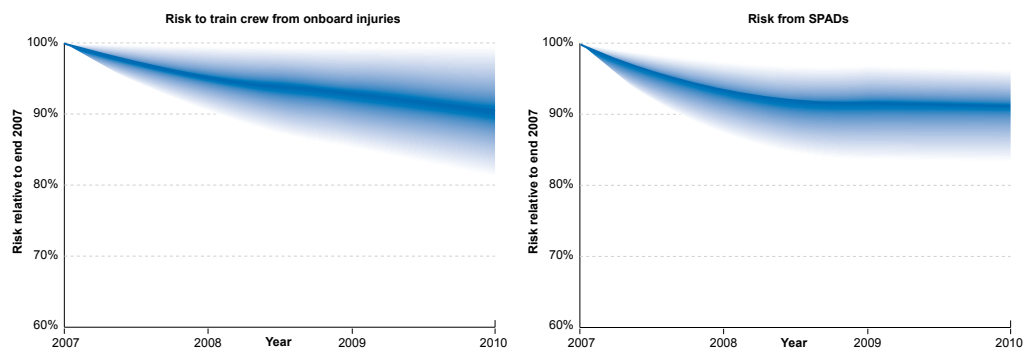
## Workforce - train crew

### Actions

Examples of the industry's actions to improve the safety of train crew and risk from train crew errors include:

- Sharing of best practice between Network Rail and TOCs.
- Trialling ERTMS with a view to future installation.
- Optimising railhead treatment to improve railhead adhesion.
- Improving management of lineside foliage.
- Improving safety critical communication protocols and audit.
- Raising driver competency levels to reduce the incidence of TPWS 'reset and continue'.
- Expanding use of train driving simulators.

### Trajectory



## KEY RISK AREA

## Workforce - track workers

### Risk Information

Much of the risk from track worker activities is similar to that from building and construction work. There are additional hazards that make railway maintenance more dangerous; these stem from the risk from undertaking maintenance and upgrade work in close proximity to the running railway and within possessions where specialised rail maintenance vehicles, such as road-rail vehicles and maintenance trolleys are used.

The majority of the risk from maintenance work is occupational risk to personnel working in possessions (28 FWIs per year of which, approximately four are fatalities); however, there is also a risk to the operational railway due to potential errors in maintenance work (approximately 0.2 FWIs per year). Most of the risk to track workers is from major and minor injuries; however, workers being struck by trains and specialised rail maintenance vehicles typically have fatal consequences. There has been a significantly decreasing trend in reported major injuries since 2004.

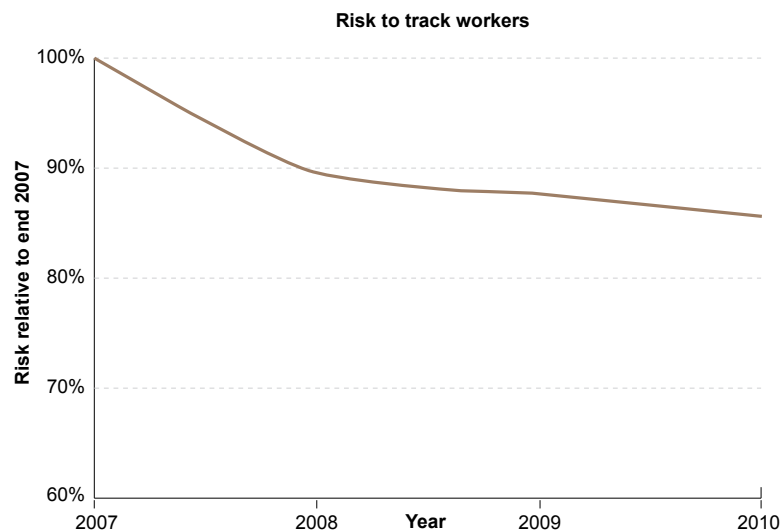
## Workforce - track workers

### Actions

Examples of the key initiatives to improve track worker safety include:

- Improving safety critical communication protocols to airline industry standard.
- Improving processes for briefing of operating rules.
- Improving training for road/rail vehicle operators.
- Improving fixed lighting systems at higher risk junctions.
- Increasing the use of lookout operated warning systems.

