Category A SPAD and TPWS activity report, 2010/2011

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Executive summary

At a glance

There were 25 SPADs in March, bringing the total for 2010/11 to 299, which compares to 275 in 2009/10.

	Current SPAD Figures	Comparison with last year
SPAD risk[1]	March 2011 – 71% March 2010 – 84%	■ 13% worse: Representing an 18% change over the year
All SPADs	March 2011 - 25 Q4-2010/11 - 63 12 months to date - 299	■ 92% worse ■ 11% better ■ 9% worse
16+ SPADs	March 2011 - 6 Q4-2010/11- 16 12 months to date - 87	■ 20% worse ■ 27% better ■ 7% worse
20+ SPADs	March 2011 - 1 Q4-2010/11 - 2 12 months to date - 17	■ The same ■ 50% better ■ 10% better

Other Headlines

- **Multi-SPAD signals**

  Of the 150 multi-SPADs signals listed at 26 March 2010, 86 (57%) are fitted with TPWS.

- **TPWS**

  Of the 63 SPADs in Q4-2010/11, 33 (52%) involved a Train Protection and Warning System (TPWS) brake demand, comprising 15 interventions, 16 activations and two where the TPWS involvement is currently unknown.

  There was one TPWS 'reset and continue' event during Q4-2010/11. This occurred on 14 March, and is detailed in Section 3.5.2. This was the third such incident during 2010/11, the previous ones having occurred on 30 September and 12 December.

- **Incidents on ERTMS lines**

  There have now been six incidents of trains exceeding their movement authority on the newly-commissioned ERTMS section of the Cambrian coast line. One of these occurred in December 2010 with four following during Q4-2010/11. There was a sixth on 30 April, though this is outside the scope of this report. These are subject to investigation and are currently being treated as a Category A SPADs.

1 Introduction

1.1 Report scope

The information herein covers the period 1 April to 31 March 2011.

1.2 SPAD risk

SPADs are ranked and analysed in terms of the potential risk they represent. Details of the methodology are presented in Appendix 2.

The measure of SPAD risk is calculated using the SPAD risk ranking tool (SRRT). This process fulfils the purpose of providing a consistent and objective measure of assessing changing trends in SPAD risk on a system-wide basis.

The SRRT provides each SPAD with a score between zero (no risk) and 28 (a very high risk). To assist with reporting, the SPAD risk ranking scores are grouped into three bands as follows:

- Risk rankings of 0 to 15 are classified as **not significant risk.**
- Risk rankings of 16 to 19 are classified as **potentially significant.**
- Risk rankings of 20 and above are classified as **potentially severe.**

For the purposes of most of the tables and graphs in this report, the significant and severe groups are reported together as 16+.

1.3 Data quality

RSSB is currently working on a data quality initiative, involving each individual RSSB member company and using a set of data quality indicators developed within RSSB. These will help the industry to recognise the degree to which data in the Safety Management Information System (SMIS) accurately reflects reality.

All RSSB safety performance reports derive from analysis of data extracted from SMIS. It is therefore vital that SMIS is wholly and accurately representative of safety issues in and around the railway infrastructure. The data quality initiative is aimed at ensuring this accuracy.

The Railway Group Standard GE/RT8047 (*Reporting of safety related information*)[1] mandates the requirements for reporting safety related information by means of SMIS, so that reliable safety data is collected, analysed and made available by RSSB for use by RSSB members in their management of risk.

The requirements of the Standard are additional to the statutory RIDDOR reporting requirements.

[1] See www.rgsonline.co.uk.

Guidance on the reporting of safety related information is provided in the RSSB document *Guidance on the definitions and analysis of safety related information*, which may be found at www.rssb.co.uk/publications/guidance.asp.

In addition to the data quality initiative, the Operations Focus Group (OFG) has requested that all Formal and Local Investigation reports pertaining to SPAD incidents be submitted to RSSB. This will serve to improve the quality of the data collected, and therefore the outputs to the industry (in reports such as this, for example).

1.4 Operational safety

OFG provides the industry with the opportunity to review and discuss mainline railway operational safety risk at one forum, meeting bi-monthly.

OFG's remit is to:

Facilitate progressive improvement of operational safety through the understanding and development and promotion of justifiable and effective campaigns, programmes and tools.

To achieve this, OFG will:

- Monitor industry performance in relation to operational safety and recommend changes to priorities and strategies.
- Review the work of the OPSRAM groups.
- Identify and initiate activities to improve duty holder management of operational safety risk, including identifying and sharing good practice across the industry.
- Scope the need for research and development including acting as the client group.
- Develop the Strategic Safety Plan's trajectories and objectives to address operational safety risk.

The specific subject areas on which OFG is focussing are:

- Platform train / station interface
- Track safety
- Station safety
- On-train safety
- Train accidents and train accident precursors[2]

Category A SPAD and TPWS performance analysis is a standing agenda item at all OFG meetings.

OFG's website may be found at www.opsweb.co.uk.

[2] Train accident precursors include category A SPADs

2 Industry developments

TPWS – industry strategy

TPWS was implemented in the UK as an interim measure to reduce the consequences of Signals Passed at Danger (SPADs), pending implementation of full protection through systems that monitor driver performance continuously. In the Uff-Cullen report, it was envisaged that this higher level of protection would be delivered by the roll-out of the European Rail Traffic Management System (ERTMS[3]) within ten years.[4] In the intervening period it has become clear that the roll-out of ERTMS will take considerably longer, hence TPWS will be the primary means of mitigating SPAD risk for a period significantly beyond that originally envisaged.

At the operational risk conference in July 2008, the ORR gave a presentation on *Managing and Reducing Operational Safety Risk*, which highlighted a concern regarding the lack of a clear strategy for the long-term future of TPWS.

In response, the RSSB Board considered the issues at its December 2008 meeting and directed the Vehicle/Train Control & Communications System Interface Committee (V/TC&C SIC) to develop a long-term strategy for TPWS. In turn, the V/TC&C SIC created a TPWS Strategy subgroup to aid with development, which is being achieved via close co-operation from Network Rail, the train operators, RSSB, the ROSCOs and the Rail Industry Association. It has been reviewed at senior industry level at each stage.

The strategy was approved by the RSSB Board at its meeting on 12 November 2009, and may be found at http://www.rssb.co.uk/safety/safety_strategies/TPWS%20Strategy.asp There is also a TPWS strategy action plan at www.Opsweb.co.uk

If you require information on the strategy, please contact: Colin Dennis, Head of Safety Knowledge & Planning at colin.dennis@rssb.co.uk.

[3] For more information on ERTMS, see www.ertms.com
[4] Prof. John Uff QC FREng and the Rt Hon Lord Cullen PC, *The Southall and Ladbroke Grove Joint Inquiry into Train Protection Systems* (HSE Books, 2001).

3 SPAD performance

3.1 SPAD numbers

3.1.1 Key Facts: March 2011

The key facts are listed below. Greater detail is provided in the following chapters.

March 2011:	25 category A SPADs during March, which is 12 more than March 2010 (92% worse). March 2011 was also 9% worse than the three-year average of 23.
Risk ranking:	Six SPADs were risk ranked 16 or above (one of which was risk ranked 20+). This compares to five in 2010 (one of which was risk ranked 20+).
TPWS:	Four TPWS interventions (TPWS applied the brakes before, or in the absence of, driver action). Eight TPWS activations (the driver initiated braking before the system). One where the TPWS involvement is currently unknown. There was one 'reset and continue' event.
Multi-SPADs:	Four SPADs by multi-SPAD drivers (two or more since qualifying as a driver), One of which registers within the current five-year period. Four SPADs at multi-SPAD signals (two or more within the current five-year period).

3.1.2 Key Facts: Quarter 4-2010/11 – 1 January to 31 March 2011

The key facts are listed below. Greater detail is provided in the following chapters.

Quarter 4:	63 category A SPADs during Q4-2010/11, which is eight fewer than Q4-2009/10 (11% better). Q4-2010/11 was also 13.3% better than the three-year average of 72.7.
Risk ranking:	16 SPADs were risk ranked 16 or above (Two of which were risk ranked 20+). This compares to 22 in Q4-2009/10 (of which four were risk ranked 20+).
TPWS:	15 TPWS interventions (TPWS applied the brakes before, or in the absence of, driver action). 16 TPWS activations (the driver initiated braking before the system). Two where the TPWS involvement is currently unknown. There was one 'reset and continue' event.
Multi-SPADs:	14 SPADs by multi-SPAD drivers (two or more since qualifying as a driver), eight of which register within the current five-year period. 14 SPADs at multi-SPAD signals (two or more within the current five-year period).

3.1.3 Key Facts: 2010/11 – 1 April 2010 to 31 March 2011

The key facts are listed below. Greater detail is provided in the following chapters.

2010/11:	299 category A SPADs during 2010/11, which is 24 more than 2009/10 (8.7% worse). 2010/11 was 2.1% better than the three-year average of 305.
Risk ranking:	87 SPADs were risk ranked 16 or above (17 of which were risk ranked 20+). This compares to 81 in 2009/10 (of which 19 were risk ranked 20+).
TPWS:	58 TPWS interventions (TPWS applied the brakes before, or in the absence of, driver action). 88 TPWS activations (the driver initiated braking before the system). Three where the TPWS involvement is currently unknown. There were three 'reset and continue' events.
Multi-SPADs:	72 SPADs by multi-SPAD drivers (two or more since qualifying as a driver), 36 of which register within the current five-year period. 71 SPADs at multi-SPAD signals (two or more within the current five-year period).

3.1.4 SPAD numbers

Table 1 presents the monthly, quarterly and annual totals for all category A SPADs. The coloured panels show the quarterly totals.

