



Rail Accident Investigation Branch



Annual Report 2011 Section 1



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This report is published in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Preface

Preface

This is the Rail Accident Investigation Branch's (RAIB) Annual Report for the calendar year 2011. It is produced in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005 (SI1992) and also meets the requirement of the European Railway Safety Directive (2004/49/EC).

This legislation can be referred to on the website at www.raib.gov.uk.

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RAIB Annual Report 2011

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Chief Inspector's foreword

Chief Inspector's foreword

Publishing the Rail Accident Investigation Branch's (RAIB's) Annual Report provides me an important opportunity to share the RAIB's views on railway safety as seen through our investigation work. This report includes an overview of both:

- a) The positive work that the industry has undertaken to improve safety specifically in connection with the findings of our investigations. In some cases the industry parties have taken action to address the risks identified whilst our investigation is in progress which we applaud; however the majority of our reports make recommendations for further actions yet to be taken. Around 95% of our recommendations have been implemented or are subject of a plan for completion, which is evidence of the positive and continuing improvements to safety that are being delivered by the industry.
- b) The actions industry has been asked to take through our recommendations which are still to be completed and which, we believe are "the most wanted" to improve railway safety.

Whilst I hope this report gives a balanced view of the safety issues and the efforts the industry has invested to resolve these issues, I want to highlight particular matters, which in my opinion, warrant further consideration and action from the industry and the Office of Rail Regulation (ORR), which is the rail safety authority for most of the UK.

Repeat accidents arising from common areas of risk

This report, like its predecessors, identifies areas of risk that we have seen on a recurring basis during our investigations. In this report we highlight our work on:

- level crossings;
- track worker safety leadership and supervision;
- freight train design, maintenance and preparation;
- defective switches and crossings;
- failure of structures and earthworks;
- worker fatigue; and
- Safety Management Systems in the Heritage sector.

These themes should inform the prioritisation and resourcing of work within the relevant rail organisations which are responsible for these matters.

Most of these recurrent themes have been on our radar as particular concerns for some time, and some were subject of our previous Annual Report. I appreciate that these issues may not be the subject of quick fixes and that the industry and the ORR are working on all of them. But the continuing occurrences of accidents indicate that despite these efforts, risks in these areas were still evident during 2011 and are also evident in our ongoing investigations in 2012.

Accidents that could have been avoided

All our investigations assess whether recommendations we have previously made could or should have prevented the occurrence. Where this is the case we investigate why the recommendation(s) were not implemented.

Chief Inspector's foreword

I am concerned that in a significant number of the investigations we undertook during 2011 we identified factors that had been the subject of previous RAIB recommendations. In at least three investigations we found that a more timely and/or thorough response to one or more previous RAIB recommendations would have had the potential to prevent the accident¹. In another case we concluded that the consequence of an accident would have been reduced if an earlier recommendation had been more fully addressed². There were similar cases that I referred to in last year's report. I also reported we had, as a result, reinforced our communications with both the industry and ORR to ensure they had a full understanding of the risks we had identified and the actions we were proposing in our recommendations.

Time taken to conclude recommendations

The time taken to implement earlier recommendations will influence the possibility of a reoccurrence of an accident. I am therefore concerned that at the end of 2011, ORR's reports to the RAIB indicated there were 66 RAIB recommendations, published over two years ago, which were yet to be concluded. Some of these may legitimately take more than two years to accomplish - but not all. I expressed similar concerns in last year's Annual Report and whilst the number of recommendations that were more than two years old and reported by ORR as incomplete had reduced in 2011, there were, in my opinion, still too many.

At the time of writing this foreword there are 67 recommendations over two years old, which have yet to be reported as implemented by ORR.

From the first quarter of 2010, the ORR implemented a more formal process of supervising that the industry commits to an acceptable timeframe for implementation of recommendations and supervising the delivery of the recommendations accordingly. The time necessary for implementing recommendations will clearly depend on the nature of the recommendation but as an indication the average of the industry committed timeframes for implementing recommendations over a sample six months was 14 months; the minimum for this period was 2 months and the maximum 45 months. The ORR's process of oversight of the implementation timeframes is designed to bring a sharper focus on this activity. The RAIB will continue to monitor the effect on recommendation delivery time accordingly.

However, for nearly half of the recommendations reported to the RAIB as still outstanding, Network Rail believed those recommendations were complete. For the same recommendations the ORR reported they were still evaluating the adequacy of Network Rail's response. I am hoping the frequent meetings between these organisations and the introduction of target timeframes will drive the number of aged recommendations down by the time of our next Annual Report.

Prominent safety issues in 2011

One of the most prominent areas of our work during 2011 and 2012 has been investigating accidents at level crossings. We elect to only investigate those accidents where we believe our investigation has the potential to improve safety. During the year we completed five investigations and commenced five further investigations relating to level crossing accidents.

¹ Track worker struck by train at Cheshunt Junction in March 2010 (RAIB report 06/2011), track worker struck by train at Stoats Nest Junction in June 2011 (RAIB report 16/2012) and tamper driver struck by train at Torworth in January 2011 (RAIB report 02/2012).

² Derailment at Falls of Cruachan in June 2010 (RAIB report 11/2011). The safety issue involved the fixing of ceiling panels, first raised in recommendation 9 of the report into a derailment at Moy in November 2005 (RAIB report 22/2006).

Chief Inspector's foreword

Network Rail has allocated significant capital resource to address the risks at crossings and has informed us of their crossing improvement programme, which is currently in progress. This includes closures, revisiting the means of risk assessing crossings, new equipment, and newly establishing dedicated and trained staff to assess and manage crossing safety. Network Rail informs us that this programme, which is planned to run until 2015, if fully and successfully implemented, should address our major concerns.

We have, however, made repeated recommendations concerning realistic and rigorous assessment of the risks at individual crossings; understanding the local and human factors that may influence the risk to the users, and the implementation of improvements identified during risk assessments and inspections. Not all our recommendations require a long lead time or significant resource. I urge both Network Rail and RSSB, who are carrying out related research on crossings, to review the resources committed to this work and where ever possible ensure that the individual elements of their programmes that will address these risks are completed at the very earliest opportunity.

Workload and resources

In last year's report I explained that in addition to a budget cut of nearly 20% the DfT also required the RAIB to relocate our southern office from Woking (chosen for operational reasons including its communication links) to the outskirts of Farnborough along side the AAIB. This has placed extra demands on the now smaller team. We began operations from the new site in September 2012. That the team delivered in 2011 a higher workload than in 2010 in terms of completed and newly started investigations is a tribute to their hard work and their determination to continue to make the railways safer for workers, passengers and the general public.

I hope that this report will not only be of use to the UK's rail industry and the travelling public but that it will also be a useful reference to other rail organisations in the European network and beyond. We will for the first time use social media to bring this report, its key messages and the work of the RAIB to a wider audience



Carolyn Griffiths

Chief Inspector of Rail Accidents

11 December 2012

1. The role of the Rail Accident Investigation Branch

Further information about the role of the RAIB can be found on our website by clicking on the following links:

[1. Background to the Branch](#)

The RAIB became operational in October 2005 as the UK's independent body for investigating accidents and incidents occurring on the railway, including metros, light rail, and heritage railways, of Great Britain and Northern Ireland and tramways in England and Wales. The roles and duties of the RAIB are set out in the Railways and Transport Safety Act 2003 (the Act) and its associated implementing regulations, the Railways (Accident Investigation and Reporting) Regulations 2005 (the Regulations). Together, the Act and the Regulations also implement the requirements of the European Railway Directive (2004/49/EC) (the Directive) ([click here](#)), which came into force in 2004. This creates a common regulatory framework for safety across Europe and requires each member state to establish a safety authority (Office of Rail Regulation (ORR)), and an independent body to investigate all rail accidents (Rail Accident Investigation Branch (RAIB)).

[2. Aims of the Branch](#)

The RAIB's aims are to improve the safety of the railways by carrying out timely investigations into railway accidents and incidents to determine the causes and circumstances, and to make safety recommendations to reduce the likelihood of accidents in the future.

[3. Objectives of the Branch](#)

To respond promptly and effectively to notifications of railway accidents and incidents.

To conduct thorough investigations in a way that is proportionate to the seriousness of the event and the lessons to be learned from it.

To use the resources of the RAIB appropriately to achieve the maximum effect in the improvement of safety on railways and tramways.

[4. Scope of accidents and incidents investigated](#)

The scope of the RAIB's investigation work is set out in the Regulations and the act and covers most types of railway in the UK. Under the Act, the RAIB is mandated to investigate any serious railway accident, as defined in the Regulations, and also has the freedom to investigate other types of accident or incident where it believes that an investigation could significantly improve railway safety.

[5. Accident and incident notification](#)

The Regulations place a duty on railway industry bodies, whose staff or property is involved in an accident or incident to notify the RAIB.

1 The role of the Rail Accident Investigation Branch

[6. The RAIB's response to notifications](#)

The RAIB will decide on the basis of the initial notification whether it should immediately mobilise personnel to the accident site. Usually this is to conduct a Preliminary Examination. The RAIB's Chief Inspector or her Deputy, a Duty Co-ordinator and a team of inspectors are on call 24 hours a day, 365 days per year.

[7. Preliminary Examination](#)

The purpose of the Preliminary Examination is to gather sufficient details and evidence to enable the RAIB to make an informed decision whether or not to conduct a full investigation.

[8. Investigation](#)

The RAIB's investigations are conducted completely independently of all other organisations and investigations by other parties. However, it can share with industry stakeholders and will share with other statutory investigatory bodies factual evidence. It will not share witness statements or identification, nor medical records relating to persons involved in the accident or incident. The RAIB aims to keep involved parties informed of emerging findings throughout the investigation and may elect to inform the broader industry of progress and findings during the investigation by way of an interim report.

If the RAIB decides that a full investigation is disproportionate to the potential safety lessons that might be learned then it might publish a bulletin, which consists of a summary of the findings and identification of safety lessons.

[9. The investigation report](#)

On completion, the Chief Inspector sends the report to the Secretary of State for Transport and publishes it on the RAIB's website.

[10. The recommendation process](#)

Where appropriate, the RAIB's investigation reports will include recommendations to improve safety.

[11. Organisation](#)

The RAIB consists of full time investigators and support staff. They are based in one of two operational centres: Derby and Farnborough.

[12. Board of Transport Accident Investigators](#)

The Board of Transport Accident Investigators was established in 2003, consisting of the three Chief Inspectors of accident investigation (Rail, Marine and Air), and currently chaired by the RAIB's Chief Inspector. Its purpose is to, where appropriate, ensure consistency of approach and to identify and develop any common strategic aims and objectives and best practices. The Board normally meets quarterly; joint work initiated by the Board is ongoing.

2. Operational Activity 2011

During the period from 1 January to 31 December 2011, the RAIB received 389 notifications of railway accidents and incidents from the industry as required by law, in accordance with the Schedules³ of the Regulations. These resulted in 36 deployments of RAIB inspectors to the accident or incident site to carry out a preliminary examination. There were 11 additional preliminary examinations which did not require deployment to site. As a result of the analysis of the information gathered, the RAIB started 27 full investigations, and issued six Bulletin reports and two Urgent Safety Advices.

Investigation reports published in 2011

The RAIB completed and published 20 full investigation reports in 2011. While the RAIB's aim is to publish reports and bulletins within 12 months, the length of individual investigations can sometimes extend beyond this because of the complexity and scale of the investigation. In 2011 the average time from the date of the incident to publication for full investigations was 10.5 months, with the longest being 14 months and the shortest taking three months. In addition to these, there were six bulletins published in 2011, the average time from the incident date to the bulletin publication was just over four months, the longest took eight months and the shortest two months. Together the average time for full investigation and bulletin reports to be published was just over nine months.

Table 1 – RAIB outputs in 2011

Preliminary examinations completed	47
Full investigation reports published	20
Bulletins published	6
Urgent safety advice issued	2
Investigations commenced	27

A summary of the details in table 1 of each full investigation where a report has been published and the associated recommendations can be found in [Part 2 of the Annual Report](#).

Table 2 provides details of the investigations completed in 2011 and the basis for the investigation taking account of the reporting requirements of the European Railway Safety Directive and national regulations.

Table 3 provides details of full investigations commenced in 2011 along with the basis for investigation (as per table 2).

Table 4 provides details of an investigation opened in 2010 but not completed by 31.12.2011.

³ Full details on the Schedules can be found by clicking [here](#)

2 Operational Activity 2011

Table 2 - Investigations completed in 2011

Report Number	Event date	Publication date	Title of investigation (location)	Occurrence type	Basis for investigation		
					19(1)	19(2)	21(6)
01/2011	06/03/10	24/01/11	Passenger train struck by object at Washwood Heath	Collision with an obstacle		a	
02/2011	22/12/09	31/01/11	Near miss involving a freight train and two passenger trains, Carstairs, Scotland	Runaway incident		a	
03/2011	04/01/10	24/02/11	Derailment of a freight train at Carrbridge, Badenoch and Strathspey	Freight train derailment		a	
04/2011	16/01/10	28/02/11	Fatal accident at Moreton-on-Lugg, near Hereford	Level crossing fatality	x		
05/2011	12/05/10	21/03/11	Derailment of an engineering train between Gloucester Road and Earl's Court stations on London Underground's Piccadilly Line	Freight train derailment		a	
06/2011	30/03/10	23/03/11	Track worker struck by a train at Cheshunt Junction	Staff hit by train (Injury)		a	
07/2011	04/05/10	24/03/11	Runaway and derailment of wagons at Ashburys	Runaway incident			x
08/2011	10/07/10	07/04/11	Collision between train and a tree at Lavington, Wiltshire	Collision with an obstacle		a	
09/2011	13/08/10	15/06/11	Runaway of an engineering train from Highgate (London Underground)	Runaway incident		a	
10/2011	20/07/10	11/07/11	Runaway and collision of a road-rail vehicle near Raigmore, Inverness	Collision with other train		a	
11/2011	06/06/10	14/07/11	Accident at Falls of Cruachan, Argyll	Collision with an obstacle		a	
12/2011		28/07/11	Investigation into the safety of automatic open level crossings on Network Rail's managed infrastructure	Class investigation			
13/2011	05/11/10	04/08/11	Bridge strike and road vehicle incursion onto the roof of a passing train near Oxshott Station	Collision with an obstacle		a	
14/2011	17/08/10	11/08/11	Collision between an articulated tanker and a passenger train at Sewage Works Lane user worked crossing, near Sudbury, Suffolk	Level crossing Injury		a	
15/2011	17/08/10	15/08/11	Uncontrolled freight train run-back between Shap and Tebay, Cumbria	Runaway incident		a	
16/2011	28/12/10	29/09/11	Derailment in Summit tunnel, near Todmorden, West Yorkshire	Collision with an obstacle		b	
17/2011	05/02/11	20/10/11	Derailment of a passenger train near Dryclough Junction, Halifax	Collision with an obstacle		a	
18/2011	08/11/10	17/11/11	Station overrun at Stonegate, East Sussex	Runaway incident		a	
19/2011	28/01/11	28/11/11	Passenger accident at Brentwood station	Train movement accident involving passengers/ pedestrians		a	
20/2011	23/03/11	15/12/11	Train passed over Lydney level crossing with crossing barriers raised	Level crossing near miss		b	

Article 19(1) - a serious accident where the investigation is mandatory.