### Trajectory



## KEY RISK AREA

## Workforce - station staff

### Risk Information

The risk from station staff is approximately 24 FWIs per year, which includes approximately five fatalities. There are three main areas of risk:

**Train despatch** resulting in injuries to passengers which equates to approximately 3.4 FWIs per year.

**Personal accidents to station staff**, dominated by slips, trips and falls which equates to approximately 3.8 FWIs per year.

**Station management** dominates the risk, which includes issues such as dealing with wet/slippery surfaces, fixing uneven surfaces and dealing with crowding. This represents approximately 16.8 FWIs per year.

The number of personal accidents to station staff has remained relatively constant over recent years. Incidents related to station management have also remained relatively constant, but this is against the background of increasing passenger numbers.

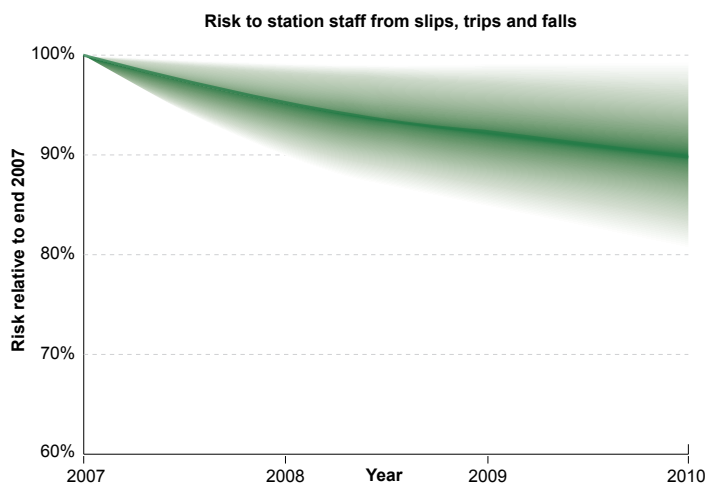
### Workforce - station staff

### Actions

Examples of the actions being undertaken to improve station staff safety and the risk from errors caused by station management include:

- Improving footbridge surfaces.
- Extending the use of the slip, trip and fall toolkit.
- Extending the programme of stair nose painting.
- Improving programmes of planned station inspections to identify and mitigate hazards.

### Trajectory



#### Note

A trajectory for passenger injuries at the platform-train interface is included under Passengers – At Stations

## KEY RISK AREA

## Engineering - infrastructure

### Risk Information

Infrastructure presents the highest risk of the engineering topics and includes track, signalling and telecommunication, and structures assets amounting to approximately five FWIs per year, including approximately two fatalities. The overall level of risk, in terms of fatalities and weighted injuries, is relatively low compared to other key risk areas such as passengers at stations. However, a substantial portion of this risk is from train accidents, in particular derailment, which has the potential for catastrophic consequences.

The non-train accident element of the risk is principally from the track condition/geometry causing a poor train ride resulting in passenger and staff minor injuries on trains, through spilt beverages, falling against fixed objects, and falling etc.

The trend in the rate of occurrence of structural failures and track defects is monitored by the PIM. Broken rails and Level 2 exceedances (which includes gauge, line, top and twist faults) have approximately halved since 2002. Structural failures have reduced to a third of the level seen in 2002.

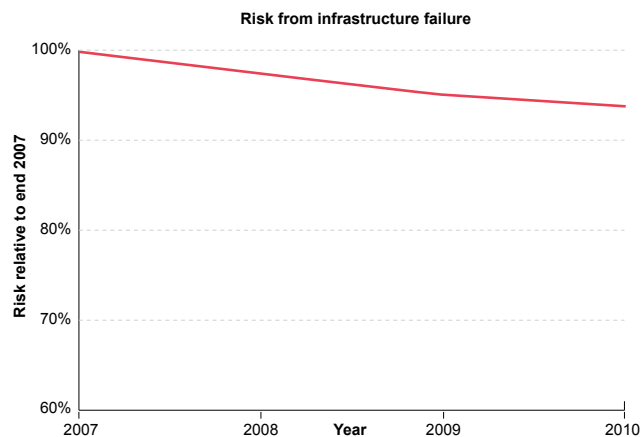
### Engineering - infrastructure

### Actions

Examples of the industry's actions to further improve the safety performance of infrastructure include:

- Enhancing TPWS at the trackside to reduce the incidence of 'reset and continue'.
- Improving the quality of signal maintenance.
- Improving inspection and maintenance of earthworks to combat increased risk from extreme weather.
- Application of latest technology to further reduce defects.
- Strategic replacement of softwood sleepers.
- Improving driver/signaller communication through GSM-R.