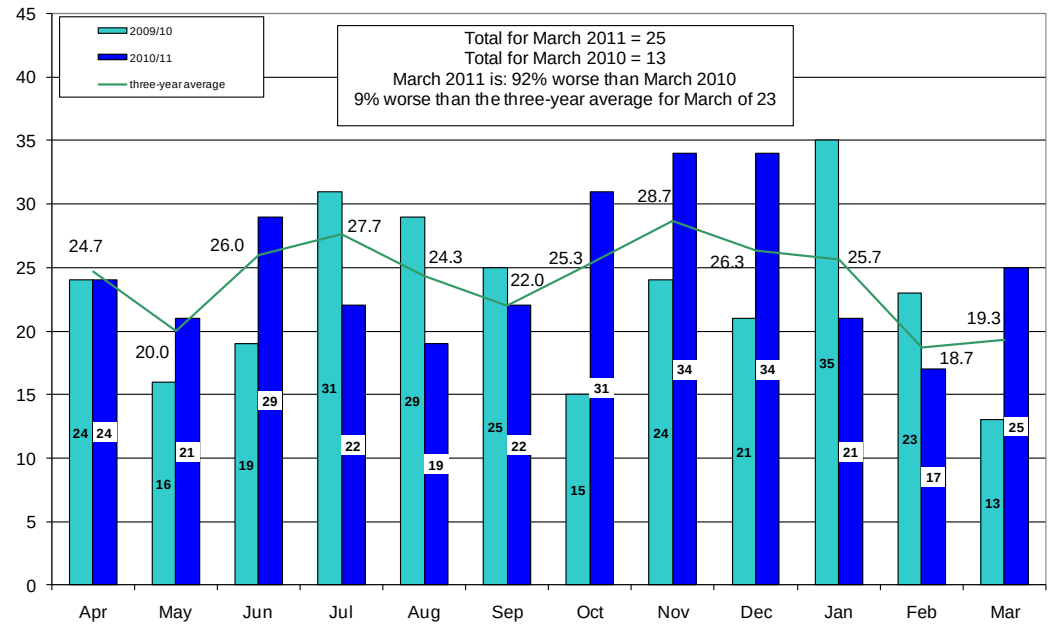
Table 1 All SPADs – monthly, quarterly and annual totals

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year Total
2003/04	21	32	29	37	33	28	44	46	36	23	19	26	82	98	126	68	374
2004/05	38	31	25	43	32	36	38	27	19	26	22	34	94	111	84	82	371
2005/06	19	16	40	26	27	31	41	31	24	21	24	28	75	84	96	73	328
2006/07	24	22	29	42	24	28	41	35	30	27	13	19	75	94	106	59	334
2007/08	20	30	28	31	23	28	40	36	23	21	33	36	78	82	99	90	349
2008/09	26	23	30	30	25	19	30	28	24	21	16	20	79	74	82	57	292
2009/10	24	16	19	31	29	25	15	24	21	35	23	13	59	85	60	71	275
2010/11	24	21	29	22	19	22	31	34	34	21	17	25	74	63	99	63	299
Difference from previous year	**0**	**5**	**10**	**-9**	**-10**	**-3**	**16**	**10**	**13**	**-14**	**-6**	**12**	**15**	**-22**	**39**	**-8**	**24**
Percentage change from previous year	**0.0%**	**31.3%**	**52.6%**	**-29.0%**	**-34.5%**	**-12.0%**	**106.7%**	**41.7%**	**61.9%**	**-40.0%**	**-26.1%**	**92.3%**	**25.4%**	**-25.9%**	**65.0%**	**-11.3%**	**8.7%**
Three-year average (2007/08-2009/10)	***23.3***	***23.0***	***25.7***	***30.7***	***25.7***	***24.0***	***28.3***	***29.3***	***22.7***	***25.7***	***24.0***	***23.0***	***72.0***	***80.3***	***80.3***	***72.7***	***305.3***
Percentage change against three-year avge	**2.9%**	**-8.7%**	**13.0%**	**-28.3%**	**-26.0%**	**-8.3%**	**9.4%**	**15.9%**	**50.0%**	**-18.2%**	**-29.2%**	**8.7%**	**2.8%**	**-21.6%**	**23.2%**	**-13.3%**	**-2.1%**

During Q4-2010/11, there were 63 SPADs, which compares with 71 during the same period in 2009/10. This represents a decrease of 11.3%, as well as a decrease of 13.3% against the three-year average of 72.7. This brings the total number of Category A SPADs during the 12 months to the end of March to 299.

Chart 1 compares monthly SPAD numbers in 2010/11 with those during 2009/10, along with the three-year average.

Chart 1 All SPADs – monthly variation



3.2 SPADs risk ranked 16+ and 20+

3.2.1 SPADs risk ranked 16+

Table 2 presents the monthly, quarterly and annual totals for category A SPADs risk-ranked 16+. The coloured panels show the quarterly totals.

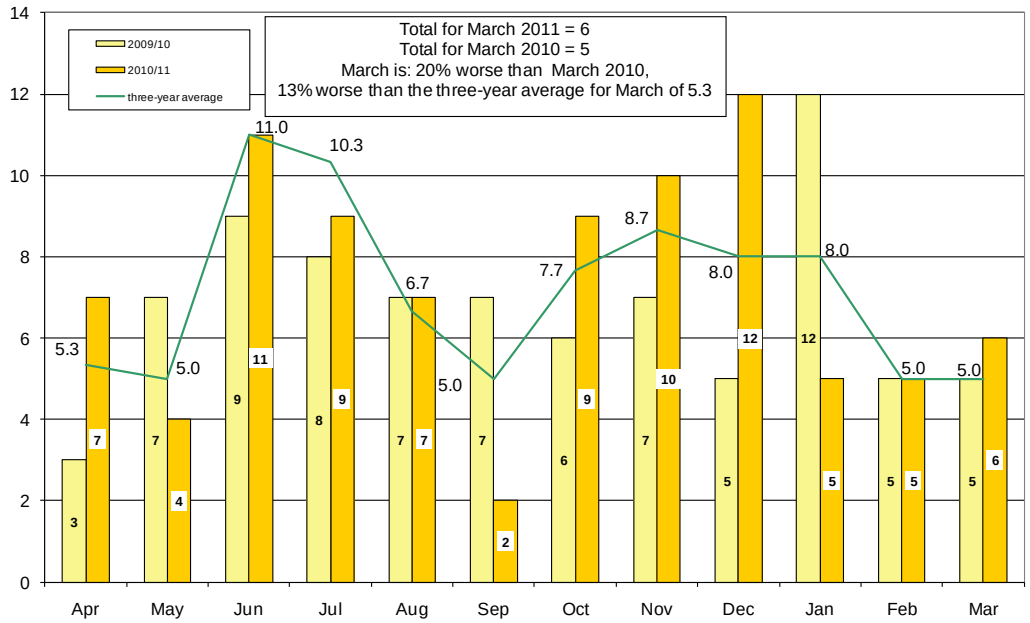
Table 2 16+ SPADs – monthly, quarterly and annual totals

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year Total
2003/04	6	12	13	22	13	12	19	25	17	6	5	9	31	47	61	20	159
2004/05	12	8	9	16	16	13	22	12	6	7	7	11	29	45	40	25	139
2005/06	7	7	17	7	10	9	14	15	8	5	8	13	31	26	37	26	120
2006/07	8	8	7	11	6	7	17	13	12	9	3	5	23	24	42	17	106
2007/08	5	8	9	6	10	6	14	9	4	7	8	7	22	22	27	22	93
2008/09	6	4	13	14	6	6	8	9	7	7	5	4	23	26	24	16	89
2009/10	3	7	9	8	7	7	6	7	5	12	5	5	19	22	18	22	81
2010/11	7	4	11	9	7	2	9	10	12	5	5	6	22	18	31	16	87
Difference from previous year	4	-3	2	1	0	-5	3	3	7	-7	0	1	3	-4	13	-6	6
Percentage change from previous year	133.3%	-42.9%	22.2%	12.5%	0.0%	-71.4%	50.0%	42.9%	140.0%	-58.3%	0.0%	20.0%	15.8%	-18.2%	72.2%	-27.3%	7.4%
Three-year average (2007/08-2009/10)	*4.7*	*6.3*	*10.3*	*9.3*	*7.7*	*6.3*	*9.3*	*8.3*	*5.3*	*8.7*	*6.0*	*5.3*	*21.3*	*23.3*	*23.0*	*20.0*	*87.7*
Percentage change against three-year avge	50.0%	-36.8%	6.5%	-3.6%	-8.7%	-68.4%	-3.6%	20.0%	125.0%	-42.3%	-16.7%	12.5%	3.1%	-22.9%	34.8%	-20.0%	-0.8%

There were 16 SPADs with a risk ranking score of 16 or more during Q4-2010/11, bringing the total for the 12 months to the end of March to 87. This compares to 22 in Q4-2009/10 and a three-year average of 20.0. It represents a decrease of 27.3% when compared to the same time last year.

Chart 2 compares monthly 16+ SPAD numbers in 2010/11 with those during 2009/10.

Chart 2 SPADs risk ranked 16+ – monthly variation



3.2.2 SPADs risk ranked 20+

Table 3 presents the monthly, quarterly and annual totals for category A SPADs with a risk ranking of 20 or more. The coloured panels show the quarterly totals.

Table 3 SPADs risk ranked 20+ – monthly, quarterly and annual totals

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year Total
2003/04	1	1	4	8	4	6	3	9	3	1	1	2	6	18	15	4	43
2004/05	4	1	1	5	3	1	6	4	0	3	3	3	6	9	10	9	34
2005/06	1	0	2	1	1	0	2	4	2	1	3	2	3	2	8	6	19
2006/07	0	2	0	1	2	0	3	3	2	3	0	2	2	3	8	5	18
2007/08	1	2	3	3	1	2	1	3	0	3	1	1	6	6	4	5	21
2008/09	1	0	2	6	2	0	2	2	0	2	0	0	3	8	4	2	17
2009/10	1	2	1	1	0	3	1	3	3	2	1	1	4	4	7	4	19
2010/11	1	1	1	1	0	1	2	3	5	1	0	1	3	2	10	2	17
Difference from previous year	**0**	**-1**	**0**	**0**	**0**	**-2**	**1**	**0**	**2**	**-1**	**-1**	**0**	**-1**	**-2**	**3**	**-2**	**-2**
Three-year average (2007/08-2009/10)	***1.0***	***1.3***	***2.0***	***3.3***	***1.0***	***1.7***	***1.3***	***2.7***	***1.0***	***2.3***	***0.7***	***0.7***	***4.3***	***6.0***	***5.0***	***3.7***	***18.7***

There were two SPADs with a risk ranking score of 20 or more during Q4-2010/11, which compares to four in Q4-2009/10. Details of these two incidents may be found in Appendix 10. This brings the total for the 12 months to the end of March to 17.