Article 19(2) - an accident or incident, which under slightly different conditions might have led to a serious accident, ie a near miss of a serious accident – see key below a, b, c, or d:

- the seriousness of the accident or incident;
- it forms part of a series of accidents or incidents relevant to the system as a whole;
- its impact on railway safety on a community level;
- requests from infrastructure managers, the safety authority or the Member State.

Article 21(6) - a non-serious accident or incident where there is significant potential for learning safety lessons.

Table 3 – Full investigations commenced in 2011

Event date	Title of the investigation (location)	Occurrence type	Basis for investigation		
			19(1)	19(2)	21(6)
08/01/11	Investigation into a member of staff being struck by a passenger train at Torworth, Nottinghamshire	Staff hit by train (Injury)		a	
28/01/11	Investigation into a passenger accident at Brentwood station, Essex	Train movement accidents involving passengers/ pedestrians		a	
05/02/11	Investigation into the derailment of a passenger train near Dryclough Junction, Halifax	Collision with an obstacle		a	
08/03/11	Investigation into two safety incidents involving track maintenance staff between Clapham Junction and Earlsfield stations	Staff hit by train (near miss)		b	
23/03/11	Investigation into an incident at Lydney level crossing	Level crossing near miss		b	
06/04/11	Investigation into the partial failure of 'bridge 94', Bromsgrove Stream, Worcestershire	Infrastructure failure		a	
10/04/11	Investigation into an incident at Durham station	Train defects		b	
20/04/11	Collapse of overhead line equipment near Jewellery Quarter tram stop, on the Midland Metro tramway, Birmingham	Collision with an obstacle		a	
26/05/11	Investigation into an incident near London St Pancras International (Low Level)	Train movement accidents involving passengers/ pedestrians		a	
05/06/11	Fatal accident at Piccadilly Gardens, on the Manchester Metrolink tramway	Train movement accidents involving passengers/ pedestrians	x		
12/06/11	Track worker struck at Stoats Nest Junction	Staff hit by train (Injury)		a	
19/06/11	Investigation into an incident at Llanbadarn level crossing	Level crossing near miss		a	
03/07/11	Investigation into a boiler incident on the Kirklees light railway	Train defect		a	
11/07/11	Investigation into an incident at Warren Street station, Victoria line, London Underground	Train movement accidents involving passengers/ pedestrians		a	
18/07/11	Investigation into the collision of a detached panel on a freight container with a track maintenance machine near Althorpe Park	Out of gauge train collision		a	
27/07/11	Investigation into the derailment of an empty passenger train near Edinburgh Waverley station	Passenger train derailment		a	
24/08/11	Fatality at Gipsy Lane footpath crossing	Level crossing fatality	x		
26/08/11	Derailment at Bordesley Junction	Freight train derailment		a	
04/09/11	Ufton AHBC level crossing	Level crossing near miss		a	
10/09/11	Investigation into a safety incident involving a track maintenance trolley near Haslemere station	Runaway incident		a	
23/09/11	Partial failure of a structure inside Balcombe tunnel	Infrastructure failure		a	
25/09/11	Tractor struck by train at Hatsons UWC	Level crossing injury		a	
03/10/11	Investigation into a fatal accident at Mexico footpath crossing, near Penzance, Cornwall	Level crossing fatality	x		
10/10/11	Person trapped in train door and pulled along platform at King's Cross station	Train movement accidents involving passengers/ pedestrians		a	
22/10/11	Investigation into a fatal accident at James Street station, Liverpool	Train movement accidents involving passengers/ pedestrians	x		
30/11/11	Investigation into a collision between a train and a road vehicle at Stowmarket, Suffolk	Collision with an obstacle		a	
19/12/11	Investigation into a collision between a train and a lorry at Llanboidy level crossing, near Whitland, Carmarthenshire	Level crossing injury		a	

Table 4 - List of investigations opened in 2010 but not completed by 31.12.2011

Event date	Title of the investigation (location)	Occurrence type	Basis for investigation		
			19(1)	19(2)	21(6)
20/02/10	Investigation into the derailment of a passenger train at East Langton, near Market Harborough, Leicestershire	Passenger train derailment		a	

Summary details of open investigations can be found at www.raib.gov.uk in the section called current investigations register under the publications area.

2 Operational Activity 2011

Bulletins

Normally, when the RAIB deploys inspectors to the site of an accident or incident, it is to conduct a preliminary examination of the circumstances and key evidence. In some instances, on the basis of a review of this information, the RAIB concludes that further investigation by the RAIB would be unlikely to result in the formal recommendations for the improvement of safety. However, sometimes, more general safety lessons are identified where the RAIB believes that it would be beneficial to make these more widely known across the industry and Bulletins are used for this.

During 2011, the RAIB published six Bulletins on its website.

The Bulletins covered:

- two derailments;
- one collision - a passenger train collision with a car on a user worked crossing;
- one accident to staff - a Guard fell while trying to board a moving freight train;
- one staff hit by train (near miss) - station cleaner clearing snow from platform was nearly struck by a passing train;
- one train door incident.

Urgent safety advice

In addition, the RAIB can issue urgent safety advice at any stage during an investigation when it believes that there is a need to provide immediate information to the relevant industry bodies about the wider safety issues that have been identified. If the issue affects other European member states the safety advice is loaded onto the ERA safety information system (ERA SIS), this action alerts all member states when advice has been published. During 2011 the RAIB issued urgent safety advice on two occasions, as follows:

Table 5 – Urgent safety advice by the RAIB in 2011

Incident date	Incident	Date of USA	Urgent Safety Advice	Date sent to ERA SIS
23/02/11	Derailment at Dalchalm level crossing	16/03/11 (publication date 24/08/11 Bulletin)	Review maintenance regimes for split pins fitted to brake rigging components and safety straps on all Y25 bogied stock.	17/03/11
03/07/11	Kirklees Light Railway boiler incident	28/07/11 ²	<p>The risks associated with the operation of boilers on steam locomotives, in particular:</p> <ul style="list-style-type: none"> • the importance of maintaining the water level in the boiler; • what to do if it drops below the bottom of the gauge glass; • the need to drop the fire as quickly as possible when the water drops below the minimum. 	Not applicable

⁴ Full report published 13/03/12

3. Operational experience - Summary of incidents and accidents investigated by the RAIB (2007 – 2011)

Classification of accidents and incidents that have to be notified to the ERA

The RAIB has a duty to report to the ERA on certain types of accidents and incidents occurring on the railways in the United Kingdom. To assist this process, the ERA provides guidance on the decision to investigate accidents and incidents and to promote consistent categorisation and reporting to the ERA. The RAIB uses this to classify its investigations according to Articles 19(1), 19(2), and 21(6), (see table 2 for an explanation).

The following table 6 shows the breakdown of accidents and incidents, that the RAIB has investigated between 2007 - 2011. The figures have been collated according to the date of occurrence and not publication of the report.

Table 6 – Investigations by category sorted by Article 19(1), 19(2), and 21(6)⁵

Basis for Investigations by the European Railway Safety Directive category	2007	2008	2009	2010	2011	TOTAL
Art 19(1)	4	6	4	1	4	19
Art 19(2)	27	21	13	16	23	100
Art 21(6)	6	2	3	1	0	12
Total	37	29	20	18	27	131

The bar charts 1 to 5 on the following pages show the total number of investigations carried out by the RAIB; the total broken down by the type of accident and railway for the 5 year period 2007 to 2011⁶.

⁵ Figures do not include four class investigations (which address more general safety issues).

⁶ Figures include 4 class investigations.

3

Operational experience

Chart 1 - Types of incidents/accidents investigated 2007 - 2011

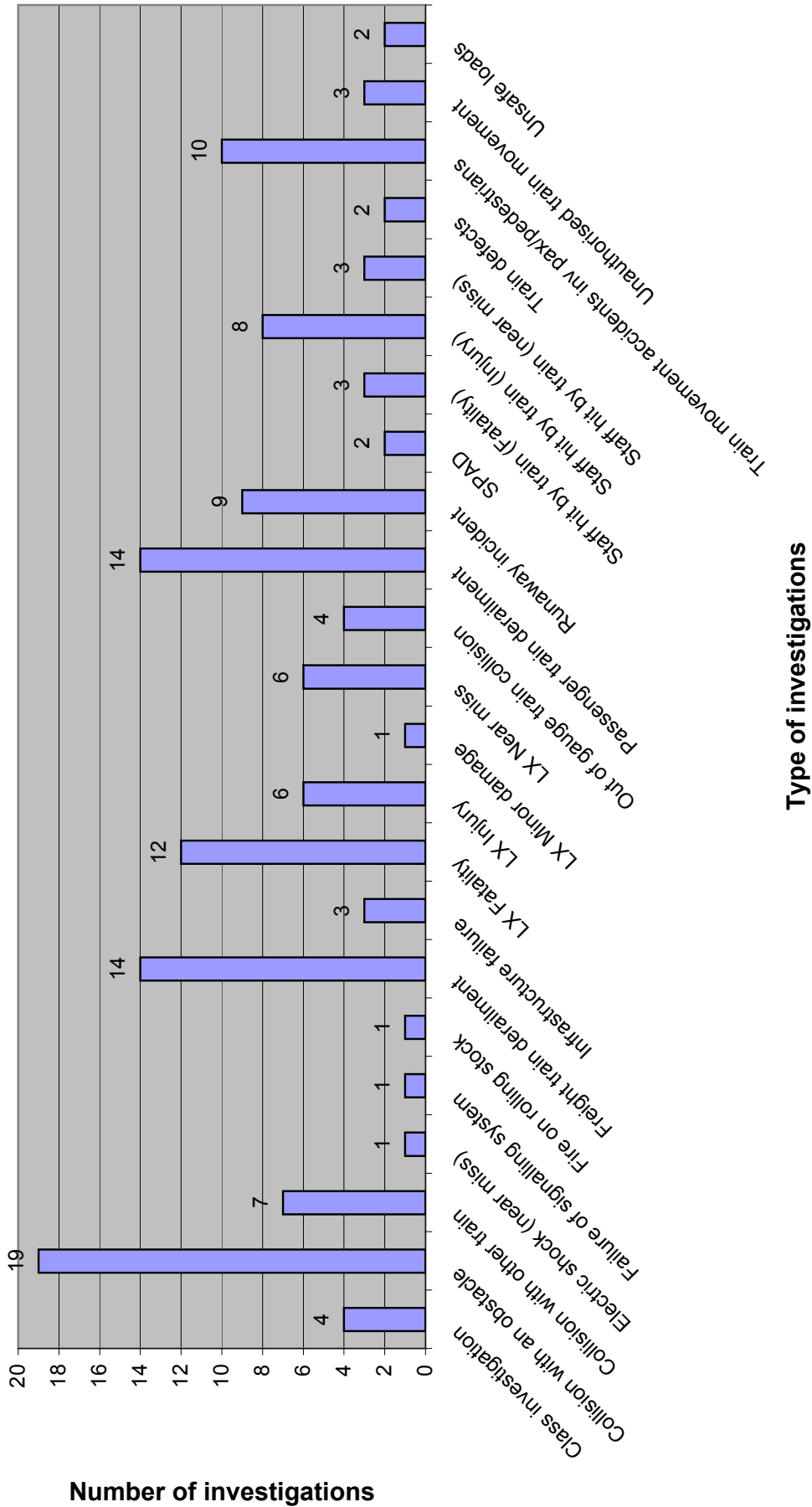
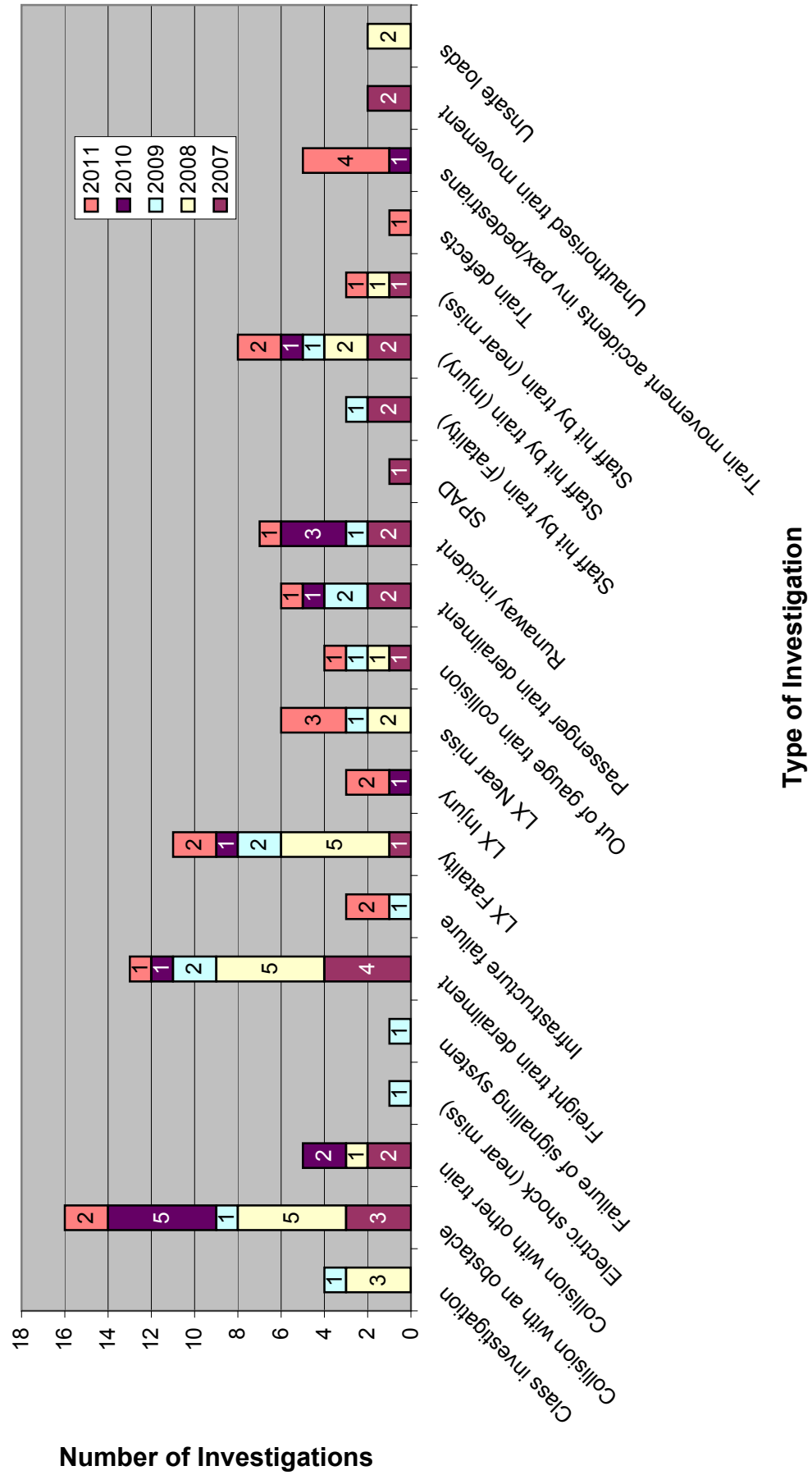