### Trajectory



## KEY RISK AREA

## Engineering - trains

### Risk Information

There are two main types of risk from rolling stock: passengers and staff falling against train interiors and derailments (eg, from failed axles and broken rails). Incidents of passengers being injured through contact with train interiors can be contributed to by track condition, train braking and suspension. The risk from these events is approximately four FWIs per year, including approximately one fatality; most of the risk is from minor injuries. The risk from the more catastrophic system failures is approximately one FWI per year.

There has been a significant reduction in the number of serious rolling stock defects since 2004.

### Engineering - trains

### Actions

Examples of the industry's actions to maintain or improve the safety performance of trains include:

- Continuing to develop the Railway Industry Supplier Approval Scheme (RISAS) in order to improve the processes for the supply of safety critical components and services.
- Reviewing axle monitoring equipment to improve its effectiveness and ensure installation at the most appropriate locations.
- Improving the man/machine interface for TPWS to reduce the incidence of TPWS 'reset and continue'.
- Introducing additional rolling stock, as specified in the Government's white paper *Delivering a Sustainable Railway*, which will have improved interiors compared to some existing stock types.

### Trajectory

*Deliver a measurable reduction in the risk from catastrophic accidents and accidents to passengers from vehicle defects.*

## KEY RISK AREA

## Public Behaviour - crime

### Risk Information

There are two main elements to the risk from railway crime:

**Assaults on passengers and staff:** The SRM estimates that there are approximately 4000 passenger and 2000 workforce assaults per year. The vast majority of these result in minor injuries equivalent to a risk of approximately 31 FWIs per year. The data from SMIS indicate that there has been a generally increasing trend in reported assaults, however, the number of assaults on staff resulting in physical injuries has reduced.

**Trespass and vandalism:** Acts of vandalism take a few different forms including arson, objects placed on the line and objects thrown at trains. The overall level of risk from such events is approximately 1.5 FWIs per year. The vast majority of the risk is from objects being thrown at trains. The risk from trespass is approximately 48 FWIs per year. Most acts of trespass that result in injury are fatal, either through being struck by a train or electrocution. The overall number of reported trespass incidents has remained relatively constant in recent years at about 1000 per month.

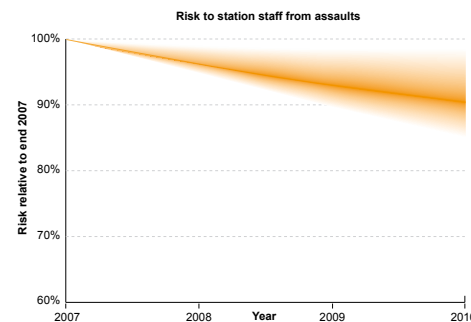
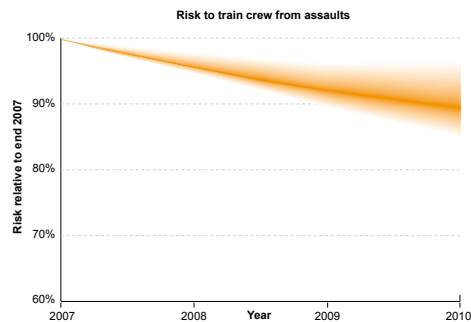
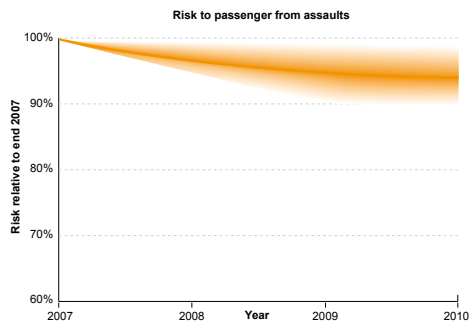
### Public Behaviour - crime