SPADs risk ranked 20+ are taken forward to OFG and OpsRAM meetings and are also reported to the RSSB Board.

3.2.3 SPAD trends

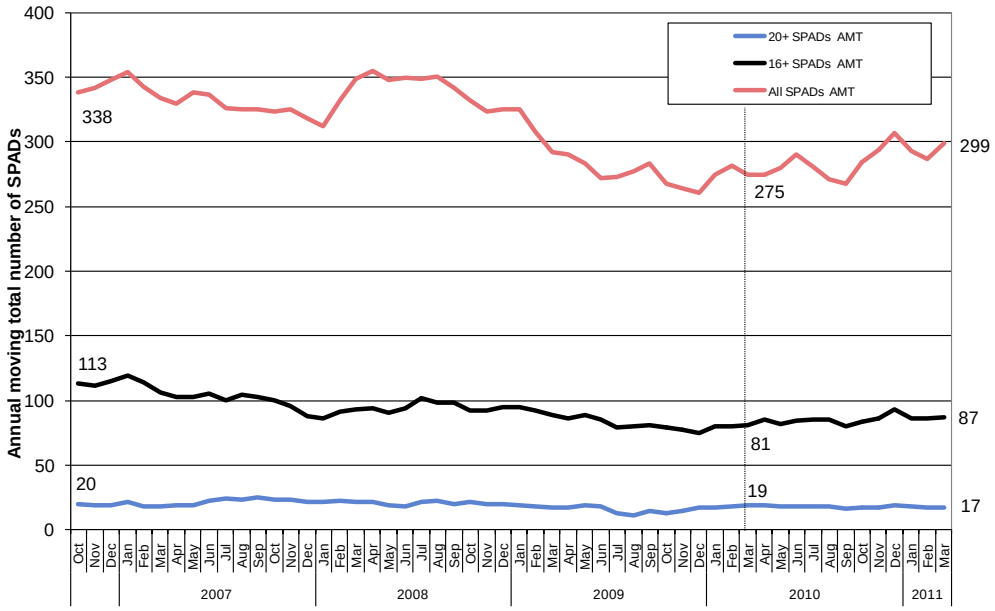
Table 4 shows a summary of the change in SPAD numbers over the 12-month periods ending March 2010 and March 2011. This indicates that overall SPAD numbers have increased by 8.7%, 16+ SPADs have increased by 7.4%, and 20+ SPADs have decreased by 10.5% during the past twelve months. None of these changes are statistically significant at the 90% confidence level.[5]

Table 4 Year-on-year changes in SPAD count – All, 16+, 20+

	12 months ending		Difference	Percentage change	Statistically Significant Change?
	March 2010	March 2011			
All SPADs	275	299	**24**	**8.7%**	No
16+ SPADs	81	87	**6**	**7.4%**	No
20+SPADs	19	17	**-2**	**-10.5%**	No

Chart 3 shows the annual moving total numbers of SPADs, and that for those risk ranked 16+ and 20+.

Chart 3 All SPADs – Annual moving totals



It may be seen from Chart 3 that the annual moving total (AMT) for 'all SPADs' had been decreasing between early 2008 and the end of 2009. As at the end of 2009, it had fallen to 261, which is its lowest recorded figure.[6] However, this measure has shown an increase

[5] Statistical significance testing can help to indicate whether a genuine change has occurred or whether the data could be the result of chance fluctuations. Throughout this report, the term *statistically significant* refers to a change that is significant at the 90% confidence level; that is, we can be reasonably confident that there has been a real improvement or deterioration.

[6] Since the systematic collection of SPAD data started in 1985.

since the end of 2009. At the end of Q4-2010/11, it was 299. The AMT for '16+ SPADs' has also shown an increase, though less pronounced, being 87 as at the end of March.

3.3 SPAD risk

SPAD risk is calculated system-wide using a consistent and objective measure applied by the SPAD risk ranking tool (SRRT). The risk ranking score assigned to each SPAD is then used to track changes in SPAD risk over time.

The method of assessing trends in SPAD risk is designed to assess whether the changes are representative of any underlying change in risk rather than just volatility in the data. Thus the metric is less vulnerable to one high-risk SPAD.

The selection of September 2006 as the benchmark date ensures that factors such as the instigation of TPWS and the removal of Mk 1 rolling stock, both of which had a positive effect on the level of SPAD risk, are not reflected in the changes in risk level, as they were completed prior to that date.

Discounting these two factors from the calculations portrays a more current indication of trends in risk. It is based on the SPAD risk ranking tool (hence it reflects changes in both frequency and potential consequence) and provides a robust method for identifying changes in the underlying risk.

Chart 4 Change in SPAD risk Since Sept 2006.

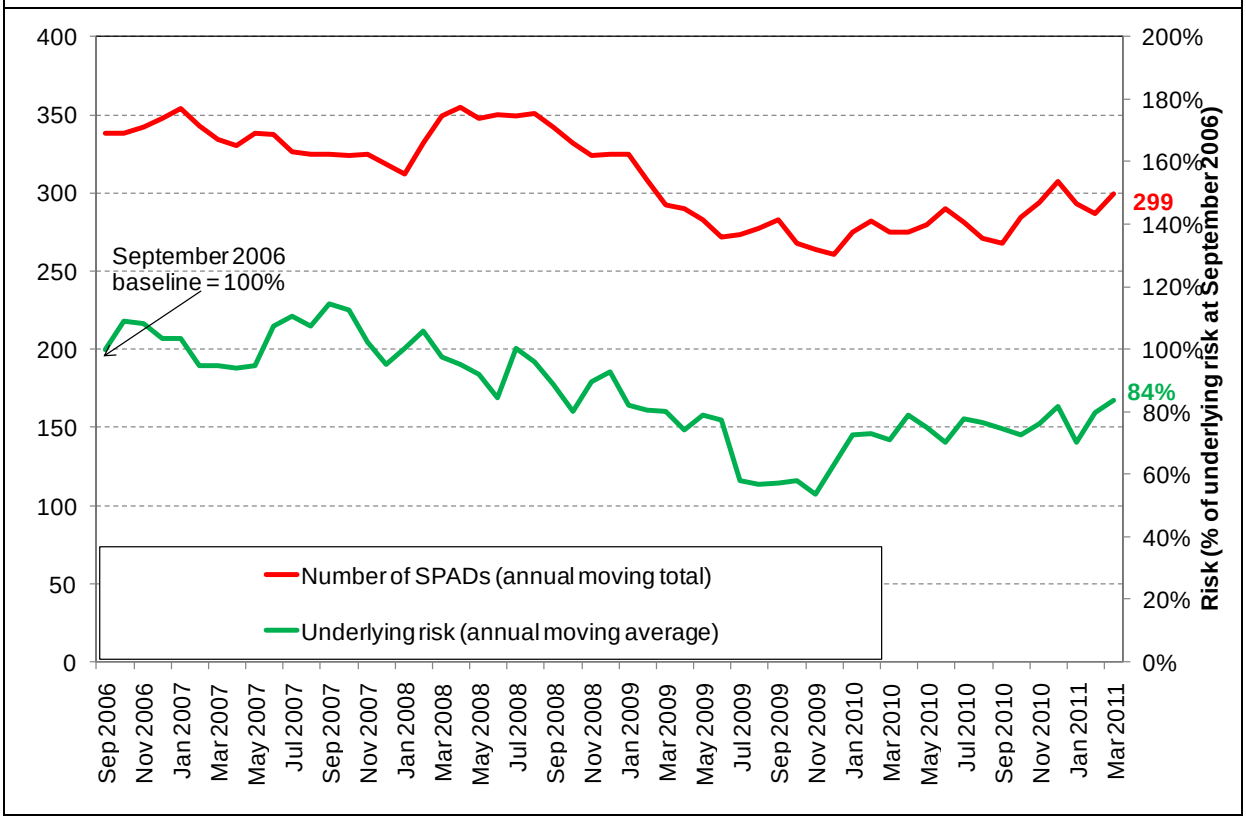


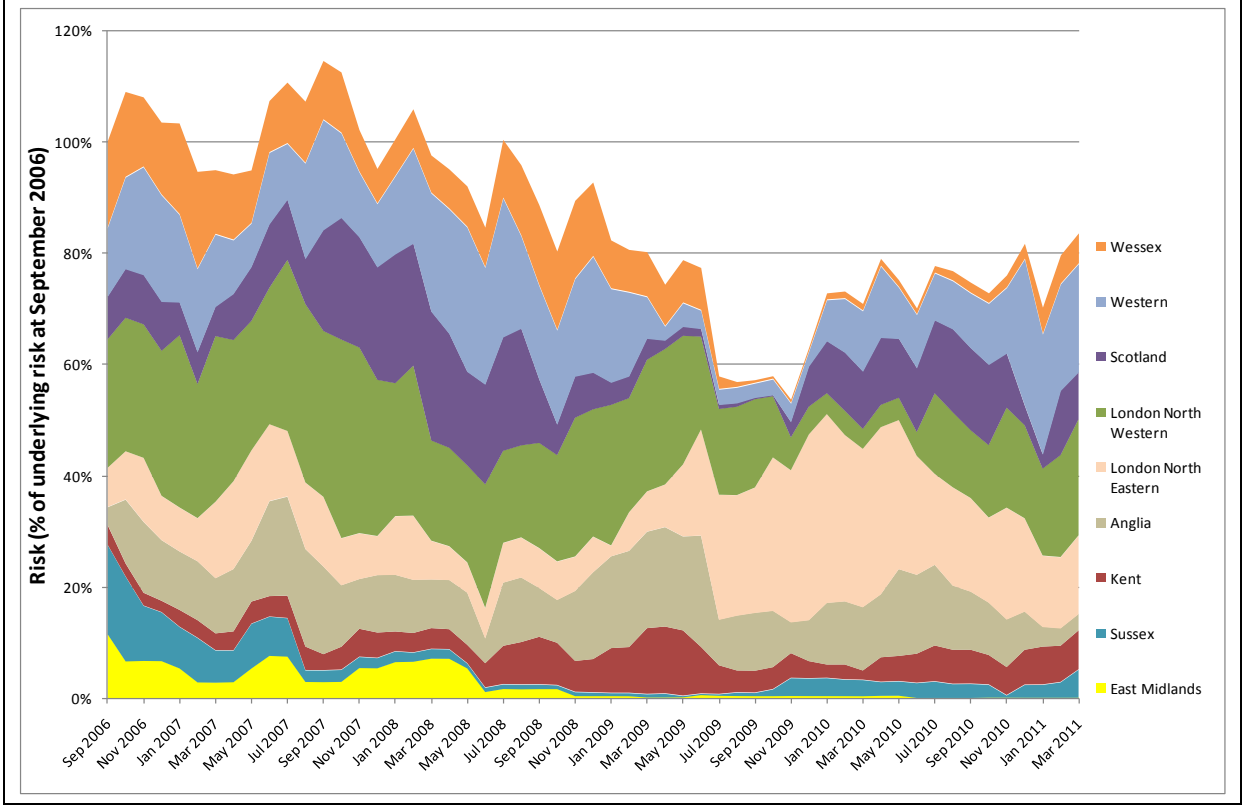
Chart 4 shows the annual moving total number of SPADs (red line), along with SPAD risk (green line). This is modelled using the individual components of SPAD risk ranking scores over a rolling 12-month period. It indicates that the risk from SPADs, which had fallen to 54% of the benchmark level, has since risen.