Chart 2 - Types of incidents/accidents investigated on National Networks 2007 - 2011



3

Operational experience

Chart 3 - Types of incidents/accidents investigated on Light Rail 2007 - 2011

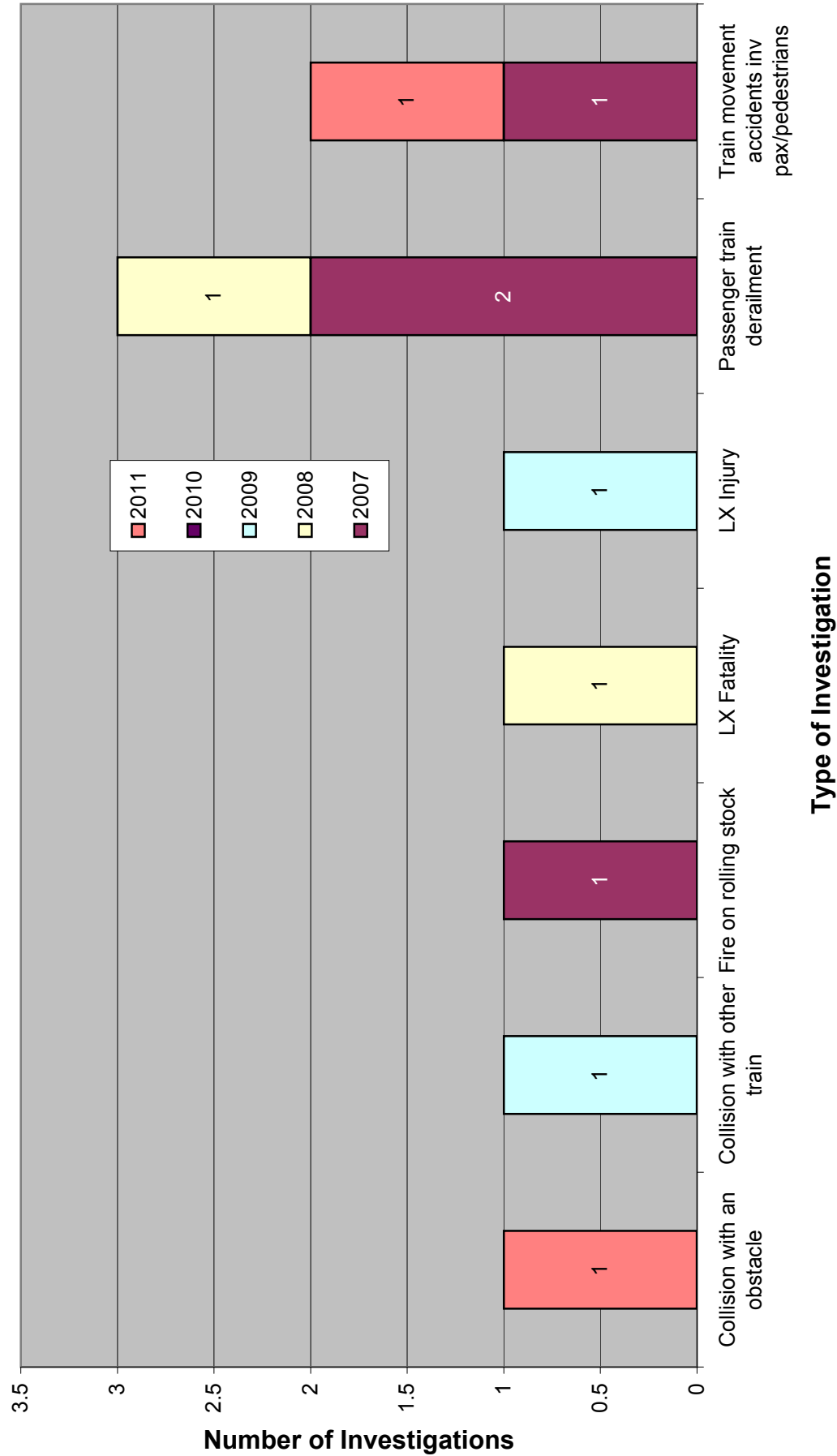


Chart 4 - Types of incidents/accidents investigated on Metro 2007 - 2011

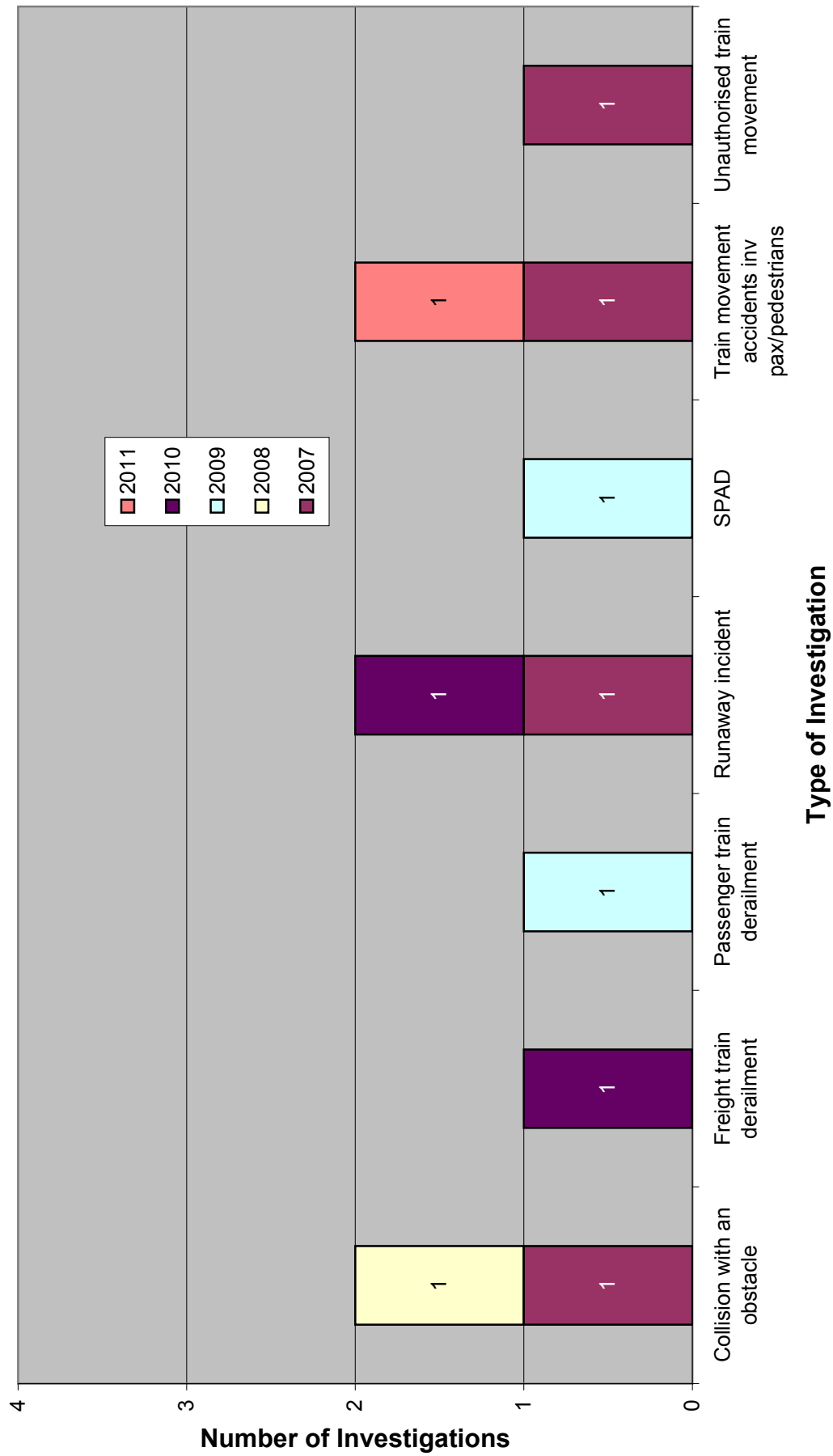
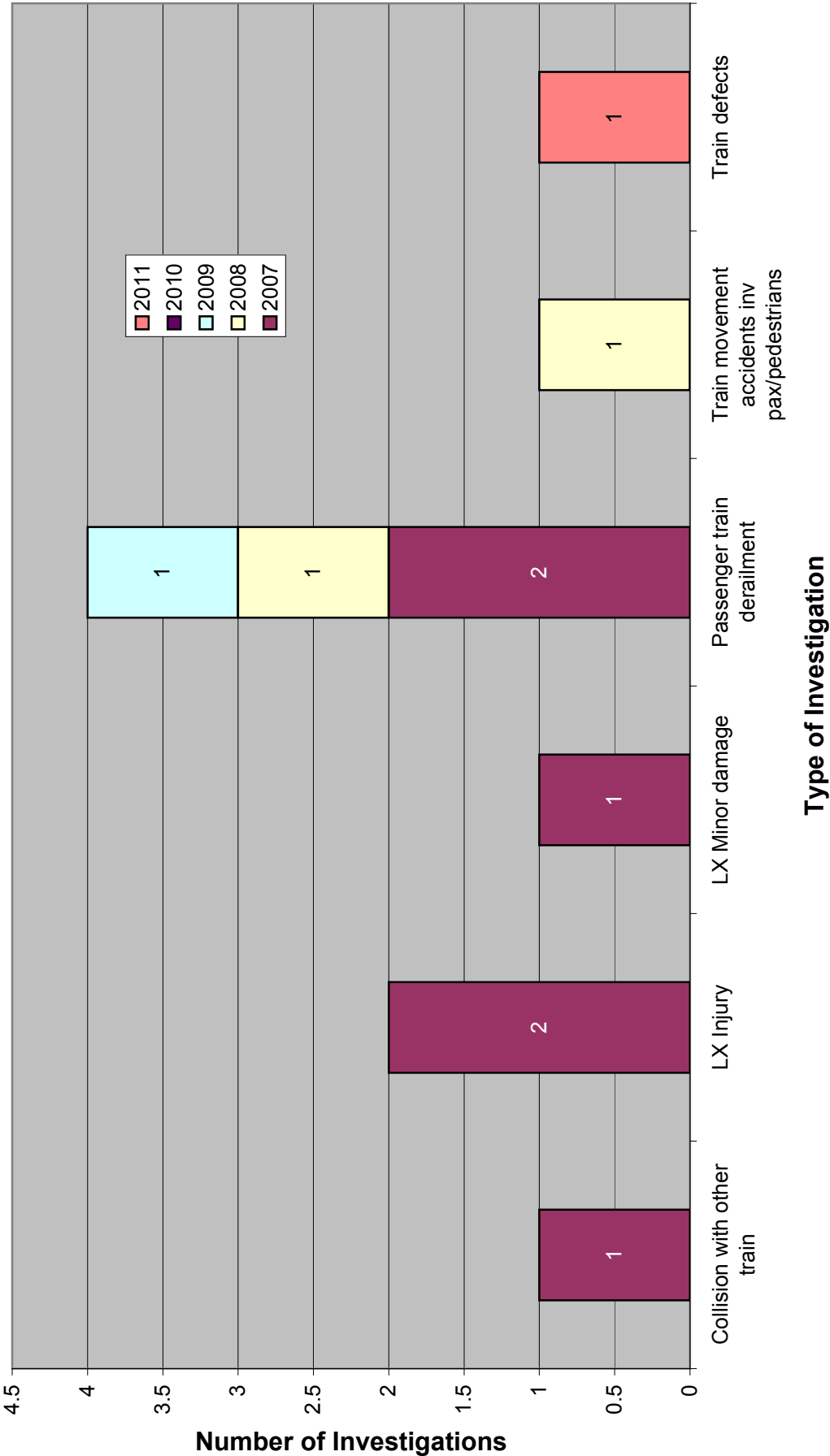


Chart 5 - Types of incidents/accidents on Heritage Railways 2007 - 2011



4. Recommendations

Recommendations are the prime output of the RAIB's investigations in improving safety as required by the Directive and the Regulations⁷. The recommendations are addressed to the appropriate safety authority⁸, and other public bodies where they are the end implementer.