### Actions

Examples of actions to reduce the risk from crime include:

- Increasing the use of CCTV at stations and on trains.
- Increasing deployment of Police Community Support Officers (PCSOs).
- Providing additional conflict avoidance training for all customer facing staff.
- Using court procedures to exclude members of the public who offend on railway property.
- Widespread implementation of the secure station scheme.
- Developing the 'safe zone' concept at stations.
- Installing 'mosquito' devices at stations.
- Continual development and evolution of the *No Messin'* campaign.
- Targeted use of helicopter surveillance.
- Increasing the use of undercover surveillance cameras at known trespass and vandalism hotspots.
- Implementing a programme of school visits to discourage railway crime by children.

### Trajectory



**Railway Crime – Trespass and Vandalism**  
Deliver a measurable reduction in the risk from trespass and vandalism.

## KEY RISK AREA

## Public Behaviour - level crossings

### Risk Information

The risk from misuse of level crossings by road vehicle drivers and pedestrians is approximately 12 FWI per year, which includes approximately 11 fatalities. The majority of the risk (70%) is from misuse by pedestrians through traversing the crossing when it is not safe to do so. Pedestrian misuse will normally only result in an injury to the pedestrians using the crossing. Road vehicle collisions with trains at level crossings have a much higher potential for catastrophic risk through the collision causing the train to derail.

Risk is unevenly distributed among the 7600 crossings on the network, depending on factors such as level of use, local circumstances and type of crossing.

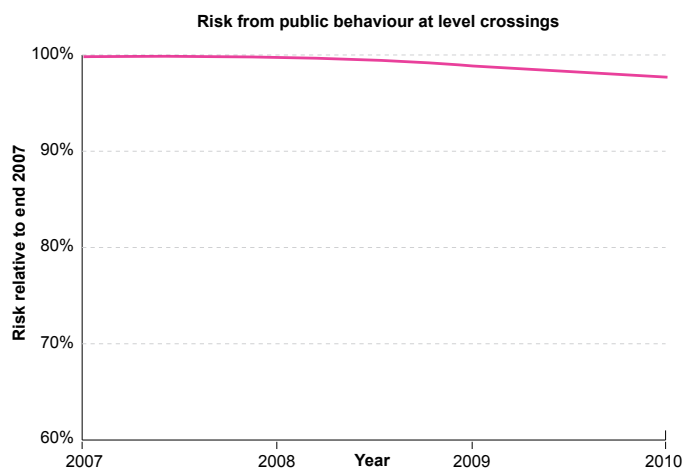
### Public Behaviour - level crossings

### Actions

Examples of the industry's actions to reduce the risk at level crossings, connected with misuse by members of the public, include:

- Installing simpler to use emergency phones where appropriate.
- Implementing a strategic programme to upgrade or close higher risk level crossings.
- Continuing the *Don't run the risk* public awareness campaign.
- Trialling new technology to deter level crossing misuse.
- Encouraging the prosecution of road users who deliberately misuse level crossings.
- Improving train driver training to increase awareness of level crossings with high levels of misuse.

### Trajectory





“Progress is being made in developing the industry’s approach to safety management, while it continues to respond to changes in the external environment in which it operates.”

## 4. how safety management on the railway is changing

Progress is being made in developing the industry’s approach to safety management, while it continues to respond to changes in the external environment in which it operates. Work is now being undertaken to respond to the EU requirement to introduce some commonality into the management of health and safety, which will draw together and build on a range of initiatives already taking place across the industry. This work is described in some detail here as it will become a central element of the way in which European railway safety legislation is delivered and key elements of safety interface risk is controlled.

### Safety Management Systems

A Health and Safety Management System consists of the arrangements and processes used by an organisation to effectively manage health and safety to a level that is as low as reasonably practicable (ALARP).

Its objective is to provide the necessary framework around which good performance can be established and maintained and which will support the development of a positive safety culture.

The recent introduction of new railway safety legislation, most notably the Railway & Other

Guided Transport Systems (Safety) Regulations 2006, provides an opportunity for industry to review and refine existing practices with a view to developing safety management systems which contain more efficient methods, systems and processes based on best practices.