During the twelve months to March 2011, the SPAD risk metric has shown an increase. As at the end of March, it was 84% of the benchmark level, which compares with 71% a year ago. This 13% increase represents an 18% in SPAD risk over the twelve month period.

Whereas Chart 4 shows the overall risk from SPADs, Chart 5 shows the breakdown of the overall risk into the individual routes' shares of that SPAD risk. Each route is indicated by a different colour. This shows that each route's proportion of the overall SPAD risk can vary considerably from month to month, with a few noticable increases and decreases being apparent. It should be noted that, by virtue of the smaller numbers of SPADs, the component parts of this chart are more sensitive to the effects of one SPAD with a high risk-ranking, than the overall SPAD chart (Chart 4) is.

In particular, East Midlands Route's SPAD risk decreased towards the end of 2008, and has since remained low; LNE showed an increase in mid-2009, followed by a decrease and five routes (Wessex, Western, Scotland, LNW and Sussex) showed a decrease towards the autumn of 2009, but have since increased.

Chart 5 SPAD risk – Individual route share.



3.4 Other SPAD issues

3.4.1 Brake performance in wintry conditions

Severe winter weather was a major issue during 2009/10. There were six category A SPADs where the effect of snow and ice on the trains' braking performance was a significant factor. In addition, an uncontrolled backwards movement of a freight train was attributed to a build-up of ice. Details of these incidents were given in the Q3-2010/11 SPAD/TPWS report.

In October 2010, the Rail Freight Operators' Group (RFOG) issued an approved code of practice, which offers guidance on testing brakes in snowy conditions and suggests various ways of minimising the risks associated with winter weather operations.

The subject of train braking performance during winter conditions was discussed by OFG at the January 2011 meeting and at the February Train Operations and Management Standards Committee (TOM-SC) meeting. An ATOC proposal was tabled advocating that a stock-specific approach is necessary in respect of some types of modern rolling stock. This issue is to be taken forward as work continues to produce a guidance note regarding this subject.

3.4.2 European Rail Traffic Management System (ERTMS)

The first section of the Cambrian Coast line ERTMS was commissioned in October 2010, with a further section in February 2011. Between 3 December 2010 and the end of March 2011 there were five instances of trains passing block markers whilst running under the recently commissioned ERTMS signalling on the Cambrian Coast line. Although outside the period of this report, there was a further incident on 30 April.

3.4.3 Railway Group Standard GO/RT3119 – Version 2

Version 2 of GO/RT3119 (*Accident and Incident Investigation,* dated September 2010) came into effect on 4 December 2010.

The principal changes to this standard are in the descriptions of how SPADs are categorised. The reporting of a SPAD and subsequent procedures undertaken by signallers and drivers remains unchanged. At present, a reported SPAD is initially categorised by the Infrastructure Manager (Network Rail only). The changes to this document do not alter this initial procedure, however the decision now results in a 'provisional' SPAD category (P). This provisional category of SPAD remains until the conclusion of the investigation by the lead organisation.

Chart 6 shows (based on SMIS data) the breakdown of category A SPADs for Q4-1010/11, indicating whether the categorisation is provisional or confirmed. It would be expected that there would be a greater proportion of 'provisional' SPADs in respect of recent events, with this proportion decreasing over time. This is not apparent from the chart.

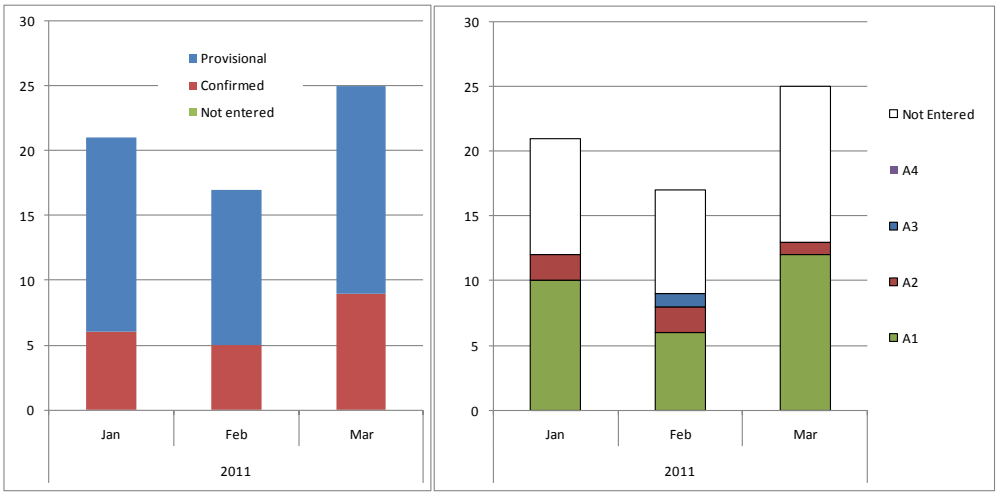
GO/RT3119 sub-divides Category A SPADs into four different types: A1, A2, A3 and A4. These differing sub-categories cover the scenarios of a 'classic' category A SPAD, as well as those of a signal being imperfectly displayed/part obscured; an incorrect authority being

given and the scenario of a train experiencing compromised braking performance. The full descriptions are given in Appendix 2.

Chart 6 shows the distribution of the different SPAD classifications, in respect of Q4-2010/11, based on SMIS data. It may be seen from the right-hand bar chart that more than half of the SPADs in this period do not have a SPAD sub-category entered in SMIS. With such a large proportion of this categorisation data being unavailable for analysis, it is not possible to draw any meaningful conclusions from the data. RSSB will support the duty holders in this area, with a view to improving this situation.

Of the 31 (from a total of 63 SPADs) which do have this field completed in SMIS, 25 (81%) are 'A-1', 5 (16%) are 'A-2' and 1 (3%) 'A-3'. There were no SPADs listed as 'A-4' during this period.

Chart 6 SPADs by sub-category Q4-2010/11



Source: SMIS

The categorisation of SPADs as per the requirements of this standard will be reflected in all future editions of this report. The accuracy of these charts is dependant upon comprehensive and accurate SMIS data entry.

Version 2 also contains extensive support wording on the categories contained within the associated Guidance Note GO/GN3519 (*Guidance on Accident & Incident Investigation*).

GO/RT 3119 has been changed in order to establish and clarify the requirements for lead organisations involved with SPAD-specific incidents to confirm (and possibly, change if required) the provisional category allocated by Network Rail. The changes will enable the SPAD categories to more accurately describe the circumstances of the incident that occurred.

3.5 TPWS brake demands at category A SPADs

3.5.1 Brake demand numbers

Chart 7 shows the number of SPADs by month, and the number of these which involved a TPWS brake demand. The green line illustrates the percentage of these SPADs with TPWS

activity; the red line illustrates the annual trend. The trend line has been falling slightly, since reaching a peak in April 2009.

This is discussed in more detail in Section 7.