The purpose of addressing the recommendation in this way is so these organisations can ensure the recommendations are duly taken into consideration and where appropriate are acted upon. The Regulations give the safety authority the power to require end implementers to provide full details of the measures they intend to take, or have taken, to implement the recommendation. The safety authority is also required to inform the RAIB of the measures taken, or the reasons why no implementation measures are being taken.

The RAIB has no role or statutory powers to follow up on the implementation of recommendations, other than if it becomes relevant as part of a subsequent investigation.

This section provides an overview of the status of recommendations made by the RAIB. It is compiled from information provided to the RAIB by the ORR, other safety authorities, or other public bodies, and the categories used are based on the following ORR descriptors:

- Implemented – meaning that all associated actions to deliver the recommendation have been completed.
- In-Progress – meaning a timeframe for delivering the recommendation has been agreed with the ORR and work is in progress.
- Non-implementation – meaning that no measures will be taken to implement the recommendation.
- Awaiting Response – meaning awaiting initial response from ORR on the status of the recommendation.

Between 1 January 2007 and 31 December 2011, the RAIB made a total of 860 recommendations. The following table provides a summary of the status.

Table 7 – Recommendation implementation status per year

Recommendations issued		Awaiting Response		In-Progress		Implemented		Non-implementation	
Year	Nos	Nos	%	Nos	%	Nos	%	Nos	%
2007	292	0	0%	13	4%	266	91%	13	4%
2008	181	0	0%	35	19%	142	78%	4	2%
2009	196	1	1%	59	30%	128	65%	8	4%
2010	98	27	28%	33	34%	37	38%	1	1%
2011	93	79	85%	8	9%	5	5%	1	1%
TOTAL	860	107	12%	148	17%	578	67%	27	3%

Further details of the recommendations where responses have been received in 2011 are detailed in [Part 2 of the Annual Report](#).

⁷ The European Railway Safety Directive (2004/49/EC) and Railways (Accident Investigation and Reporting) Regulations 2005.

⁸ The safety authority is the safety regulator; for the mainland UK this is primarily the Office of Rail Regulation (ORR) although there are some recommendations made by the RAIB where the HSE has been the safety authority (for accidents occurring that were not attributed to the railway and are investigated under the Health and Safety at Work etc Act 1974); for the Channel Tunnel it is the Inter Governmental Commission and for Northern Ireland it is the Department for Regional Affairs.

4

Recommendations

In the 20 reports published in 2011, the RAIB made a total of 93 recommendations; the average number of recommendations per report is approximately 4.5. The majority of the recommendations made in 2011 were targeted at the following organisations (in some cases to more than one implementer):

- Network Rail (46).
- Mainline passenger and freight train operators (18).
- London Underground Ltd (11).
- Infrastructure owners (Underground only) (12).
- Other Public Bodies (3).
- Rail Safety and Standards Board (RSSB) (6).
- Manufacturers (3).

The number of accidents investigated and the number of recommendations made should not be taken as an indicator for assessing the safety of UK railways. There is no way to assess how many incidents/accidents did not occur as a result of actions taken. The statistical data on UK's railway safety is published by the ORR, the current report is the National Rail Trends 2010-2011 Yearbook and can be found at www.rail-reg.gov.uk.

Chart 6 - National Network recommendation implementation status

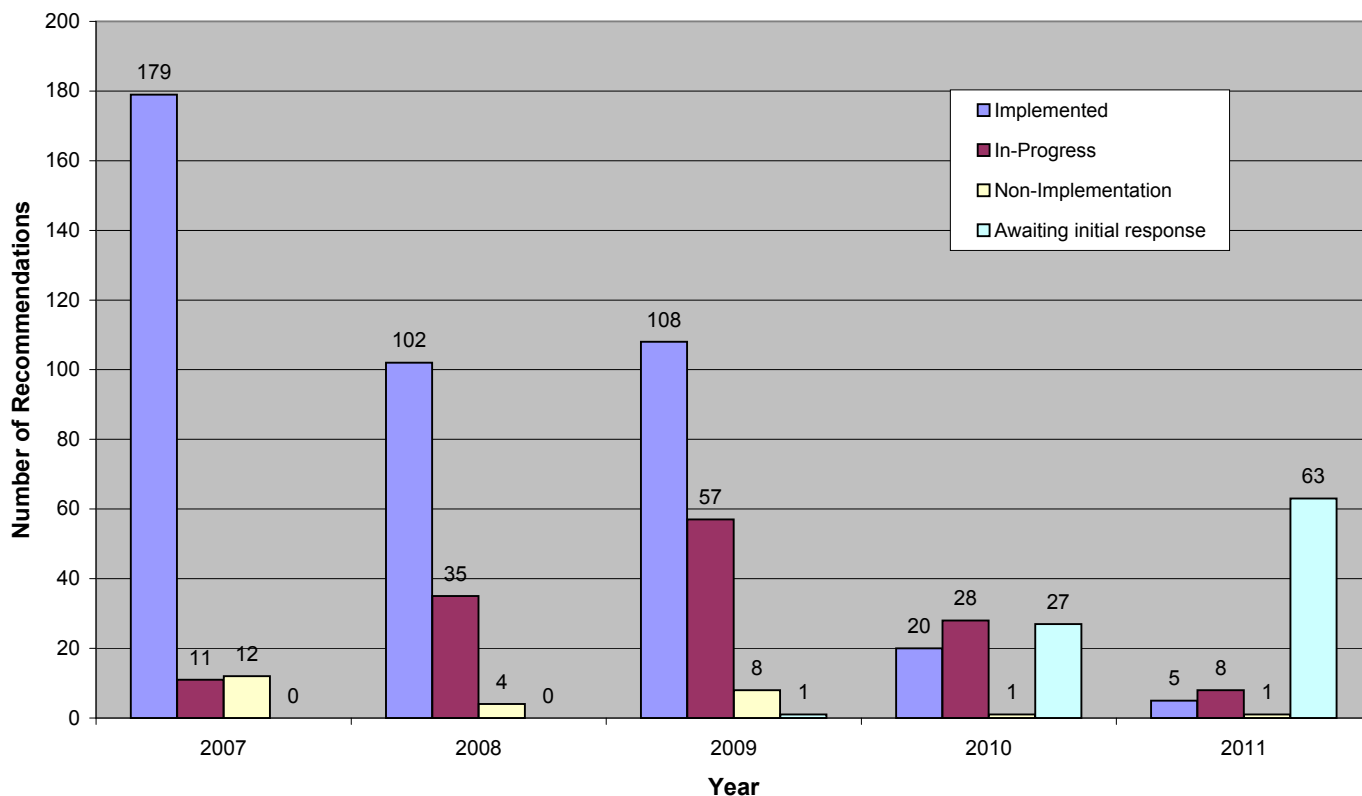


Chart 7 - Light Rail recommendation implementation status

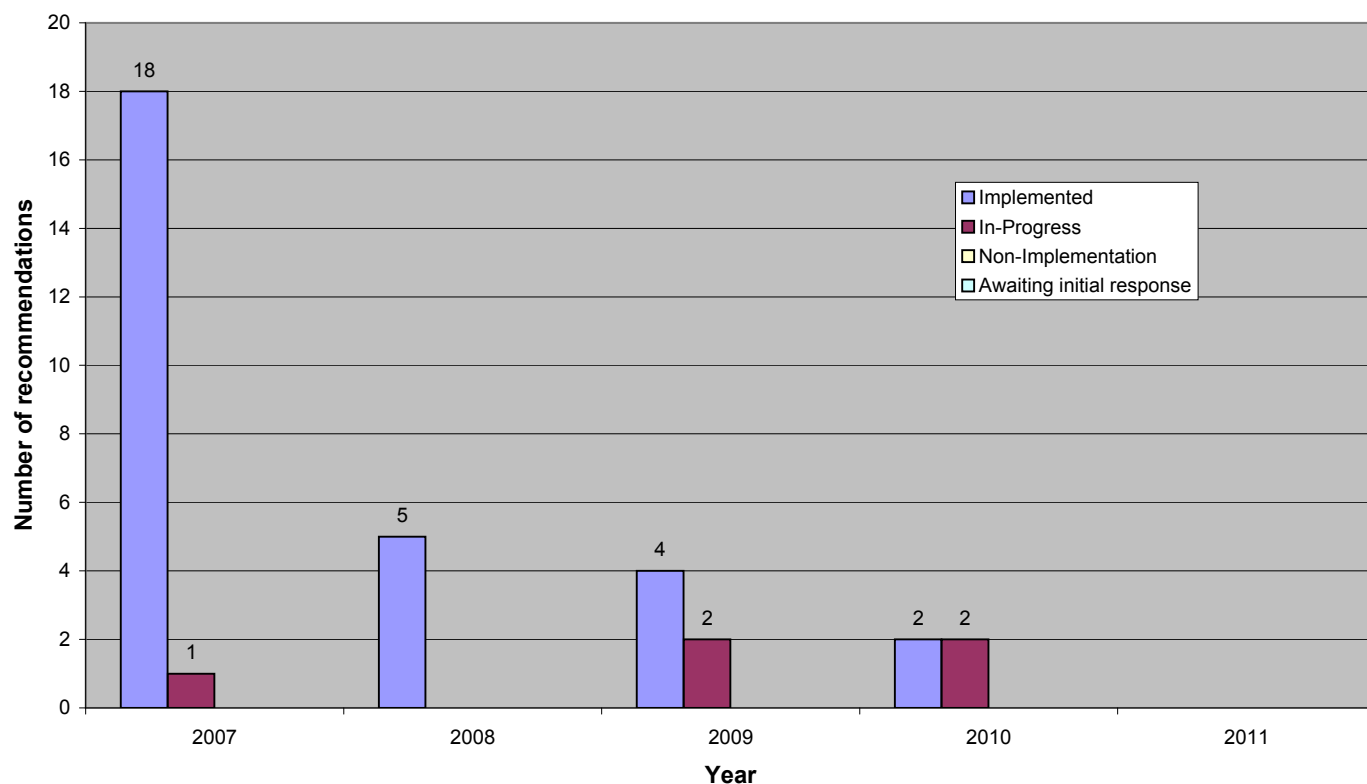
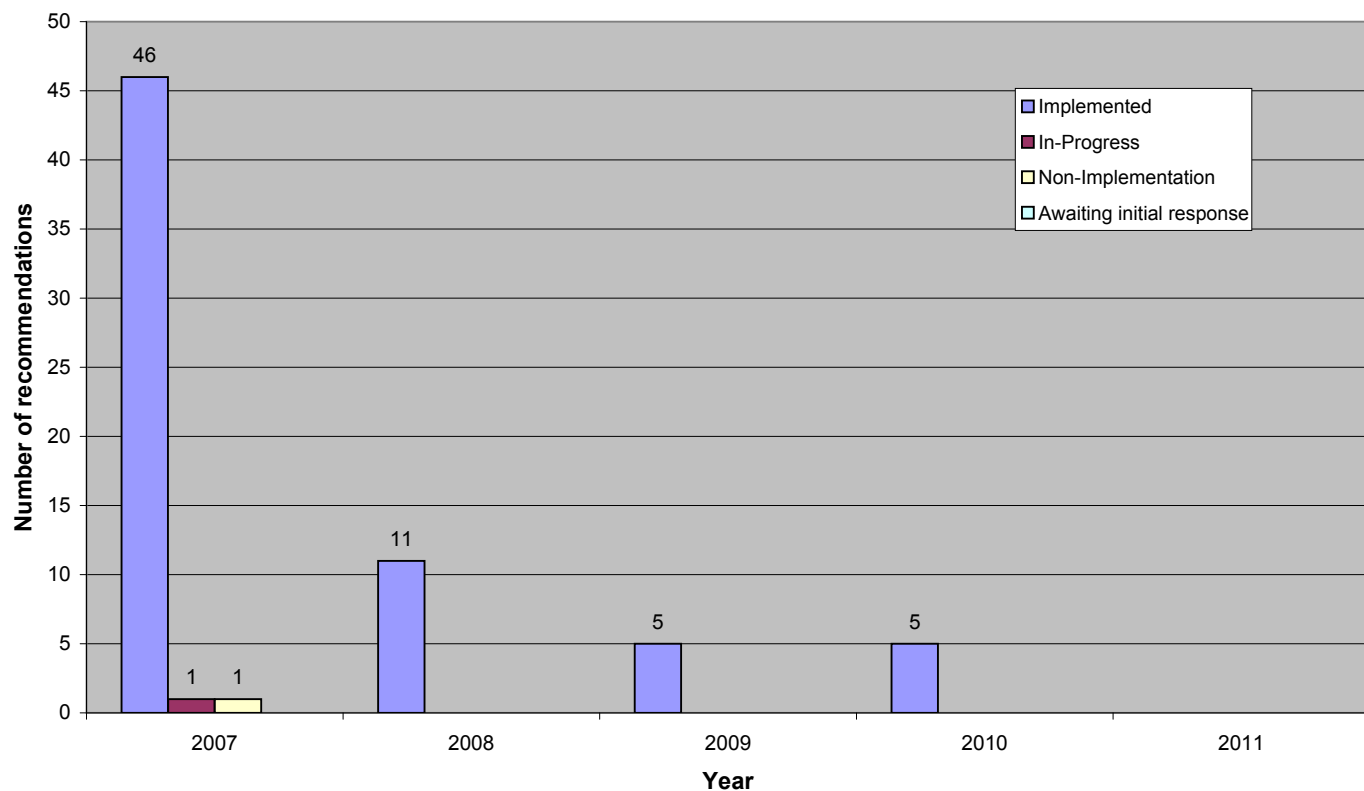