After consultation by RSSB with key stakeholders, a number of tasks have been identified that will support and assist duty holders in complying with their statutory duties, through helping to achieve a common understanding, and where appropriate, a common approach.

In order to assist the industry, RSSB has developed an SMS programme to facilitate the tasks shown in Figure 8 by working closely with key industry stakeholders to build on existing processes and provide a way forward on these issues; it also aims to help duty holders in reviewing and driving continuous improvement of their safety management systems.



Figure 8



### Safety decision making

During 2007 RSSB published *Taking safe decisions – How Britain's railways take decisions that affect safety*, a follow up to *How Safe Is Safe Enough?*, which was published in 2005. This followed an extensive period of research and consultation with stakeholders. The document sets out principles designed to ensure that safety decisions taken by the industry properly protect the safety of its staff, passengers and others, satisfy the law, respect the interests of its stakeholders and are commercially sound.

Although these principles are not new and have generally been applied by the industry for many years, this is the first time that a single staged approach to safety decision making has been set out. *Taking safe decisions* represents an industry consensus document, developed by the industry's Safety Policy Group and approved by the RSSB Board. It is intended to be used directly, or by reference, in all duty holders' safety management systems to describe the way that decisions affecting safety are taken. The document is consistent with the first SMS of Network Rail that was authorised in 2007.

The object is sensible decision making which will reduce risk where reasonably practicable whilst avoiding a culture of risk aversion. This approach allows the industry to protect its workforce and the public whilst acting as responsible custodians of the assets they own and manage.

During 2008, a suite of support documents will be published to provide practitioners with guidance and worked examples.

### GB Participation in the work of the European Rail Agency

The European Rail Agency (ERA) was set up in 2004 in response to the European Railway Safety Directive. Its role is to coordinate the drive towards the creation of an integrated and competitive European rail industry, reinforcing safety and interoperability. In the safety area, it is responsible for developing common safety targets (CSTs), common safety indicators (CSIs) and common safety methods (CSMs). A working group has been set up for each of these to advise on how they should work in practice.

The ERA's role in interoperability, as established by Directive 2004/50, which amended the high-speed and interoperability directives, is to oversee the preparation of Technical Specifications for Interoperability (TSIs), which are developed to achieve the essential requirements of interoperability, including safety, performance and efficiency, and are justified using cost-benefit analysis.

Great Britain's rail industry participates in the ERA working groups for both interoperability and safety through the sector organisations. These are the Community of European Railway and Infrastructure Companies (CER), European Rail Infrastructure Managers (EIM), and Union of the European Railways Industries (UNIFE), mainly representing the supply industry. Train Operators and the Association of Train Operating Companies (ATOC) make their input via the CER; Network Rail is able to make its input through the EIM, while the Railway Industry Association and industry suppliers make their input through UNIFE. The ORR participates in ERA working groups as the National Safety Authority and also in a pan-European coordination of National Safety Authorities. Industry input to TSIs is coordinated through a structured set of arrangements supervised by the Industry Standards Coordination Committee, and for the safety activities of the ERA, meetings of GB representatives are facilitated by RSSB, with advice and support from the industry's Safety Policy Group.

### Common Safety Targets

CSTs set the minimum safety levels that must be achieved by the rail system. They are being developed in two sets. The first set is intended to ensure that current safety performance is not reduced in any member state and will be defined in terms of a set of individual National Reference Values. These are required to be adopted by the Commission by the end of April 2009. From the experience gained with the first set, and reflecting any priority areas where it is determined that safety needs to be improved, a second set will be developed; these have to be adopted by the Commission by the end of April 2011. The evolution of CSTs is a multi-step process eventually resulting in more closely harmonised safety levels. The overall purpose is to at least maintain safety, while preventing safety being used as a barrier to interoperability.

### Common Safety Indicators

In order to demonstrate progress towards achievement of CSTs, it is essential that there should be a harmonised set of safety indicators against which member states report. A set of CSIs has been developed and the first year that member states were required to report against them was 2006. RSSB has coordinated the collection and analysis of these data on behalf of the GB industry. The experience of this first reporting round will be used to help streamline the overall process from 2008 onwards.

### Common Safety Methods

CSMs will include:

- Risk evaluation and assessment methods
- Methods for assessing conformity with requirements in safety certificates and safety authorisations
- Methods to check that rail systems are operated in accordance with the relevant essential requirements (as far as they are not yet covered by TSIs).