Chart 7 TPWS activity at category A SPADs

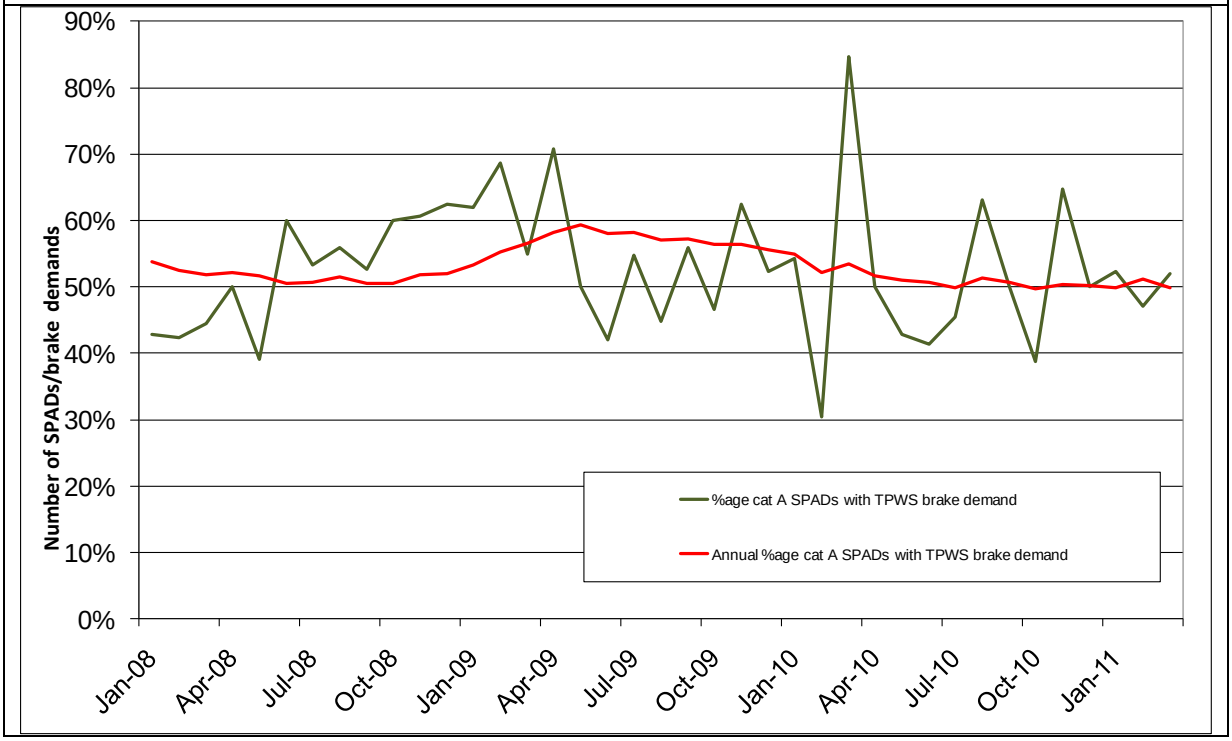


Chart 8 TPWS interventions in relation to all TPWS at category A SPADs

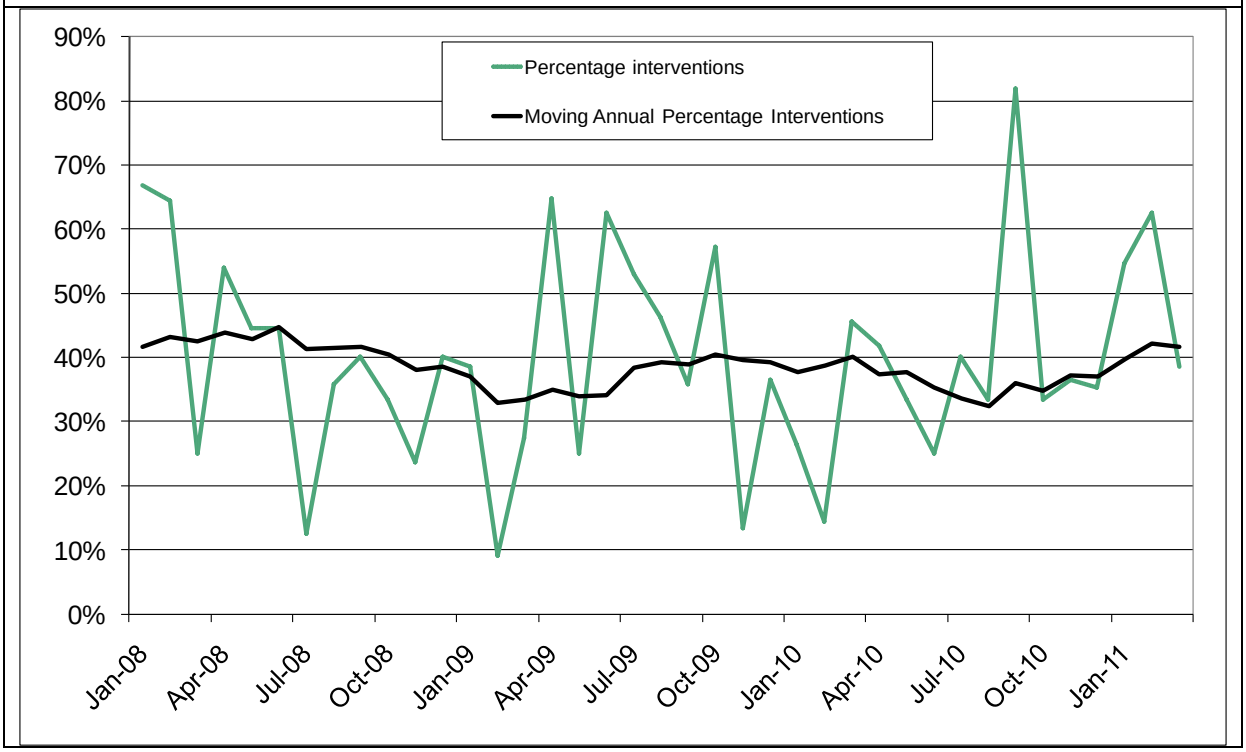
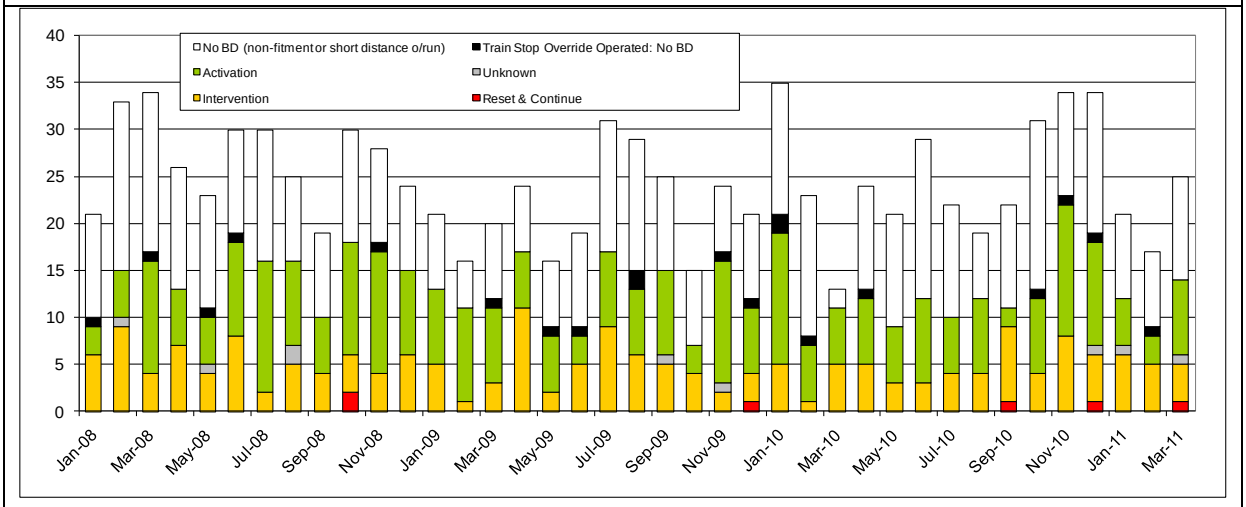


Chart 8 shows TPWS interventions, expressed as a percentage of all TPWS brake demands at Category A SPADs. The black and green lines represent the percentage of all SPADs with TPWS involvement which are interventions (green line) and the moving annual percentage (black line). From this, it may be seen that the monthly percentage does vary considerably month on month. The trend line, however, remains consistently between approximately 35%-40%.

Chart 9 shows the breakdown of TPWS involvement at category A SPADs by month.

Chart 9 TPWS brake demands at category A SPADs



3.5.2 TPWS Reset & Continue

There was one TPWS 'reset & continue' incident during Q4-2010/11.

- On 13 March, a passenger train passed T184 signal at Stoats Nest Junction (Sussex Route) by a short distance whilst the signal was showing a blank aspect. (The signal was blank owing to it undergoing tests following a report of an irregular aspect sequence.) The train was stopped by a TPWS intervention, but the driver then reset the TPWS and continued forward without authority, subsequently stopping the train approximately 400 yards beyond the signal in response to a CSR call from the signaller. This SPAD has a risk ranking of 20.

This was the third such incident during 2010/11. The previous two were at Kent House (Kent Route) on 30 September and at Sudbury Junction (LNW Route) on 17 December.

The 'reset & continue' incident at St. Margaret's station (Wessex Route) on 17 February, which was mentioned in the Q3-2010/11 SPAD/TPWS report, has since been recategorised as an Operating Irregularity, because the driving cab started from ahead of the signal.

4 SPAD performance by route

4.1 SPAD numbers by route

Charts 10 and 11 illustrate the annual monthly moving average (AMMA) number of SPADs, for each individual route over the past three years. The Wessex, Sussex, Kent and Anglia Routes are shown on Chart 9, whereas Western, Midland & Continental, Scotland, LNE and LNW are shown separately on Chart 10 for clarity.

From Chart 10, it may be seen that Anglia Route saw a decrease in SPAD numbers between September 2009 and September 2010. Since then, however, numbers have increased. SPADs on the Kent and Wessex Routes have shown an increase since the beginning of 2010, whereas Sussex has remained generally level.

Chart 11 shows that Scotland, LNE[7] and Western Routes have shown an upwards turn in SPAD numbers. LNW Route's SPADs have shown a decrease, whereas Midland & Continental's have remained generally level.

Anglia, LNE, LNW and Western Routes have forums which look specifically at the issue of SPAD numbers.

[7] Any category A SPADs which took place on London North Eastern route prior to the inception of the Midland and Continental Route, and which occurred within the current boundaries of the latter, have been re-attributed to Midland and Continental Route