Chart 8 - Heritage recommendation implementation status



4

Recommendations

Chart 9 - Metro recommendation implementation status

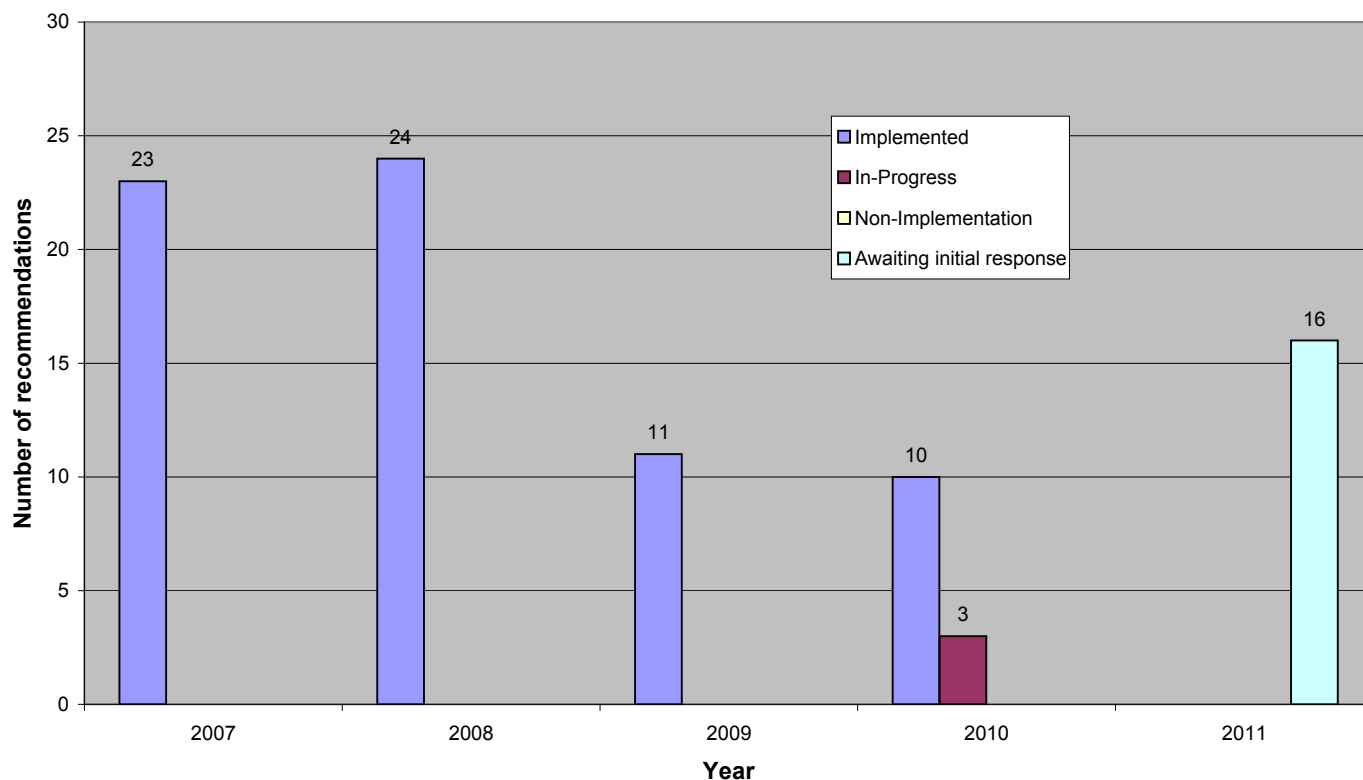
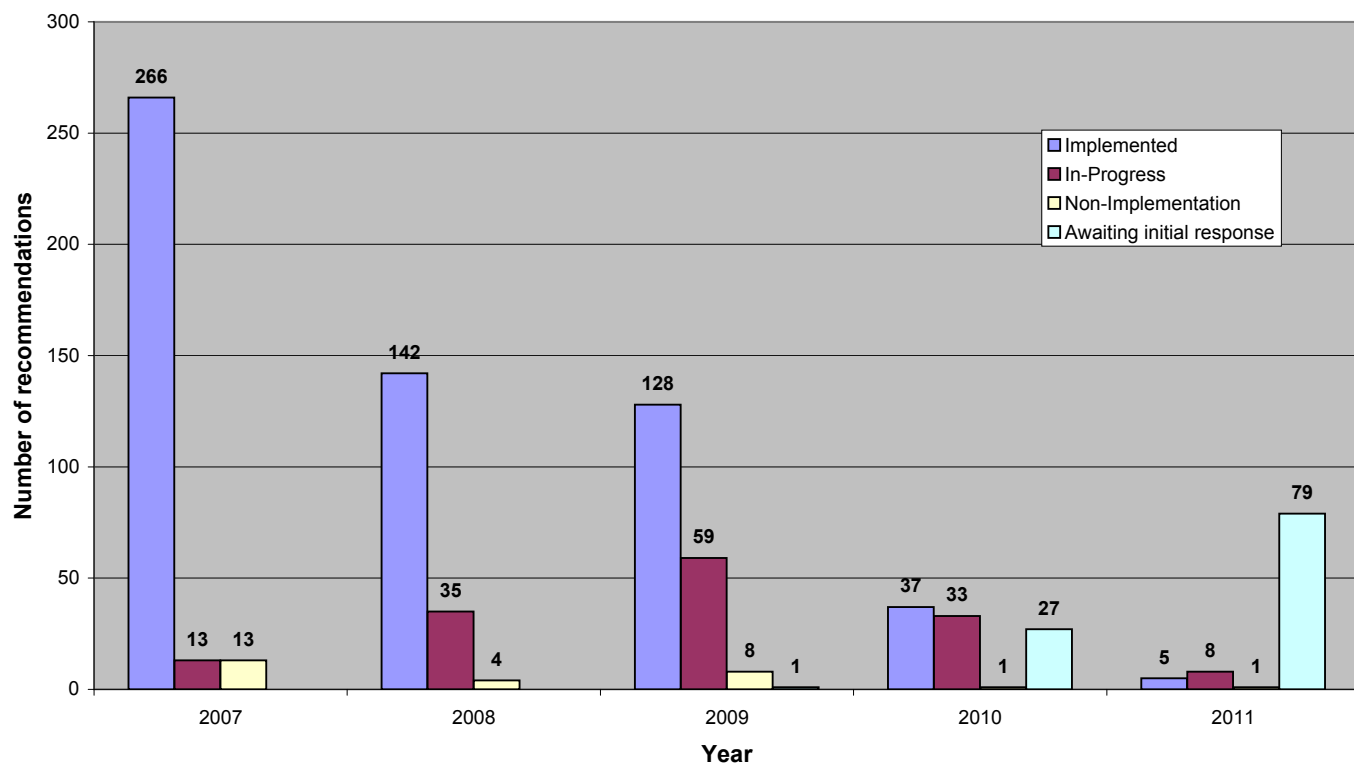


Chart 10 All railway type recommendation implementation status



5. Identification of important recurrent issues

Statistics in this section relate to investigations started and reports published between 17 October 2005 and 31 December 2011. The areas of recommendations highlighted in this section are those which have featured in the RAIB investigation reports that were published during 2011.

Details of the actions taken by the railway industry are primarily based on reports provided by the ORR during 2011.

Throughout this section the RAIB reports are referred to as follows:

two digit report number/year of publication; location of event

A full listing of RAIB reports, giving dates of occurrence and the full title is to be found at: www.raib.gov.uk.

Recurrent themes

Shown in Table 8 are some of the most important recurrent issues identified in the RAIB investigation reports to date and details of recurrences during 2011. The table shows for each theme:

- the number of investigations published before 2011;
- the number of investigations published during 2011 and their titles;
- the number of investigations ongoing at 31 December 2011 and their titles.

All named investigations have taken place on the national network unless indicated thus:

- (U) London Underground
- (L) Light rail/tramway
- (H) Heritage sector (and other minor railways)
- (I) Northern Ireland

Themes that are highlighted in pink are discussed in more detail in the text that follows.

Areas of particular concern to the RAIB during 2011 are described below.

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Identification of important recurrent issues

Table 8 - Summary of some recurrent safety themes in RAIB investigations between October 2005 and the end of 2011

RECURRENT THEMES	No. of reports published before 2011 N = National Networks L = Light Rail H = Heritage U = Underground I = Northern Ireland	No. of reports published during 2011	Report reference (bulletins shown in italics)	No. of investigations ongoing at 31 Dec. 2011	Details of investigations ongoing at 31 Dec. 2011
Level crossings	N = 17 (+ 2 bulletins) L = 3 H = 3 I = 1 Total = 26	3 (+ 1 class investigation + 1 bulletin)	Fatal accident at Moreton-on-Lugg, near Hereford, RAIB report 04/2011 Investigation into the safety of automatic open level crossings on Network Rail's managed infrastructure, RAIB report 12/2011 Collision between an articulated tanker and a passenger train at Sewage Works Lane user worked crossing, near Sudbury, Suffolk, RAIB report 14/2011 <i>Passenger train collision with car on user worked crossing, Wensleydale Railway, RAIB bulletin B05/2011 (H)</i> Train passed over Lydney level crossing with crossing barriers raised, RAIB report 20/2011	5	Investigation into an incident at Llanbadarn level crossing on 19/06/11 Fatality at Gipsy Lane footpath crossing on 24/08/11 Ufton AHBC level crossing on 04/09/11 Investigation into a fatal accident at Mexico footpath crossing, near Penzance, Cornwall on 03/10/11 Investigation into a collision between a train and a lorry at Llanboidy level crossing, near Whitland, Carmarthenshire on 19/12/11
Risk management and inspection at level crossings	N = 14 (+ 1 bulletin) Total = 15	2 (+ 1 class investigation + 1 bulletin)	Fatal accident at Moreton-on-Lugg, near Hereford, RAIB report 04/2011 Investigation into the safety of automatic open level crossings on Network Rail's managed infrastructure, RAIB report 12/2011 Collision between an articulated tanker and a passenger train at Sewage Works Lane user worked crossing, near Sudbury, Suffolk, RAIB report 14/2011 <i>Passenger train collision with car on user worked crossing, Wensleydale Railway, RAIB bulletin B05/2011 (H)</i>	2	Fatality at Gipsy Lane footpath crossing on 24/08/11 Investigation into a fatal accident at Mexico footpath crossing, near Penzance, Cornwall on 03/10/11

RECURRENT THEMES	No. of reports published before 2011 N = National Networks L = Light Rail H = Heritage U = Underground I = Northern Ireland	No. of reports published during 2011	Report reference (bulletins shown in italics)	No. of investigations ongoing at 31 Dec. 2011	Details of investigations ongoing at 31 Dec. 2011
Error by signaller or crossing keeper at level crossings	N = 2 (+ 1 bulletin) H = 1 Total = 4	2	Fatal accident at Moreton-on-Lugg, near Hereford, RAIB report 04/2011 Train passed over Lydney level crossing with crossing barriers raised, RAIB report 20/2011	1	Ufton AHBC level crossing on 04/09/11
Unintentional misuse/error by level crossing users	N = 11 L = 2 I = 1 Total = 14	(1 class investigation)	Investigation into the safety of automatic open level crossings on Network Rail's managed infrastructure, RAIB report 12/2011	2	Fatality at Gipsy Lane footpath crossing on 24/08/11 Investigation into a fatal accident at Mexico footpath crossing, near Penzance, Cornwall on 03/10/11
Staff working on lines that are still open to traffic (Red Zone working)	N = 8 L = 1 Total = 9	1	Track worker struck by a train at Cheshunt Junction, RAIB report 06/2011	0	
Work activities in and around an engineering possession (including train movements)	N = 5 (+ 1 bulletin) Total = 6	1	Passenger train struck by object at Washwood Heath, RAIB report 01/2011	2	Investigation into two safety incidents involving track maintenance staff between Clapham Junction and Earlsfield stations, on 08/03/11 Track worker struck at Stoats Nest Junction on 12/06/11
Safety leadership and the supervision of track workers	N = 13 (+ 1 bulletin) L = 1 Total = 15	2	Passenger train struck by object at Washwood Heath, RAIB report 01/2011 Track worker struck by a train at Cheshunt Junction, RAIB report 06/2011	2	Investigation into two safety incidents involving track maintenance staff between Clapham Junction and Earlsfield stations, on 08/03/11 Track worker struck at Stoats Nest Junction on 12/06/11
Track quality, maintenance & inspection	N = 12 L = 4 H = 3 I = 1 Total 20	1	Derailment of an engineering train between Gloucester Road and Earl's Court stations on London Underground's Piccadilly Line, RAIB report 05/2011 (U)	1	Derailment at Bordesley Junction on 26/08/11

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Identification of important recurrent issues

RECURRENT THEMES	No. of reports published before 2011 N = National Networks L = Light Rail H = Heritage U = Underground I = Northern Ireland	No. of reports published during 2011	Report reference (bulletins shown in <i>italics</i>)	No. of investigations ongoing at 31 Dec. 2011	Details of investigations ongoing at 31 Dec. 2011
Defective switches and crossings (S&C)	N = 4 (+ 2 bulletins) L = 4 H = 2 U = 1 Total = 13	0		1	Investigation into the derailment of an empty passenger train near Edinburgh Waverley station on 27/07/11
Failures of structures or deficient inspection/assessments	N = 3 Total = 3	3	Train struck by lorry falling from bridge at Oxshott, RAIB report 13/2011 Derailed in Summit tunnel, near Todmorden, West Yorkshire, RAIB report 16/2011 Derailed of a passenger train near Drycough Junction, Halifax, RAIB report 17/2011	2	Investigation into the partial failure of 'bridge 94', Bromsgrove Stream, Worcestershire on 06/04/11 Partial failure of a structure inside Balcombe tunnel on 23/09/11
Road rail vehicles	N = 2 I = 1 Total = 3	1	Runaway and collision of a road-rail vehicle near Raigmore, Inverness, RAIB report 10/2011	0	
Use of trolleys	N = 2 (+ 1 bulletin) I = (+ 1 bulletin) U = 2 Total = 6	0		1	Investigation into a safety incident involving a track maintenance trolley near Haslemere station on 10/09/11
Defective freight wagons/load and train preparation	N = 14 (+ 3 bulletins) Total = 17	1 (+ 1 bulletin)	Runaway and derailment of wagons at Ashburys, RAIB report 07/2011 Derailed at Dalchalm level crossing, Highland, Scotland RAIB bulletin B03/2011	2	Investigation into the collision of a detached panel on a freight container with a track maintenance machine near Althorpe Park on 18/07/11 Derailed at Bordesley Junction on 26/08/11
Runaway trains (excluding RRVs and trolleys)	N = 3 L = 1 (+ 1 bulletin) H = (1 bulletin) Total = 5	3	Runaway and derailment of wagons at Ashburys, RAIB report 07/2011 Runaway of an engineering train from Highgate (London Underground), RAIB report 09/2011 (U) Uncontrolled freight train run-back between Shap and Tebay, Cumbria, RAIB report 15/2011	0	