A first set of CSMs, concerning methods for risk evaluation and assessment, must be adopted by the Commission before the end of April 2008, with the remainder being adopted by the end of April 2010. The first set are predictive methods designed to assess the safety of any substantial changes to the railway system, such as the construction of new lines, new or substantially modified equipment and significant organisational changes.

### High Level Output Specifications

Under the Railways Act 2005, the Secretary of State for Transport and Scottish ministers have a duty to specify the outputs they require from the rail industry and the available public finances initially over the period 2009 - 2014. These are known as High Level Output Specifications (HLOS). In July 2007, the Secretary of State set two HLOS safety metrics in a White Paper entitled *Delivering a Sustainable Railway*:

- Passenger safety risk will reduce by 3%.<sup>5</sup>
- Workforce safety risk will reduce by 3%.<sup>6</sup>

Note that there is no metric relating to public safety.

The White Paper also sets out a number of significant enhancements to the railway network, including schemes to relieve congestion and for a significant increase in rolling stock to accommodate the anticipated growth in passenger and freight traffic by 2014. The document states that the railway is past the point where big step-change investments in safety are necessary or would deliver. There will be a safety benefit from investment in new equipment which incorporates modern standards; however, most safety improvements will come from more effective and efficient management of the network.



<sup>5</sup>Measured as fatalities and weighted injuries normalised per million passenger kilometres.

<sup>6</sup>Measured as fatalities and weighted injuries normalised per million employee hours.

The industry has considered the HLOS metrics and, on the basis of the already developed duty holder plans, is reasonably confident they will be achieved. In addition to being part of the industry's process for effectively managing safety, the trajectories in section 3 also provide an indicator of forecast progress against HLOS safety metrics. The safety plans of both Network Rail and the TOCs were therefore analysed to determine to what extent existing safety proposals would meet these metrics. This showed that the industry could expect to deliver the workforce risk reduction through a combination of:

- Better processes and systems.
- Improved communication of safety information.
- Enhanced competence and leadership.
- Improved physical controls.
- Improvements to the safety culture.

Passenger risk on the mainline network comprises risk from train accidents and non-train accidents. Non-train accident risk accounts for nearly 95% of the total risk to passengers but 25% of the fatality risk to passengers, comes from train accidents due to the potential high consequence of such accidents. Network Rail and the TOCs therefore place particular emphasis on addressing train accident risk with initiatives to reduce the harm from level crossing failures and misuse, structural failures, failures in track integrity, signal failures and the effect of the environment on infrastructure.

Passengers are far more likely to suffer personal injury from individual accidents on stations and on board trains than in train accidents. This is classified as non-train accident risk and the industry will address this by taking actions to reduce incidents of slips, trips and falls at stations and on trains, passenger assaults, and boarding and alighting trains at stations.

Performance against HLOS safety metrics will be measured by the output of the SRM. However, because the SRM is only updated periodically, more frequent reporting using actual fatalities, major and minor injuries will be necessary in order to track performance. For train accident risk, where actual events are too infrequent to provide meaningful trend information, the output of the Precursor Indicator Model (PIM), which is published quarterly, will be used.



## Research and Development

The research and development programme (R&D) is managed on behalf of the industry and government by RSSB. It is funded by the Department of Transport. The scope of the programme (as agreed by the RSSB Board) covers industry-wide and strategic research, such as interface issues, system issues and other issues that any one party cannot address alone. In other words, the programme deals with research where cooperation is required. The aims of the programme are to improve performance in safety, health, reliability and punctuality and to reduce costs – delivering benefits across the industry. It is of key importance in ensuring that the Government's aspirations for the railway set out in *Delivering a Sustainable Railway* and supported by the *Rail Technical Strategy* can be achieved.

Governance arrangements are in place to ensure that the research is targeted at priority issues and that the results are of practical value for the industry. The programme is overseen by the Research and Development Advisory Group, comprising senior members from across the industry and chaired by the Department for Transport. This provides strategic direction. For each of the 13 research topics that form the programme (Safety Policy and Risk Management, Workforce Development and Competence, Sustainable Development, Strategic Studies, Level Crossings, Operations, Public Behaviour, Occupational Health, Vehicle/Track Interaction, Infrastructure, Rolling Stock, Energy, Command Control and Signalling) there is one or more established cross-industry group acting as clients for the research. Client groups include Systems Interface Committees and National Programmes.