Chart 10 SPADs by Route – AMMA

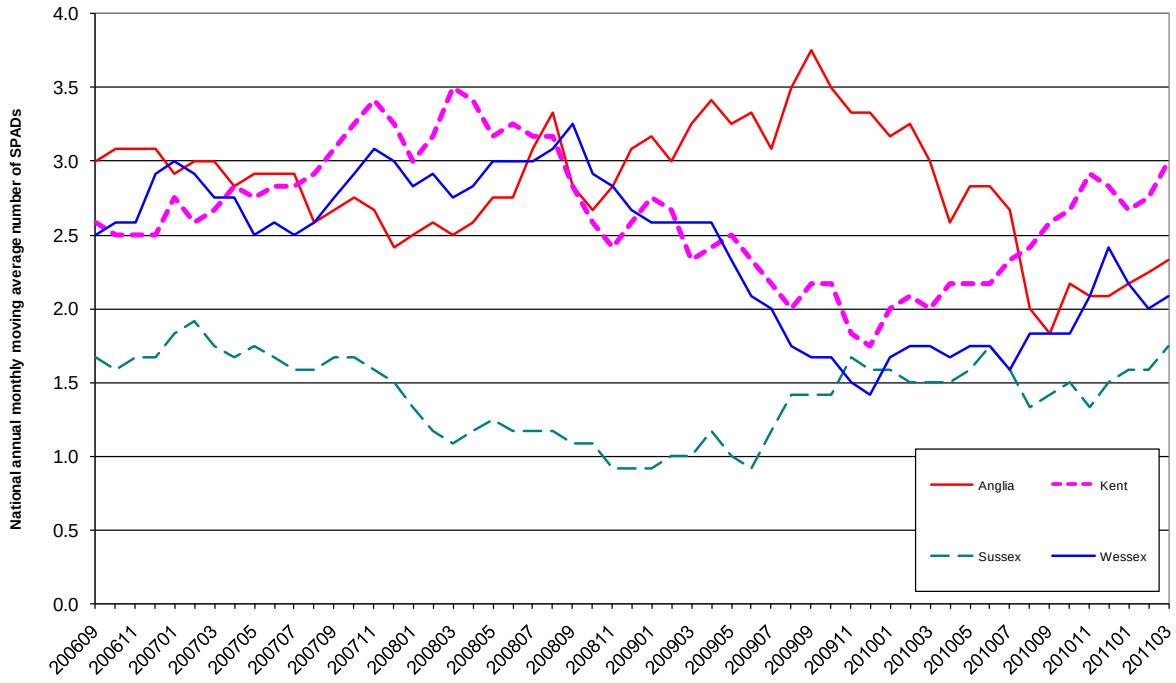


Chart 11 SPADs by Route – AMMA

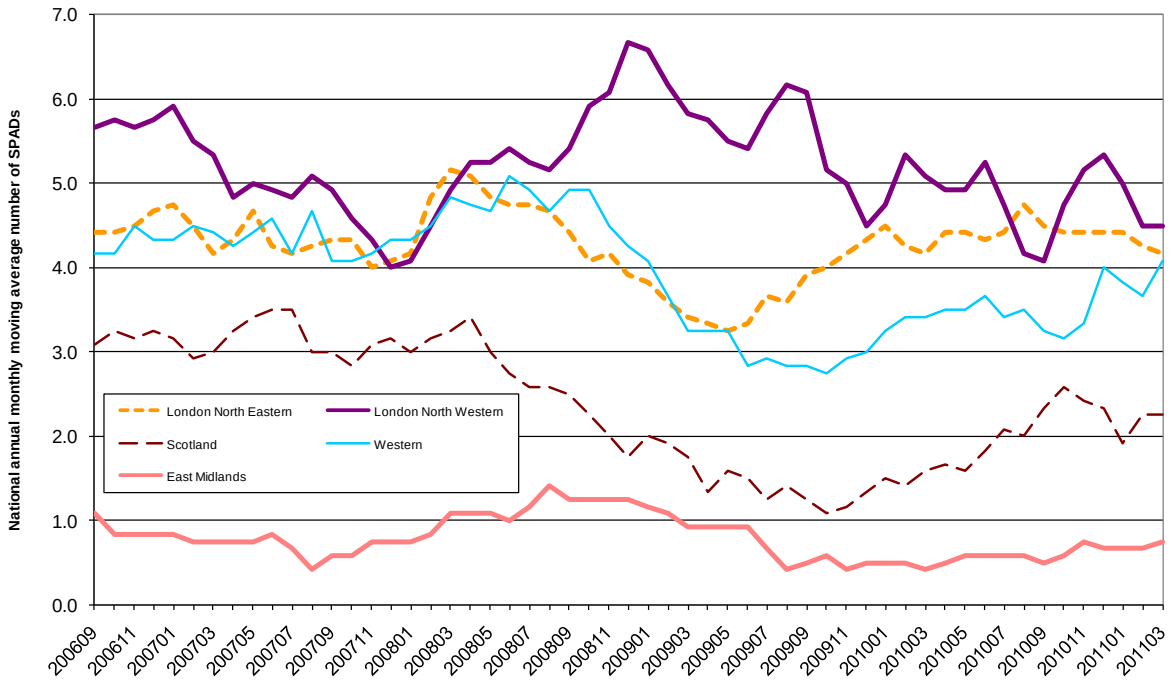


Table 5 examines performance by route for All SPADs and those risk ranked 16+. The percentage changes are based on a comparison between the annual moving totals as at the end of 2009/10 and 2010/11. If any of the changes in SPAD numbers are statistically

significant (at the 90% confidence level), this is indicated in the right-hand column of the table.

Table 5 Route Performance – Comparison of Moving Annual Totals

	Route	Annual moving total March 2010	Annual moving total March 2011	Difference in annual total	%age change in annual rate	Annual change significant?
All SPADs	Anglia	36	28	-8	-22%	No
	Kent	24	36	12	50%	No
	London North Eastern	50	50	0	0%	No
	London North Western	61	54	-7	-11%	No
	Scotland	19	27	8	42%	No
	Sussex	18	21	3	17%	No
	Wessex	21	25	4	19%	No
	Western	41	49	8	20%	No
	East Midlands	5	9	4	80%	No
16+ SPADs	Anglia	12	9	-3	-25%	No
	Kent	6	13	7	117%	No
	London North Eastern	19	16	-3	-16%	No
	London North Western	12	12	0	0%	No
	Scotland	9	9	0	0%	No
	Sussex	5	3	-2	-40%	No
	Wessex	6	10	4	67%	No
	Western	11	13	2	18%	No
	East Midlands	1	2	1	100%	No

5 SPAD performance by Railway Undertaking

5.1 SPAD performance

5.1.1 SPADs year-on-year by Railway Undertaking

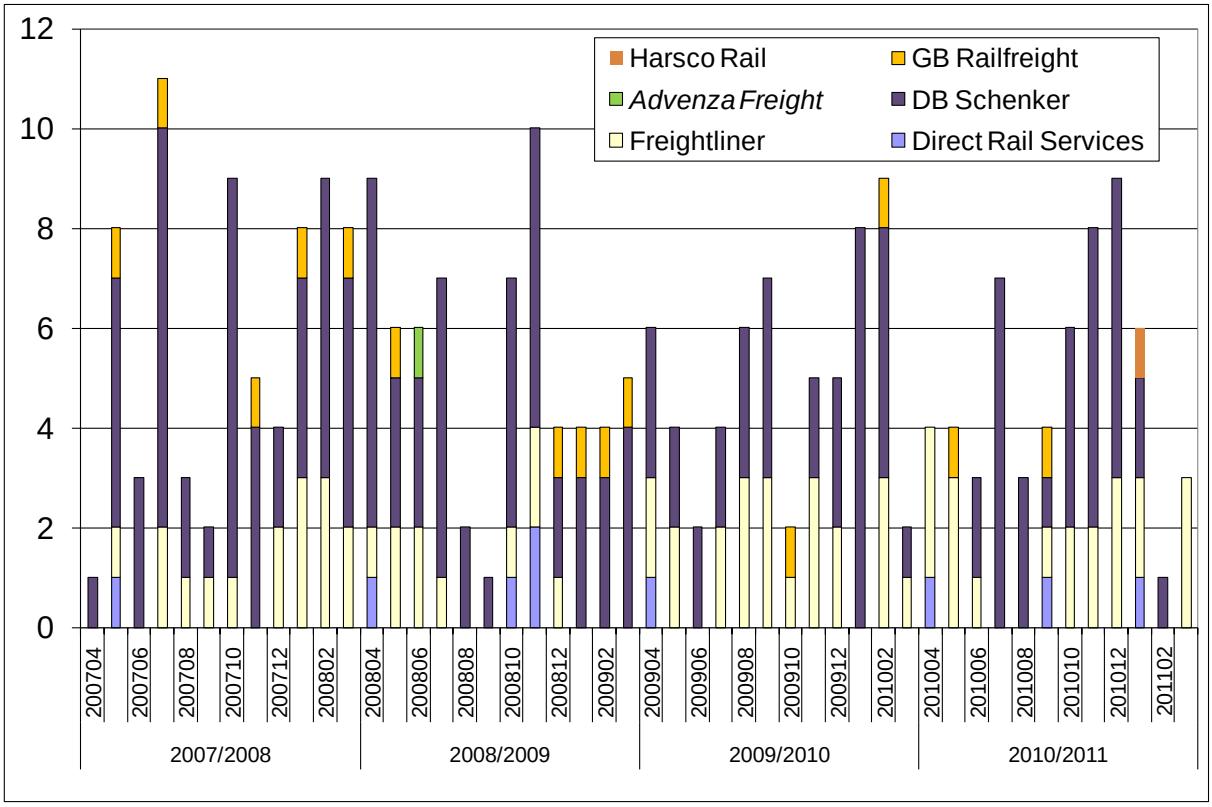
The table in Appendix 9 shows the current annual total, classified by railway undertaking (RU), for the 12 months to the end of Q4-2010/11, and for the previous 12 months, along with the differences in these totals. From this table, it may be seen that, in comparing these two 12-month periods, no RU has shown a statistically significant change in SPAD numbers.

In accommodating franchise changes, RSSB has measured relevant RUs' past performance, where possible (by considering the current RU's predecessors' SPADs), to provide a benchmark reference for future comparison. This estimation is considered to be realistic; it is based on SMIS data since January 1998.

Appendix 7 presents SPAD data for each RU, which has been normalised by million train miles run, and compares this with the national average for all RUs.

5.2 Railway Undertakings - freight

Chart 12 SPADs by Freight Railway Undertakings



** Advenza Freight ceased trading in 2009*

Chart 12 shows the monthly numbers of SPADs by freight Railway Undertakings from the beginning of 2007/08. This chart presents raw SPAD numbers which have not been normalised against train miles run.