RECURRENT THEMES	No. of reports published before 2011 N = National Networks L = Light Rail H = Heritage U = Underground I = Northern Ireland	No. of reports published during 2011	Report reference (bulletins shown in <i>italics</i>)	No. of investigations ongoing at 31 Dec. 2011	Details of investigations ongoing at 31 Dec. 2011
Fatigue	N = 6 Total = 6	1	Uncontrolled freight train run-back between Shap and Tebay, Cumbria, RAIB report 15/2011	0	
Low adhesion	N = 2 (+ 1 bulletin) H = 1 Total = 4	1	Station overrun at Stonegate, East Sussex, RAIB report 18/2011	0	
Safety management, compliance with rules and asset management on heritage and other minor railways	H = 8 (+ 1 bulletin) Total = 9	(3 bulletins)	Serious injury of a guard on the Foxfield Light Railway, RAIB bulletin B01/2011 Derailment on the Bure Valley Railway, Norfolk, RAIB bulletin B04/2011 Passenger train collision with car on user worked crossing, Wensleydale Railway, RAIB bulletin B05/2011	1	Investigation into a boiler incident on the Kirklees light railway on 03/07/11
Accidents involving passengers and moving trains at stations	N = 1 (+ 1 bulletin) L = 1 U = 1 Total = 4	1	Passenger accident at Brentwood station, RAIB report 19/2011	3	Investigation into an incident at Warren Street station, Victoria line, London Underground on 11/07/11 Person trapped in train doors and pulled along platform at King's Cross station on 10/10/11 Investigation into a fatal accident at James Street station, Liverpool on 22/10/11
Incidents linked to severe weather conditions – ice and snow	0	3 (+ 1 bulletin)	Near miss involving a freight train and two passenger trains, Carstairs, Scotland, RAIB report 02/2011 Derailment of a freight train at Carrbridge, Badenoch and Strathspey, RAIB report 03/2011 Near miss incident at Seaburn station platform, RAIB bulletin B02/2011 Derailment in Summit tunnel, near Todmorden, West Yorkshire, RAIB report 16/2011	0	

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Identification of important recurrent issues

Topics of concern to the RAIB

Level crossings

The RAIB notes that the UK's mainline railway has a good overall level crossing safety record relative to the other European Union Member States. However, by 31 December 2011 the RAIB had cause to investigate 35 level crossing accidents or incidents, and had published 30 related reports. These level crossing accidents resulted in a total of 17 fatalities on the national network, one fatality on Northern Ireland Railways and two fatalities on a tramway (light railway).

Investigations published during 2011 related to level crossings

Relevant investigations published by the RAIB in 2011 were:

04/2011; Moreton-on-Lugg (16/01/2010)⁹: Barrier raised too early causing a car to drive into the path of an oncoming train (one fatality).

14/2011; Sudbury (17/08/2010): Driver of lorry drove onto crossing without calling signaller for permission to cross causing an oncoming train to collide with it (two seriously injured train passengers).

20/2011; Lydney (23/03/2011): Barrier raised in error despite the presence of an oncoming train (dangerous occurrence).

Bulletins:

B05/2011; Wensleydale (01/08/2011): Car struck by train at User Worked Crossing on line operated by a heritage railway.

Investigations related to level crossings ongoing at 31 December 2011

On 19 June 2011 a train passed over Llanbadarn level crossing (near Aberystwyth) when the barriers were still open.

On 04 September 2011 a train passed over Ufton Nervet level crossing (Berkshire) when the barriers were still open.

On 03 October 2011 a pedestrian was struck and killed at Mexico footpath crossing (near Penzance).

On 19 December 2011 a train struck a lorry at Llanboidy level crossing (Carmarthenshire).

Recurrent factors related to level crossings

The RAIB has concerns about the following recurrent factors:

User behaviour at level crossings

The railway industry attempts to influence user behaviour at level crossings by various means including active measures such as warning lights and passive measures such as signage. Other factors influencing human behaviour (eg distraction) can result in these measures becoming ineffective. The RAIB has considered the ways in which the safety measures might better influence the behaviour of crossing users and made recommendations accordingly.

Nine RAIB investigations have found the actions of pedestrians to have been a factor and in another eleven the actions of a road vehicle driver were found to be a factor.

⁹ Date in brackets indicates when accident/incident happened.

In only two of the accidents investigated has it been proven that the accident was caused by deliberate violation of the rules associated with the use of the crossing. In four other investigations it was found that a deliberate violation could have played a part in the causation of the accident. However, it should be noted that the RAIB's policy is that generally, it only investigates accidents that are caused by reckless behaviour or deliberate violation if there is significant safety lessons for the railway industry.

Out of a total of 30 published RAIB investigations into accidents at user worked, footpath and station level crossings, 15 have found the design of the crossing, the sighting of approaching trains or the position of signs to be a factor (three of which were on a heritage line).

A safety issue identified by the RAIB in four crossing investigations is the positioning of signs relative to the location at which the user is required to make their final decision to cross the line (the decision point). The position at which the user should have adequate sighting of approaching trains is not marked and in some cases may be counter intuitive. Therefore this is a particular issue at those locations where the best sighting of trains is not obtained from the existing gate and/or sign. The implications of this, and the potential solutions, were discussed in a class RAIB investigation (report 13/2009, UWCs) examining the safety of User Worked Crossings published in 2009.

The RAIB investigations have identified a range of other local factors that might influence the actions of crossing users. These include:

- local obstructions to the sighting of trains;
- environmental conditions such as traffic noise and visibility at night;
- gates left open at User Worked Crossings;
- anxiety to cross the line to catch a train (station crossings);
- visibility of road traffic signals (eg impact of sunlight); and
- the audibility of train horns.

Infrastructure managers need to take such factors into account in order to manage risk at level crossings. The RAIB welcomes the continued development of the railway industry's tool that is designed to help risk assessors identify factors of this type and evaluate potential mitigating measures (the Level Crossing Risk Management Toolkit¹⁰).

Inspection and risk assessment at level crossings

The term 'inspection' describes the process of checking that the crossing is in good condition and compliant with relevant railway standards and legal requirements. The term 'assessment' is a parallel process that the industry has implemented to assess risk at crossings in the UK and to identify any reasonably practicable measures for improvement.

In 19 of the 30 RAIB level crossing investigations it was found that the application of the inspection and/or risk assessment process had been deficient and/or the findings of the inspection/assessment had not been fully implemented. The RAIB findings include:

- errors made during data collection and risk assessments (eg incorrect collection of data);
- inadequate consideration of local factors at individual crossings;
- competence of risk assessors and crossing inspectors;

¹⁰ This document is developed and maintained by RSSB and can be found at www.lxrmk.com.

5 Identification of important recurrent issues

- actions not being taken in response to inspection and risk assessments at level crossings; and
- insensitivity of the All Level Crossing Risk Model to certain inputs (eg sighting times).

Types of level crossings that feature in RAIB investigations

The number of investigations completed by the type of crossing involved is shown below:

Table 9 - Type of Level Crossing

Type of Level Crossing	Number of investigations
Automatic half barrier	2
Automatic open (locally monitored)	2
Automatic barrier (locally monitored)	1
Manually controlled barrier	2
Manually opened gates	4
Tramway road crossing protected by road traffic lights	1
Footpath (including tramways)	7
User Worked Crossing	8
Open crossing protected only by signs	2 (both heritage)
Crossings at/near stations	1
Total	30

Areas of RAIB recommendations related to level crossings

Issues that are the subject of RAIB recommendations published during 2011 include:

- engineering safeguards to prevent signallers raising barriers at level crossings before trains have passed clear (report 04/2011, Moreton-on-Lugg);
- assessing and managing risk associated with the design, operation and maintenance of manually operated level crossings (04/2011, Moreton-on-Lugg);
- assessments of the need to comply with modern standards when upgrading crossings (04/2011, Moreton-on-Lugg);
- understanding the risk associated with non-critical information systems in signal boxes (eg TRUST) (04/2011, Moreton-on-Lugg);
- provision of barriers at higher risk locally monitored automatic open crossings (12/2011, AOCLs);
- the need to take into account human factors that have been identified in railway industry research and the previous history of incidents when assessing risk at level crossings (12/2011, AOCLs);
- digital red light enforcement equipment (12/2011, AOCLs);
- the responsibilities of authorised 'business' users at user worked crossings (14/2011, Sudbury);
- the management of risk at user worked crossings with long waiting times due to absence of information to the signaller on the position of trains (14/2011, Sudbury);

- Network Rail's procedures for interfacing with authorised users of user worked crossings (14/2011, Sudbury);
- review of the organisational arrangements for the assessment of risk at level crossings (14/2011, Sudbury);
- ensuring that signal box instructions and training material is kept up to date (20/2011, Lydney);
- assessing the competence of safety critical operations staff (20/2011, Lydney); and
- the interlocking between level crossing barriers and associated signals (20/2011, Lydney).

The railway industry's response to level crossing issues as reported during 2011

A range of actions reported by the ORR¹¹ as taken by Network Rail in response to RAIB recommendations are described in the Annual Report for 2010. During 2011 the ORR provided additional information concerning the measures taken by the railway industry to implement RAIB recommendations. These included the following:

- Network Rail have installed anti-slip surfacing at 20 footpath crossings (27/2008, Staines);
- Network Rail has issued a handbook to cover the correct management of data in order to reduce the likelihood that identified level crossing improvement works will be omitted in error (27/2008, Staines);
- Network Rail is carrying out a review of how risk at level crossings is being managed (various RAIB reports). This includes:
 - data collection at level crossings;
 - risk analysis (including the consideration of local factor); and
 - assessment of options for improvement.
- Network Rail has issued enhanced guidance on the alignment of the road traffic signals and the maintenance of backboards (16/2010, Halkirk);
- Network Rail has commissioned an analysis of human factors issues associated with speed limit, and other signs, in proximity to level crossings (16/2010, Halkirk);
- Halkirk level crossing, the site of an accident in which three occupants of a road vehicle were killed, is to be upgraded by the installation of half barriers (16/2010, Halkirk);
- Network Rail are developing a process to take into account the previous history of a level crossing when carrying out risk assessments (16/2010, Halkirk);
- the design of road traffic signal hoods is under review and testing of an alternative design is being undertaken (16/2010, Halkirk); and
- a tramway operator has reviewed speed limits and associated signage (including at level crossings) (09/2010, Norbreck).

Network Rail has reported that it has established, and is further developing, a broad programme of initiatives aimed at improving the safety of crossings, which takes account of our recommendations, and which will run until 2015. The programme includes closures, upgrade of equipment, recruitment and training of staff dedicated to crossing safety management, and revision of how crossings will be risk assessed.

¹¹ In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005.

5 Identification of important recurrent issues

Connected with this, RSSB has been commissioned to research issues concerning the safety of pedestrians at level crossings; research project T984, 'Research into the causes of pedestrian accidents at level crossings and potential solutions'. This is intended to examine all factors that cause pedestrian accidents at level crossings, and to review the effectiveness of current (and possible new) mitigation measures including signage, layout and the use of technology to enhance users' safety. It will be coordinated with research project T983, 'Research into signs at private road level crossings', which will address the issue of the marking of decision points for vehicles and pedestrians at level crossings. Both projects were expected to start in the Spring of 2012. Whilst it may take up to two years for research to be completed, RSSB has indicated it will bring forward and publish priority matters, and in particular the findings related to 'decision points' of pedestrians using the crossings.

There are a number of issues that remain of particular concern to the RAIB. These include:

- the quality of data gathering when level crossings are visited (eg measurement of sighting distance and traffic census); and
- the overall effectiveness of the level crossing risk management processes (as discussed earlier).

Although the ORR has reported that Network Rail is addressing many of the issues identified, and we recognise that it is the industry's responsibility to prioritise work according to risk, the RAIB has ongoing concerns regarding the length of time taken to implement some key recommendations. The average length of the time taken between publication of level crossing related reports and ORR's notification that the recommendations have been implemented was 19 months (based on level crossing accident reports published between October 2005 and December 2011).

Safety leadership and supervision during track maintenance and renewals

During track engineering activities it is vital that those with responsibility of the safety of the workers are well trained and have the qualities needed to exercise leadership. RAIB investigations have shown the following factors to be central:

- the ability of the leader to exercise authority and influence;
- the need for the leader to understand the task;
- the need for planning and effective communications between all parties;
- the need for the leader to possess the right personal qualities; and
- the need for clear instruction and procedures.

One or more of these factors have been identified in no less than 18 investigations (16 on the national railway network, one on a light rail system and one on the Docklands Light Railway).

Investigations published during 2011 related to safety leadership and supervision

Relevant investigations published by the RAIB in 2011 were:

01/2011; Washwood Heath (06/03/2010)	Train was struck by a rail that was being lifted by road-rail vehicle on an adjacent line.
06/2011; Cheshunt (30/03/2010)	Track worker did not move clear when warned to do so and was struck by a train (serious injury).

Areas of RAIB recommendations related to safety leadership and supervision

Issues that are the subject of RAIB recommendations published during 2011 include:

- management surveillance and supervision of maintenance activities (report 01/2011, Washwood Heath);
- training and assessment of staff carrying out safety critical roles (report 01/2011, Washwood Heath).

Investigations ongoing at 31 December 2011 relating to safety leadership Issues

On 8 March 2011 two separate but related safety incidents involving track maintenance staff occurred between Clapham Junction and Earlsfield stations.

On 12 June 2011 a track worker was struck by a passing train at Stoats Nest Junction, near Purley.