**Safety issues run through all the topics.**

Successes have been achieved in many areas of the programme. In the operations field, for example, there has been considerable research focus on the KRA of level crossings with a batch of research projects, (commissioned following the Ufton Nervet derailment of 2004), now completed. This included a study into obstacle detection at level crossings which has been used as a basis for planned trials by Network Rail. Other work has targeted the KRA of crime, assaults in particular. Work on the management of football fans on the railway has led to engagement with football associations and a regular series of meetings of the Rail Football Forum has started, with strong involvement by train operators, station managers, British Transport Police and other bodies.

Within management research, a research project in the key risk area of track workers has led to the rollout of a revised 'method statement' process throughout Network Rail operations. An industry group, the Method Statement Steering Team, was formed to oversee a research project with the aim of developing an improved process for creating method statements for track work. This would make safety-critical information as accessible and easy-to-use as it could be in each situation where it is needed. Benefits include better organisation and communication of information, a streamlined and efficient acceptance process and clear risk and safety communications for Network Rail's work force, as well as significant cost savings.

R&D to facilitate further reduction in the already small risk to passengers was published in July 2007. Analysis of seven British train accidents from 1996 to date highlighted that one-fifth of passenger fatalities during those accidents resulted from ejection from vehicles through train windows. This demonstrated the importance of containing passengers within vehicles during accidents.

The research demonstrated that fitting seat belts would, overall, increase passenger injuries and fatalities in a crash situation. However the fitting of laminated glass windows would deliver significant benefits. The fitting of laminated glass in new vehicles has been mandatory since 1993 (apart from windows provided for emergency escape), but (to date) there has been no suitable type of glass to retrofit in most vehicles built before 1993.

The report published by RSSB recommended the progressive fitment of laminated glass in all train windows, and a coordinated approach to ceasing to use windows for escape. This coordinated approach is being managed by ATOC. Train operating companies are now working together to implement these recommendations when trains are refurbished and the new windows are currently being fitted on some HST fleets.

## Human Factors

As the potential for safety improvements through new technology and additional hardware has diminished, the study of human factors has become an increasingly important basis for safety initiatives in the rail industry. Human factors considers 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. This includes environmental, organisational and job factors as well as human and individual characteristics which influence behaviour at work.

Important areas of human factors work in the rail industry have included studies into the effects of fatigue and shiftwork, an understanding of why people break rules, the evaluation of current selection processes and human centred design in safety systems.

RSSB has developed a safety compliance toolkit which is designed to help industry managers to apply good practice, and to give possible actions and solutions. Other toolkits and guidance have been developed around human factors issues in CCTV systems, alarms and alerts, train maintenance, train cab design, level crossing risk management and teamworking. In addition, a new safety culture toolkit will soon be available that enables industry organisations to assess their own safety culture and provides pointers to actions for improvement.

Updated versions of the Human Factors Research Catalogue and *Understanding Human Factors - a guide for the railway industry* will be available in 2008. This will further assist industry duty holders to identify practical steps that can be taken to mitigate their risk and reduce the likelihood of human error.

## Safety Management Information System (SMIS)

SMIS is a national data recording system into which most industry companies are required to record their basic safety data. It is the primary source of data and allows individual companies and the industry collectively to identify trends in safety performance. The system is the primary source of the information presented in this plan, the SRM and the ASPR. The industry seeks to continuously improve the integrity of the system and quality of data input under the supervision and sponsorship of the SMIS Programme Board (consisting of the nominated representative of the main users and RSSB). Currently there is a major data integrity initiative under way. This includes sponsoring increased training, vigilance in reporting and feedback to users on the use of the current system, and progressive upgrades to the system itself. During 2007 the SMIS Programme Board initiated a programme to establish a vision for the future use and development of the system which is likely to lead to further initiatives on data reporting and enhanced functionality for users. Two significant developments are planned for 2008. The first, scheduled for February 2008, will consist of fourteen separate enhancements to respond to suggestions from users. In December 2008, a major upgrade will take place, with the renewal of the support and hosting contract.