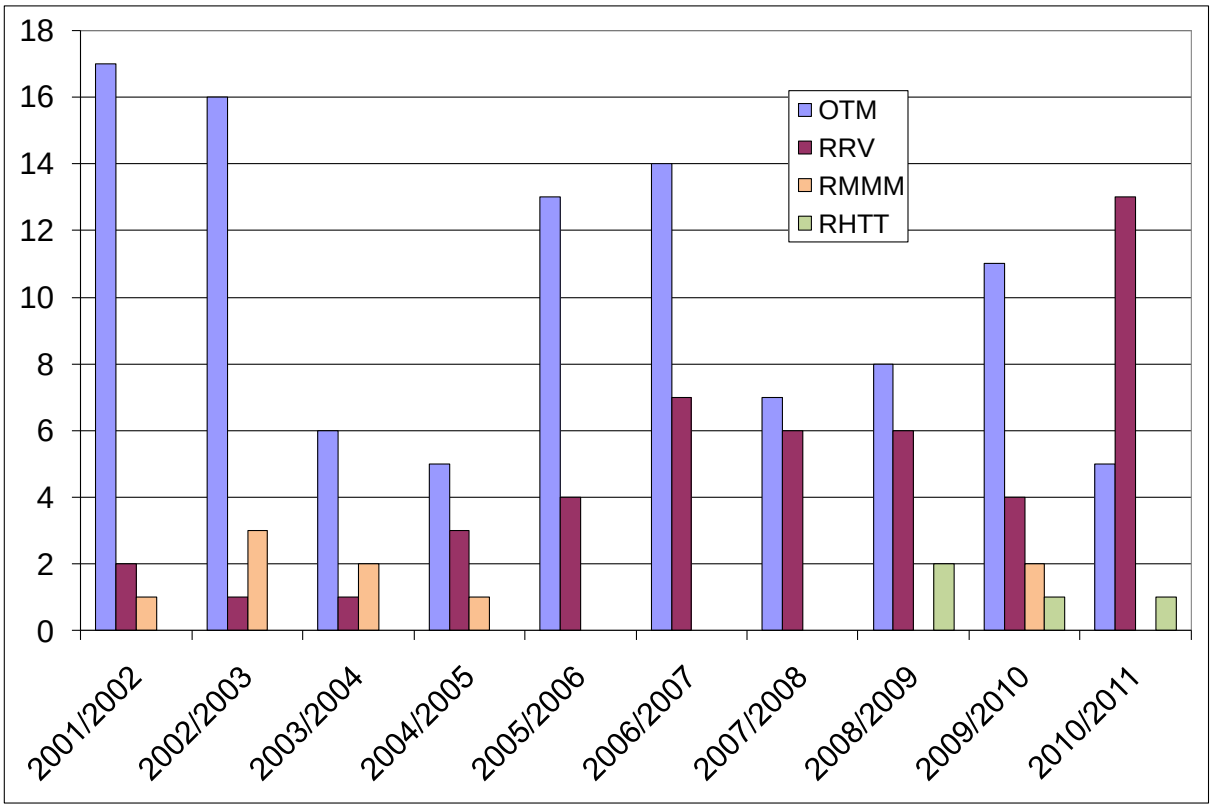
It may be seen from this chart that there were ten freight train SPADs during Q4-2010/11. This was 13 fewer than during the previous quarter, and equalled the number during Q2-2008/9, which was the lowest quarterly total.

5.3 Engineering machines

Chart 13 shows the number of category A SPADs involving engineering machines. This shows that there have been 19 SPADs in 2010/11 against 18 during 2009/10 and 16 in 2008/9. Of these 19, five involved on-track machines (two tampers, two stone blowers and one ballast regulator coupled to a tamper), one a rail-head treatment train and 13 involved road/rail vehicles.

Of the 13 incidents with RRVs, six occurred at the signal protecting a CCTV level crossing. Four of these were incurred when two RRVs, running independently, traversed two separate CCTV crossings in the same movement, each passing two signals. A further two involved the same signal being passed by two separate RRVs.

Chart 13 SPADs by engineering machines



5.4 Possession-related SPADs

5.4.1 SPADs entering, leaving, or within a possession

Chart 14 Possession related SPADs

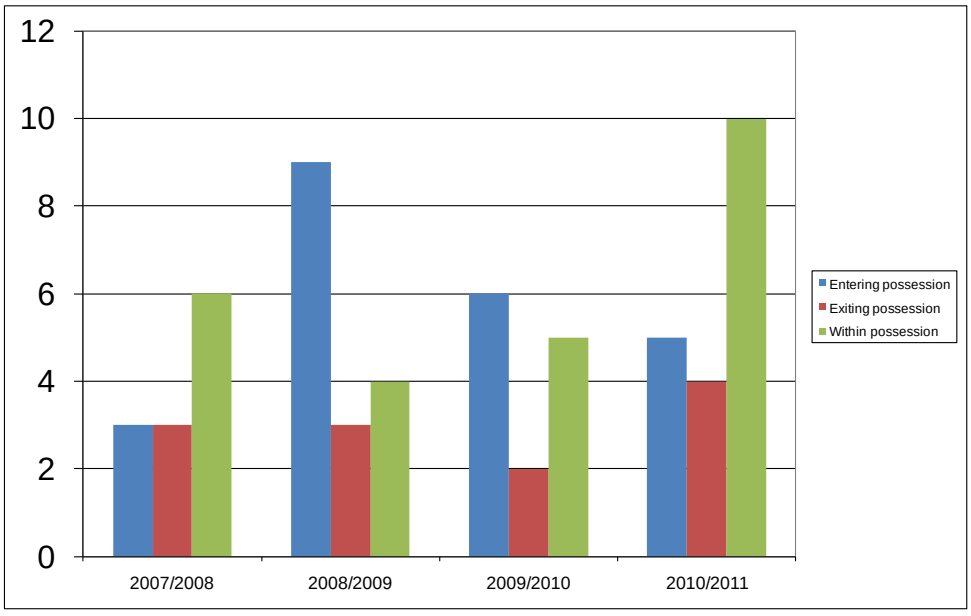


Chart 14 indicates the number of possession-related SPADs, broken down by whether the movement concerned was entering, leaving or within a possession at the time of the SPAD.

This chart shows that there have been 19 possession-related SPADs during 2010/11, compared to 13 during 2009/10 and 16 in 2008/9. Five of these occurred when movements were entering possessions, four when movements were exiting possessions and ten within possessions.

Table 6 shows the breakdown of these SPADs, by Network Rail route and by the movement being made.

Table 6 Possession related SPADs

		A	KT	EM	LNE	LNW	M&C	SC	SX	W	WX	Total
2007/08	**Qtr1**									1		**1**
	Qtr2				1					2	1	**4**
	Qtr3				3					1		**4**
	Qtr4					1				1	1	**3**
2008/09	**Qtr1**				1	2				3		**6**
	Qtr2	1				2		1		3		**7**
	Qtr3				1	1						**2**
	Qtr4	1										**1**
2009/10	**Qtr1**				1							**1**
	Qtr2	3			1	2						**6**
	Qtr3				1					1		**2**
	Qtr4				1	2					1	**4**
2010/11	**Qtr1**	4			2					1		**7**
	Qtr2				1	2				1	1	**5**
	Qtr3		1		1	1		1		1		**5**
	Qtr4	1			1							**2**
		10	**1**	**0**	**15**	**13**	**0**	**2**	**0**	**15**	**4**	

		Entering possession	Exiting possession	Within possession	Total
2007/08	**Qtr1**			1	**1**
	Qtr2	1	1	2	**4**
	Qtr3	1	1	2	**4**
	Qtr4	1	1	1	**3**
2008/09	**Qtr1**	3	2	1	**6**
	Qtr2	5	1	1	**7**
	Qtr3	1		1	**2**
	Qtr4			1	**1**
2009/10	**Qtr1**		1		**1**
	Qtr2	3		3	**6**
	Qtr3	1	1		**2**
	Qtr4	2		2	**4**
2010/11	**Qtr1**	1		6	**7**
	Qtr2	2	2	1	**5**
	Qtr3	1	2	2	**5**
	Qtr4	1		1	**2**
		23	**12**	**25**	

5.5 Normalised SPAD performance

5.5.1 SPADs normalised by million train miles

Appendix 7 shows the SPAD performance of individual Railway Undertakings, normalised by million train miles (MTM) run. This is calculated from SPAD numbers and their SPAD Risk Rankings, along with train mileage data.

This table compares the performance of each Railway Undertaking, in terms of the numbers of SPADs per million train miles run, to the national rate. It highlights those which have achieved SPAD rates better than the appropriate national rate in respect of 'All SPADs' and '16+ SPADs', as well as those which have exceeded the national rate in either one, or both of these categories.

The main part of the table is divided into two. Passenger train operators are shown separately to freight train operators. This allows separate group rates to be shown for these two types of operators and should enable more meaningful comparisons to be made.

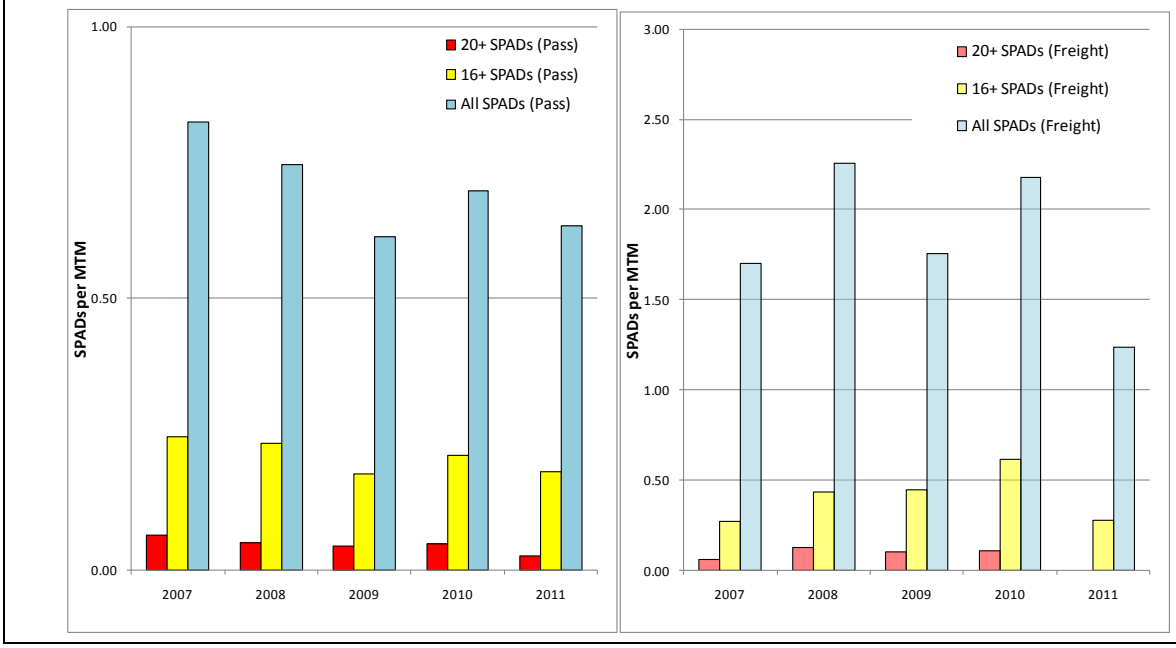
Chart 15 summarises Appendix 7 graphically. The numbers of '16+' and '20+' SPADs are also shown, as subsets of 'All SPADs'. The SPAD rates for passenger train operators are indicated separately to those for freight train operators. The passenger figures are represented by the bars in the left-hand chart, whereas freight in on the right-hand chart.