The railway industry's response to safety leadership issues

The RAIB is aware that the railway industry is taking the following actions:

- Network Rail is changing its process for managing the competence of track workers (Assessment in the Line). As at December 2011, three phases of change are being proposed:
 - A change in the competence review frequency. This is intended to emphasise the importance of site surveillance by line managers.
 - An organisational change in mid-2012 to deliver 'Local and Route ownership for delivery and compliance', coupled with the replacement of work experience log books with self-declarations of work completed.
 - The introduction of new technology (software and hardware) in 2013.
- Network Rail is progressing the following initiatives as part of its safety culture leadership programme which is intended to improve the safety-related behaviours of Controllers of Site Safety (COSSs) and team leaders:
 - In June 2010 it issued a new competence standard, NR/L2/CTM/223, '*Managing Site Safety*', which includes behavioural indicators to be used when making assessments of competence (full compliance is due by June 2014).
 - It is providing linked '*Managing Site Safety*' training for approximately 2,800 team leaders¹², with the following aims:
 - to raise awareness and understanding amongst team leaders about their roles as leaders of site safety;
 - to develop new ways of thinking and behaving in the role; and

¹² This is due to complete in December 2012.

5 Identification of important recurrent issues

- to plan for, deliver and review safe and effective working environments and work practices by applying safety leadership behaviours and competencies.
- It is producing a training DVD to highlight the different safety responsibilities of COSSs and Team Leaders.
- At the request of the railway industry, RSSB has developed a new internet based system, which went live in June 2011, that aims to allow the industry to centrally record and analyse near-miss incidents.
- It is carrying out work as part of the Quality COSS project, including:
 - the introduction of behavioural pre-requisites to encourage Line Managers to appoint individuals who have the appropriate capabilities to the role; and
 - changes to COSS training and assessment which will see more focus on the non-technical skills and behavioural elements of being a COSS.

The management of competence

During 2011 the ongoing investigation into two successive near-misses near Clapham Junction (report 03/2012) revealed concerns that Network Rail's process for assessing the ongoing competence of track workers was deficient in a number of important respects. In particular:

- the managers tasked with assessing that staff were competent had insufficient time to do so in an effective manner;
- the frequency that staff are directly observed undertaking certain types of work activity is insufficient to enable managers to assess their competence;
- it is sometimes the case that staff are not adequately trained and assessed for competence in those types of work activity that are only performed on an occasional basis.

The RAIB has expressed its concerns to the ORR and directly to Network Rail.

The response to previous RAIB recommendations

Insufficient action had been taken following previous RAIB recommendations made in mid 2006 and early 2008¹³ addressing safety behaviour and the quality of leadership in work groups to prevent two track workers being struck by a train, the first at Cheshunt Junction in March 2010 and the second at Stoats Nest Junction in June 2011 (both suffered serious injuries). While recognising that Network Rail has been active in addressing the issue of track worker safety, the RAIB is concerned that a national initiative intended to address safety related behaviour of staff in work groups had yet to reach the staff at local depots.

The accident at Cheshunt resulted from the actions of staff when working on or beyond facing points when a train approached. Previous RAIB recommendations made at the end of 2007 and early 2008 had stressed the need to develop appropriate safe systems of work at such locations and for this to be reflected in the training of staff¹⁴. Again these recommendations had not been implemented to the extent that they influenced the staff at Cheshunt.

¹³ Recommendation 9 of the report into a fatal accident at Trafford Park in October 2005 (report 16/2006), Recommendation 2 of the report into a fatal accident at Ruscombe in April 2007 (report 04/2008).

¹⁴ Recommendation 2 of the report into a near miss at Tinsley Green in March 2007 (report 43/2007), Recommendation 1 of the report into a fatal accident at Ruscombe in April 2007 (report 04/2008).

Freight trains

By 31 December 2011 the RAIB had published a total of 19 reports into accidents involving the design, maintenance, preparation or loading of freight trains.

Investigations related to freight trains published during 2011

Relevant investigations published by the RAIB in 2011 were:

07/2011; Ashburys (04/05/2010)

Stabled wagons ran away due to defective hand brake and then derailed.

Bulletins:

B03/2011; Dalchalm (23/02/2011)

Brake rigging came loose and fouled track components causing freight train to derail.

Investigations related to freight trains ongoing at 31 December 2011

On 18 July 2011, at Althorpe Park (near Northampton) a tamper was struck by a panel that had become detached from a defective container conveyed on a freight train on 18 July 2011.

On 26 August 2011 a freight train derailed at Bordesley Junction.

Recurrent factors related to freight trains

The table below indicates where the same factors have played a part in more than one incident or accident that the RAIB has investigated:

Table 10 - Factors related to Freight Trains

	No. of investigations in which the factors have been identified (some investigations feature more than one factor)
Defective wagon	12
Poor train preparation before departure	11
Design deficiencies/approvals	7
Twisted frame	3
Uneven/insecure loading	3
Operation and management of freight yards	7

Areas of RAIB recommendations related to freight trains

Issues that are the subject of RAIB recommendations published during 2011 include:

- braking of trains in snowy conditions (reports 02/2011, Carstairs & 03/2011, Carrbridge);
- assessing the risk of different types of freight vehicles when operating in snow (reports 02/2011, Carstairs & 03/2011, Carrbridge);
- speed limits and special restrictions when operating in snowy conditions (reports 02/2011, Carstairs & 03/2011, Carrbridge);
- testing the efficacy of handbrakes (report 07/2011, Ashburys);
- ensuring manufacturers maintenance requirements for safety critical components are understood (report 07/2011, Ashburys);

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- the exchange of safety critical information between different industries (report 07/2011, Ashburys); and
- maintenance and inspection of wagon hand brakes (report 07/2011, Ashburys).

The railway industry's response to freight train issues as reported during 2011

A range of actions reported by the ORR¹⁵ as taken by Network Rail in response to RAIB recommendations are described in the Annual Report for 2010. During 2011 the ORR provided additional information concerning the measures taken by the railway industry to implement RAIB recommendations. These included the following:

- A major freight operator has reviewed the actual maintenance performed on wagons to check that the requirements of the maintenance plan were being complied with and taken the necessary corrective actions (07/2009, Moor Street Station, Birmingham).
- Following the derailment at Ely in June 2007 (02/2009, Ely Dock), the relevant freight operator arranged a test programme to assess the extent of frictional lock-up in the suspension of PHA type wagons. Following these tests a number of potential modifications to the suspension were identified and in April 2010 two PHA wagons were modified. These were then subject to testing between May and September 2010 and then another 16 months of trial running. In January 2012 the trial running was concluded and subsequently a campaign of modifications was launched. (The RAIB is concerned to note that an unmodified PHA wagon derailed at Bordesley Junction on 26 August 2011. The ongoing investigation has revealed evidence that frictional lock-up in the suspension was, once again, a significant factor. The RAIB is therefore seeking to understand why it has taken so long to identify a programme of work to address the problem of frictional lockup in suspension components.)
- Private wagon owners have been rebriefed on measures to mitigate excess frame twist (02/2009, Ely Dock).
- Maintenance requirements for privately owned wagons have been reviewed and updated (02/2009, Ely Dock).
- All owners of tank wagons have reviewed the design to evaluate measures that could be taken to protect external fittings such as valves. ORR are seeking further information from some wagons owners (02/2010, Stewarton).
- Following discussions with the freight train operators modifications have been made to the railway rule book to clarify the actions to be taken when carrying out running brake tests in snowy conditions (02/2011, Carstairs & 03/2011, Carrbridge).
- Network Rail, in consultation with train operators, has reviewed issues associated with the use of miniature snow ploughs (02/2011, Carstairs & 03/2011, Carrbridge).
- The Rail Freight Operators Group (RFOG) has issued an approved code of practice on the operation of freight services in winter conditions (02/2011, Carstairs & 03/2011, Carrbridge).

¹⁵ In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005.

- A proposal for alteration of the rules to mandate a blanket speed restriction on freight trains when operating in snowy conditions was made and approved by the standards committee for industry consultation. Following a further discussion with industry it was concluded that individual operators would need to determine their policy based on an understanding of their own rolling stock and the RFOG approved code of practice (02/2011, Carstairs & 03/2011, Carrbridge).
- A major freight operator has reviewed and updated its specification for checking for twist when examining its wagons (14/2010, Wigan).

There are a number of issues that remain of concern to the RAIB. These include:

- The RAIB is still concerned that a number of container wagons are still fitted with deficient spigots. As a consequence, and as was shown in report 12/2009, some containers are vulnerable to being blown off container wagons in certain types of high wind conditions. Although the RAIB is aware of operational measures that are in place to manage this risk, it continues to urge that a technical solution to the problem is implemented (report 12/2009, Cheddington & Hardendale).
- The impact of off-set loads on derailment risk; (report 16/2008, Duddleston Jcn and report 10/2009, Santon).
- The approval and certification of freight wagons; in particular the need to ensure that the process of approving new or refurbished vehicles includes the scrutiny of safety critical equipment designed and built to non-Railway Group Standards; (reports 39/2007, Washwood Heath and 12/2009, Cheddington & Hardendale).

The RAIB has been concerned about the safety of freight train crews when entering and leaving engineering work sites. A previous RAIB recommendation that Network Rail and freight operations should implement measures to ensure that all train crew entering engineering possessions are given a suitable safety briefing¹⁶ had not been effectively implemented prior to a tamper driver being struck by a train at Torworth (in January 2011). Full implementation of this recommendation would likely have averted the accident.

Defective switches and crossings (S&C)

S&C (otherwise known as points) are designed to enable the safe routing of trains from one line to another. Many critical defects will be detected by the signalling system so preventing the normal operation of trains over the S&C. However, certain defects will not be detected in this manner and will create the possibility of a train being misrouted or even derailed.

Investigations related to defective S&C ongoing at 31 December 2011

On 27 July 2011 an empty passenger train derailed on set of defective S&C at Princes Street Gardens (Edinburgh).

Recurrent factors related to defective S&C

By 31 December 2011 the RAIB had published a total of 13 reports into accidents involving defective S&C (six of which occurred on the national network, four on light rail systems, one on London Underground and two on heritage lines). One of these accidents resulted in one fatality (derailment at Grayrigg in February 2007).

¹⁶ Recommendation 7 of the report into a fatal accident involving a freight train driver at Deal in 2006 (report 14/2007).

5 Identification of important recurrent issues

Factors identified in investigations associated with defective S&C have included:

Table 11 - Defective S&C Factors

	No. of investigations in which the factors have been identified (some investigations feature more than one factor)			
	National network	LUL	Light Rail	Heritage
Poor switch rail condition (incorrect profile)	3	-	1	-
Undetected degradation of components	2	1	3*	1
Incorrectly installed/adjusted	3	-	-	1

* 2 involved the same set of S&C on the Croydon tramway

The railway industry's response to issues associated with the defective S&C at Grayrigg in February 2007

During 2011 the ORR continued to report progress with actions taken by Network Rail in response to the RAIB's recommendations following its investigation into the derailment of an express passenger train at Grayrigg, Cumbria, in February 2007. The most recent update report from the ORR was issued to the RAIB just prior to the inquest in November 2011 and was reported in summary in the RAIB's last annual report. The following gives further details of those recommendations relevant to the design and management of S&C (the linked recommendations in the Grayrigg investigation report are shown in square brackets):

- Network Rail is carrying out a review of the design of existing S&C with fixed (ie non-adjustable stretcher bars) [1]. As part of this review it is seeking to identify:
 - the forces that such S&C are subject to;
 - their performance in service; and
 - potential modifications.
- Linked to the above, Network Rail has developed a modified design of stretcher bar. This is to be extensively tested before being considered for adoption as a new standard component [1 & 3].
- Network Rail has introduced new processes for the collection of data on the performance of S&C (eg the recording of defects observed by maintainers and the actions taken) [2].
- Network Rail has analysed the risks at S&C in order to understand the criticality of the various precursors. It has put in place a structured means of incorporating that knowledge into its maintenance standards [4].
- Network Rail has reviewed and improved its maintenance and inspection standards for S&C [5 - 11]. This includes:
 - improved guidance to staff on the identification of defects;
 - clearer presentation, and ready access to, key data;
 - improved arrangements for recording defects and actions taken; and
 - enhanced arrangements to minimise the risk of inspections being missed.
- Network Rail has improved its processes for assessing the competence of those engaged in the inspection and maintenance of S&C [12].
- Network Rail has commissioned a detailed study of the human factors influencing the reliability of inspection and maintenance processes [13].

- Network Rail has undertaken a structured review of its management arrangements for monitoring performance in relation to the inspection and maintenance of S&C assets [14].
- Network Rail has adopted a new process to verify the integrity of its engineering processes. This includes improved audits which now extend to include the actual condition of assets (ie end product checks) [15].
- Network Rail has implemented new processes for assuring that timetables and track access rules allow sufficient time for staff to carry out essential safety checks [17].
- Network Rail has reviewed its organisational structure and introduced a new post to oversee engineering issues related to S&C [18].

There are four recommendations, made to Network Rail, concerning the fundamental design, management and maintenance of its S&C assemblies that have still to be closed by ORR, recommendations 1, 2, 3 and 10.

It has been agreed between ORR and Network Rail that full implementation of recommendation 1 will take place by July 2012. Recommendation 1 requires Network Rail to carry out a detailed review of its S&C non-adjustable stretcher bar assembly design so as to understand the relationships between the design, loading, usage and the inspection and maintenance regimes, and implement appropriate modifications to the design or the inspection or maintenance regimes. In the case of recommendations 2 and 3¹⁷ Network Rail has reported to ORR that it is nearing completion of a strategy to enhance its asset information intelligence and will use this to inform its ongoing development of revised design and risk based standards. ORR has still to conclude that the actions taken in response to parts of recommendation 10¹⁸ are sufficient.

The RAIB is pleased to note the progress that was reported to ORR and the inquest. In some key areas related to the design of S&C, (and the associated inspection and maintenance) Network Rail appears to be taking substantive actions, or has concrete plans to do so.

However, certain areas of concern remain. These are summarised below:

- The RAIB is concerned that Network Rail has, as yet, been unable to determine the loads that existing S&C stretcher bars are subjected to during service. However, the RAIB notes that development of a modified design of stretcher bar for existing S&C is to proceed on the basis of the work undertaken to date and that testing to validate its performance is planned [1c].
- The RAIB notes that the modified design of stretcher bar, and the associated installation, inspection and maintenance procedures have still to be finalised [1e, 1f and 1g].
- The ORR has yet to report that it is content with Network Rail's processes for monitoring the performance of existing S&C and identifying evidence of precursors to safety critical failures [2].
- The ORR has yet to report that it is content with Network Rail's processes for the allocation of patrol lengths and the RAIB is seeking further information [10i].