## Accident Investigation

The Rail Accident Investigation Branch (RAIB) was established in 2005 to investigate train accidents and incidents on UK railway infrastructure without apportioning blame or liability. It is independent of the rail industry and the ORR, with the Chief Inspector of Rail Accidents reporting directly to the Secretary of State for Transport. RAIB's recommendations are addressed to the ORR, which is then required to ensure that they are duly considered and, where appropriate, action is taken.

In addition to the investigations carried out by RAIB, the industry has its own arrangements for carrying out internal investigations. This includes a capacity to undertake independently-chaired investigations when appropriate.

Whoever undertakes an investigation, the industry seeks to learn the safety lessons; duty holders consider and respond to recommendations appropriately. RSSB tracks the progress of investigation recommendations, producing reports which allow the ORR to report to RAIB the progress against its recommendations. RAIB submits an annual report on its activities to the European Rail Agency.

## National Programmes

RSSB facilitates a series of national programmes to help the industry pursue improvements in major risk areas. Each programme is led by a cross-industry group that is focused on understanding the causes of the risk and introducing measures that will lead to risk reductions.

### Operations Focus Group

The Operations Focus Group facilitates the progressive improvement of operational safety through the identification, discussion, development and promotion of justifiable and potentially effective campaigns, programmes and tools on Network Rail and railway-undertaking managed infrastructure. The group also facilitates operational safety risk dialogue with other railway systems. It has no statutory responsibilities. Operational safety includes issues relating to SPADs, station overruns, voice communications and degraded working.

### Community Safety Steering Group

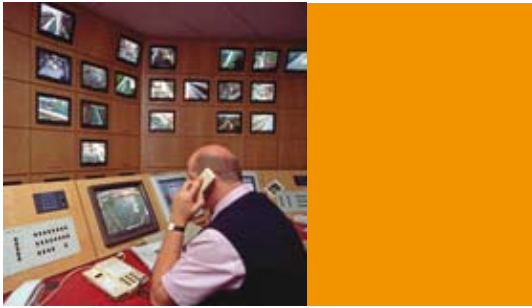
The main purpose of the Community Safety Steering Group (CSSG) is to agree national priorities and strategies aimed at reducing the risks and costs posed by crime, disorder and other forms of inappropriate public behaviour - including trespass, vandalism, graffiti, assaults, suicides and level crossing misuse.

### Rail Personal Security Group

The Rail Personal Security Group is a cross-industry tasking group set up to raise the profile of personal security on the railway and to reduce the impact of assaults on passengers and all those who work on the railway. The group reports to the CSSG.

### National Level Crossing Safety Group

The purpose of the National Level Crossing Safety Group (NLCSG) is to raise the awareness of safety matters at level crossings. In particular, the NLCSG seeks to improve the behaviour of pedestrians, motorists and other users at level crossings and examines public policy making recommendations to simplify and consolidate regulatory matters.



### Railway Industry Supplier Approval Scheme

The aim of the Railway Industry Supplier Approval Scheme (RISAS) is to provide economies of scale to the railway industry by reducing duplication in the auditing and assessment of suppliers of critical materials and services in the market for the overhaul of assets and components initially for trains. It sets out to ensure that suppliers of critical products to the industry have the appropriate systems, processes, competence, resources and procedures.

### The future of the Strategic Safety Plan

For the 2009 Plan, the following changes have already been identified:

- The opportunity will be taken to align the SSP with the periods to which HLOS apply. This means that the next plan will cover a period through to March 2014, with annual reviews.
- Efforts will be made to deliver quantified trajectories for the remaining KRAs.
- All new passenger franchises, that have taken over since this plan was developed, will be integrated into the process to develop the plan.
- A new version of the SRM will be used to create benchmarks for the HLOS period.
- Having taken account of the result of some extensive research, industry analysis, consultation with the ORR and DfT, the RSSB Board has recently approved a change in the weightings attached to minor injuries. The new weighting for 'non-reportable minor injuries and Class 2 trauma events' of 1:1000 will be introduced during 2008.

The development of the 2009 SSP will be supervised by the Safety Policy Group and approved by the RSSB Board.

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