¹⁷ Recommendations 2 and 3 are concerned with the monitoring the performance of S&C, implementation of a revised design and the development of risk based standards.

¹⁸ Recommendation 10 is concerned with the management of basic visual inspections.

5

Identification of important recurrent issues

- ORR has informed the RAIB that it accepts that Network Rail is adopting best practice principles in its current S&C engineering safety management and is continuing to monitor the actions taken in response to the Grayrigg recommendations. The RAIB has noted that the ORR has committed to review the actions taken by Network Rail in response to recommendations 1-19 to confirm that they are aligned with engineering safety management principles [20].

Failure of structures

Six investigations undertaken by the RAIB have involved the failure of a structure and/or an examination of the process for the management of structures. In all but two of these cases the failure resulted in the derailment of a train.

Investigations related to structures published during 2011

Relevant investigations published by the RAIB in 2011 were:

13/2011; Oxshott (05/11/2010):	Lorry struck parapet of road bridge over the railway and fell onto passing train.
16/2011; Summit tunnel (28/12/2010):	Train derailed after striking ice that had fallen from a ventilation shaft.
17/2011; Dryclough Junction (05/02/2011):	Train derailed after striking debris from collapsed retaining wall.

Investigations related to structures ongoing at 31 December 2011

On 6 April 2011 a culvert near Bromsgrove was found to have partially failed causing the closure of the line for several days while emergency repairs were carried out.

On the 23 September 2011 a train driver observed that a metal structure inside Balcombe tunnel had failed. A subsequent inspection confirmed that there was a risk that the structure would collapse and the line was closed to enable emergency repairs.

Areas of RAIB recommendations related to the management of structures

Issues that are the subject of RAIB recommendations published during 2011 include:

- inspections of road over rail bridges to check the condition of visibility markings (13/2011, Oxshott);
- highlighting the risk of unprotected ends of parapets on such bridges (13/2011, Oxshott);
- guidance on identifying local safety hazards at road over rail bridges (13/2011, Oxshott);
- the management of water and ice in Summit Tunnel (16/2011, Summit tunnel);
- examination of the line when restarting train services following an extended cessation of traffic during and following extreme weather (16/2011, Summit tunnel);
- review of arrangements for managing the build-up of ice (16/2011, Summit tunnel);
- communication of information critical to the safety of structures (16/2011, Summit tunnel);
- the identification of structures that have over-due examinations and the definition of appropriate actions in such cases (17/2011, Dryclough Junction);

- review of the effectiveness of the existing structures examination regime (including consideration of why examiners do not always report persistent defects and the level of checking and supervision of examiners); and
- ensuring that information provided to Network Rail by third parties is captured and actioned (17/2011, Dryclough Junction).

The railway industry's response to issues associated with the management of structures, as reported during 2011

The actions taken by the railway industry bodies concerned and reported by ORR include:

- Network Rail has carried out a significant number of examinations of metal bridges having features that could conceal corrosion occurring on critical structural parts. This has included a check that critical dimensional assumptions are correct (02/2010, Stewarton).
- Network Rail has issued a technical specification specifying engineering requirements for exposure of hidden critical elements and the methods to be used when exposing them and reporting their condition (02/2010, Stewarton).
- Network Rail is reviewing its standards and procedures for the design and approval of modified bridges (02/2010, Stewarton).
- Network Rail is reviewing and upgrading its data management systems and processes as they apply to the management of structures. This includes arrangements for ensuring that examiners are provided with information related to previously identified defects (02/2010, Stewarton).
- Network Rail has reviewed its processes for managing urgent defects on bridges (02/2010, Stewarton).
- Network Rail's database has been enhanced in order to better identify 'catch wall' structures vulnerable to failure (07/2008, Kemble).
- Network Rail is identifying structures spanning water courses that require examination for obstructions and a process for managing this risk. Signs will be installed at those structures identified as being at risk (17/2010, Feltham).
- Network Rail has reviewed the information and resources required to undertake effective examinations of structures. It is implementing changes to its processes and carrying out audits to confirm the adequacy of examinations (17/2010, Feltham).
- Network Rail is reviewing its underwater examination task list to check for, and correct, omissions (17/2010, Feltham).
- The Environment Agency & Network Rail are finalising a memorandum of understanding which includes the sharing of information of mutual interest (17/2010, Feltham).

Fatigue

Fatigue has been identified as an issue in seven investigations. These include three freight train derailments and two collisions between engineering trains operating within engineering possessions.

5 Identification of important recurrent issues

Investigations related to fatigue published during 2011

15/2011; Shap (17/08/2010): Uncontrolled roll-back of freight train. The investigation concluded that this was probably due to a loss of alertness due to fatigue.

Areas of RAIB recommendations during 2011 that are related to fatigue

Issues that are the subject of RAIB recommendations published during 2011 include:

- the identification and improvements of shifts and shift patterns most likely to induce fatigue (15/2011, Shap);
- enhanced ORR guidance to industry on the management of fatigue (15/2011, Shap);
- the comparison of different mathematical models that are used to predict fatigue (15/2011, Shap); and
- improved quality of data related to fatigue as a causal factor in incidents and accidents (15/2011, Shap).

The railway industry's response to fatigue issues as reported during 2011

In response to the RAIB's investigation into the incident at Shap (15/2011), RSSB is carrying out work to improve the quality of data available within the industry concerning fatigue. It is developing a new module in the railway industry's Safety Management Information System (SMIS) which should allow RSSB to record the incidence of fatigue (and other casual factors) when it has been identified as a factor in an investigation. RSSB aims that this data will then be available to the railway industry when seeking to better understand and manage fatigue.

The ORR has updated its guidance aimed at companies and individuals who have responsibility for managing fatigue in railway staff, including those who have control of safety critical work under regulation 25 of the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)¹⁹. The new guidance stresses the need for railway duty holders to control the risk of fatigue by means of a comprehensive fatigue risk management system. It recommends a three stage process for fatigue management, with shifts planned in accordance with good practice before they are assessed for fatigue and risk; the process will then take into account the experiences of shift workers. The updated guidance also warns against the limitations of mathematical models.

While recognising that the updated guidance is a useful aid to those responsible for managing fatigue, the RAIB has a number of residual concerns. In particular:

- the absence of definitive guidance on the limitations of different mathematical tools that are used to predict fatigue; and
- Network Rail has still to fully implement the intent of its fatigue related recommendations following the accidents at Grayrigg (report 20/2008) and East Somerset Junction (report 28/2009). In particular, the RAIB remains concerned that there is a need for the railway industry to better understand the impact of long hours on the performance of staff carrying out safety critical duties. Such an understanding should then be used to inform the development and implementation of appropriate thresholds and limits for safety critical work.

¹⁹ This revised guidance was published in January 2012 and is available on the ORR website (www.rail-reg.gov.uk/upload/pdf/managing_rail_fatigue.pdf)

The RAIB has shared its concerns with Network Rail and ORR.

The ORR has noted the concerns expressed by the RAIB regarding long hours and has stressed its view that the pattern of working hours is also an important factor affecting the performance of staff carrying out safety critical duties. The ORR remains concerned about the way the industry is managing fatigue and recognises there is need for improvement in this area. The ORR has written to Network Rail asking it to review its approach and awaits news of the outcome.

6

Emerging themes

6. Emerging themes

Safety management in the heritage sector

By 31 December 2011 the RAIB had published reports into 12 accidents on heritage and minor railways that involved:

- the absence of an adequate safety management system (SMS); and/or
- the management arrangements described in the SMS were not translated into the day to day operation of the railway.

One such investigation concerned a derailment at Hampton Loade on the Severn Valley Railway. The RAIB investigation (report 07/2010) found that specific requirements of the SMS relating to the monitoring of track and the checking of rolling stock following maintenance had not been implemented.

Similar findings relating to non-compliance with documented engineering safety arrangements were also made following the derailment of a train at Gysgfa, on the Ffestiniog Railway, in May 2008 (report 18/2009).

An investigation into an accident at Lydney on the Dean Forest Railway (report 14/2008) identified the lack of an adequate documented SMS and the absence of competent advice on matters related to safety. Similar concerns were also raised following the investigation into a fatal accident involving a guard on the Gwilli Railway in July 2006 (report 22/2007, Bronwydd Arms).

A more recent investigation concerned an injury to a volunteer guard in October 2010 as he attempted to rejoin a moving train at Foxfield Colliery yard (bulletin B01/2011). The investigation found that the requirements of the railway's own SMS relating to issuing of the rule book and the competency of staff had not been met. This instance again highlighted the need for railways that are reliant on the services of volunteers to ensure that there are suitable arrangements in place to encourage safe behaviour and compliance with published rules.

An investigation into a collision between a train and a car at a user worked level crossing on the Wensleydale Railway (bulletin B05/2011) found that the operating company had a deficient SMS, and a weak process for the management of risk at level crossings, which had been the subject of enforcement action by the ORR.

Investigations have also demonstrated the need for heritage, and other minor railways, to ensure that they have sufficient knowledge of their assets, and an understanding of the risks, to deliver reliable and safe operations, inspection and maintenance. Examples include:

- blow back of fire on the North York Moors Railway (report 04/2007);
- three derailments on the Ravenglass and Eskdale railway (reports 07/2007 and 32/2007);
- collision on the Great Orme tramway in September 2009 (report 13/2010);
- runaway and collision on the Welshpool and Llanfair Railway in March 2010 (bulletin B06/2010); and
- derailment on the Bure Valley Railway in August 2011 (bulletin B04/2010).

In March 2012 the RAIB published a report into an incident on the Kirklees Light Railway during which a steam locomotive's boiler ran dangerously low on water. This investigation identified that the operating company had neither documented nor implemented a SMS. As a consequence the risk associated with the operation of steam locomotives had not been formally assessed. The investigation also found that the system in place for assessing the competence of steam locomotive drivers was inadequate.

The ORR has indicated to the RAIB that it recognises that there are issues with the establishment and operation of SMS in some heritage railways. The ORR is planning to make available an increased resource for the oversight of safety, and take enforcement action where serious shortcomings are exposed, on heritage and other minor railways. Since the impact of the above actions will take time to become apparent, the RAIB makes no recommendation at this stage. However, the RAIB and ORR have agreed to meet later in 2012 to review, in the light of ORR's actions, the extent to which the issues identified in this report are being addressed by the sector.

7 Budget

7. Budget

In common with all government departments it has been necessary for the RAIB to reduce its costs. The RAIB's budget for 2011 - 12 was £5.1 million, a reduction of 13% from the previous year. The Branch has also relocated its southern office to the site of the Air Accident Investigation Branch on the outskirts of Farnborough. The move will achieve another 0.8% of savings (relative to the 2009-10 budget).

Annex A - Glossary of abbreviations and acronyms

AHBC	Automatic Half Barrier Crossing
AOCL	Automatic open crossing, locally monitored
COSS	Controller of Site Safety
ERA	European Railway Agency
ERA SIS	European Railway Agency Safety Information System
LUL	London Underground Ltd
LX	Level Crossing
ORR	Office of Rail Regulation
RRV	Road Rail Vehicle
RSSB	Rail Safety & Standards Board
S&C	Switches & Crossings
SMS	Safety Management System
SPAD	Signal Passed At Danger
UWC	User Worked Crossing

Annexes

Annex B - Glossary of terms

All definitions marked with an asterisk, thus (*), have been taken from Ellis' British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com

Adhesion	Describing the friction produced between a rail and a rail wheel. Therefore, loss of adhesion is the absence of this friction and the inability to make any forward progress.*
All Level Crossing Risk Model (ALCRM)	A computer model on a central database used to compute the risk at level crossings, and to evaluate reasonably practicable improvements to reduce the risk.*
Automatic level crossing	Any Level Crossing where the warning to highway users is given automatically, triggered by the approach of a train.*
Automatic half barrier crossing	An Automatic level crossing fitted with Half Barriers, traffic lights on the highway and a telephone to the relevant signal box.*
Automatic open crossing (locally monitored)	A Level Crossing without barriers, that is equipped with a flashing white light which is observed by the train driver to confirm that the road lights are functioning before the train proceeds over the crossing.*
Automatic barriers (locally monitored)	A level crossing without barriers, that is equipped with a flashing white light which is observed by the train driver to confirm that the road lights are functioning before the train proceeds over the Crossing.*
Infrastructure Manager	Any person who is responsible for establishing and maintaining infrastructure or a part thereof, which may also include the management of infrastructure control and safety systems, but does not include a maintainer.*
Manually Controlled Barriers	A manned level crossing with full barriers operated locally from a signal box or level crossing box.*
Open crossing	A type of level crossing with no barriers gates, warning system (apart from a Whistle board) or monitoring.*
Points	An assembly of Switches and Crossings designed to divert trains from one line to another.*
Possession	A period of time during which one or more tracks are blocked to trains to permit work to be safely carried out on or near the line.*
Road Rail Vehicle	Any vehicle adapted to operate equally well on road and Rail.
Red Zone	An area that is on or near the line where trains are running normally.*
Rule Book	(Network Rail) Railway Group Standard (RGS) GE/RT8000, which is the publication detailing the general responsibilities of all staff engaged on the Railway system, and the specific duties of certain types of staff such as Train drivers and Signallers.*

Spigot	A device attached to the floor of a freight wagon to secure a container in case of derailment or high wind.
Stretcher Bar	A bar that links the two Switch Rails in a set of Switches (Set of Points) and maintains their correct relationship, eg one is open when the other is closed.*
Switch	An assembly of two movable Rails (the switch Rails) and two fixed rails (the Stock Rails) and other components used to divert vehicles from one Track to another.*
Switch Rail	The thinner movable machined Rail Section that registers with the Stock Rail and forms part of a Switch assembly.*
Switches & Crossings	See definition of Points above.
User worked crossing	A level crossing where the barriers or gates are operated by the user. There is generally no indication of the approach of trains, but a telephone will be provided to contact the Signaller.*

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