It should be noted that the chart only shows three month's data in respect of 2011, but a year's data for all other years.

This chart shows that there has been a decrease in the passenger train SPAD rate since 2007, albeit with a slightly raised figure in 2010. This statement is true of all of the bands of passenger train SPADs indicated.

The freight train SPAD has shown a noticeable decrease in all categories for 2011. This is commensurate with Chart 11 in section 5.2.

Chart 15 Annual SPAD numbers, normalised by million train miles



Note that this chart is comparing calendar years.

5.5.2 SPADs normalised by driver population

Appendix 8 shows the annual SPAD rate per 100 drivers per month for each of the RUs. The colour codings indicate whether an individual company's SPAD rate is significantly better (green) than the average group rate, or significantly worse (red), at the 90% confidence level.

6 Further analysis of SPAD occurrence

6.1 SAS and SOY SPADs

A SAS SPAD is one where a stationary train starts against a signal at danger. This may be at a platform starting signal, or at any other signal at which a train is stopped. A SOY SPAD is one which occurs should a train start away from a yellow signal, but then fails to stop at the next (danger) signal.

Chart 16 shows the annual moving total number of SAS and SOY SPADs (plotted against the left axis) along with that for 'All SPADs' (plotted against the right axis). This shows that the numbers of SOY SPADs and SAS SPADs have increased and decreased broadly in line with total SPAD numbers. However, there has been a decrease in SOY SPADs and an increase in SAS SPADs since August 2010.

Chart 16 SAS & SOY SPADs (Annual moving total)

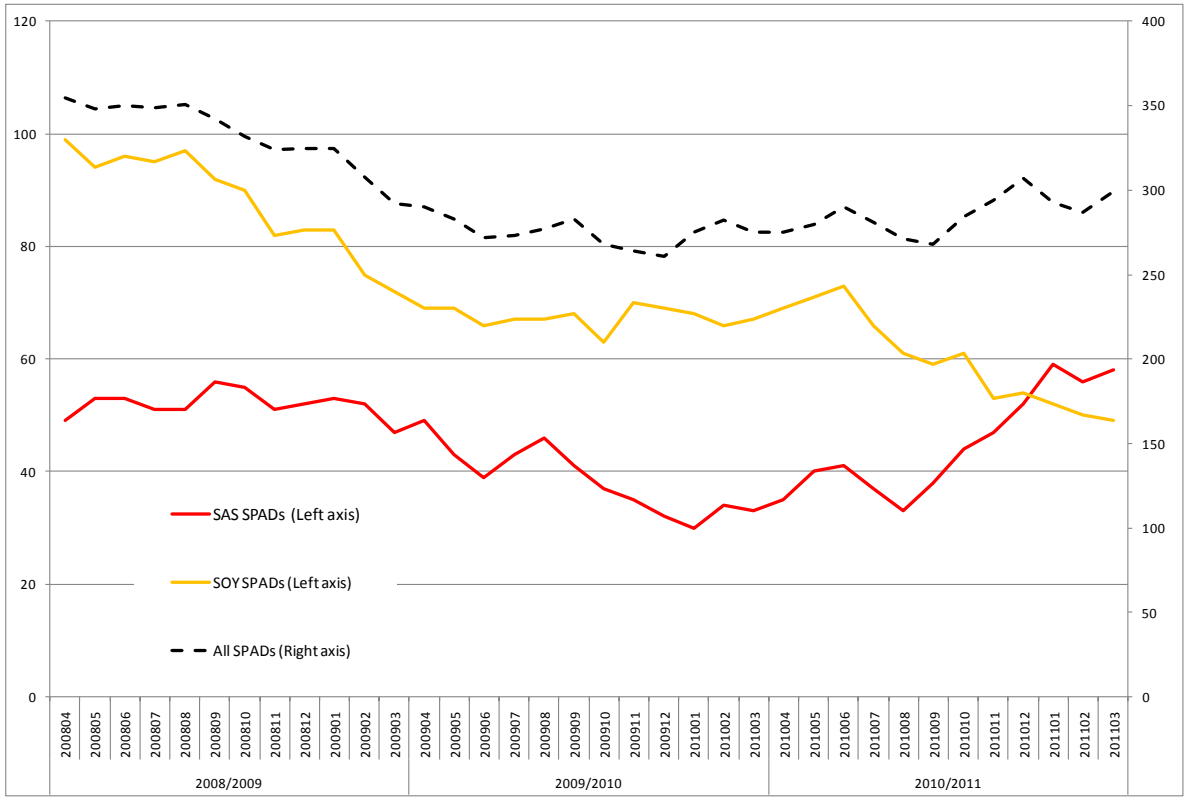
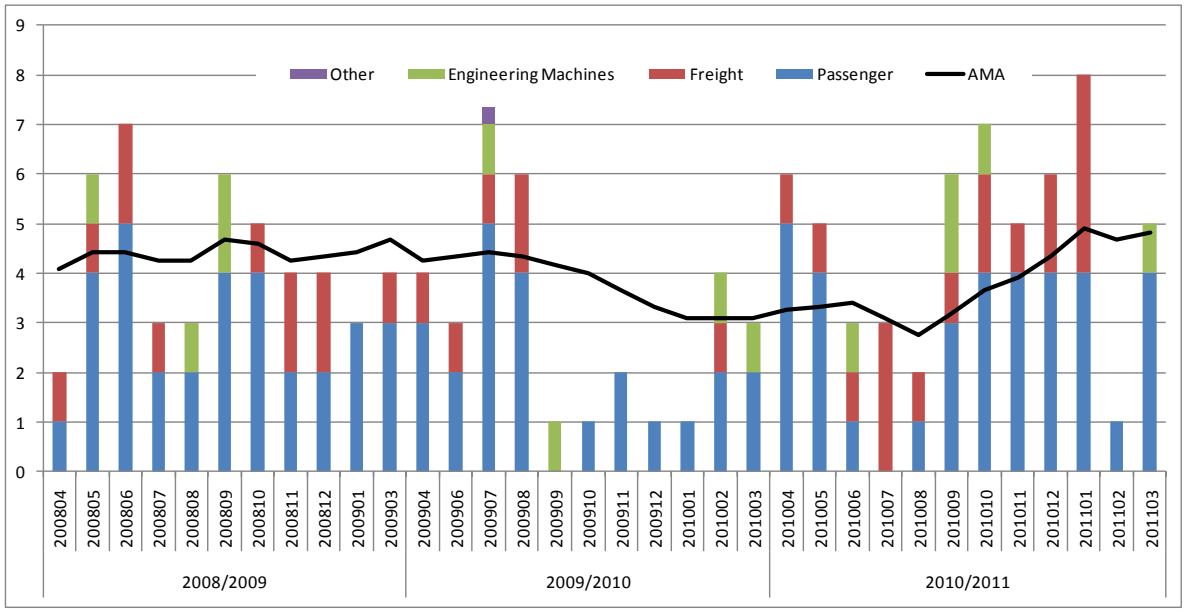


Chart 17 shows SAS SPADs, by month, split by train type. The annual moving average (AMA) is also shown. From this chart it may be seen that there was a decrease in the number of these SPADs during the latter months of 2008, since when their incidence has increased. This increase is evident with both passenger and freight trains.

Chart 17 SAS SPADs by train type



The reasons for this are remain unclear, though this will continue to be observed closely over the coming months.

6.2 Multi-SPAD signals and drivers

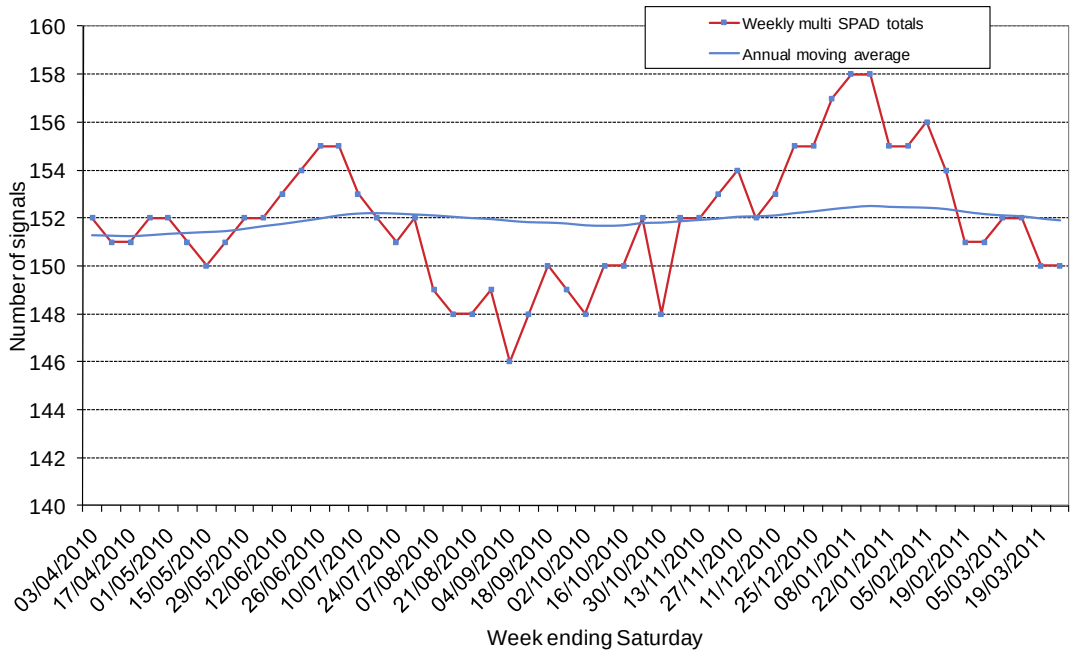
This section examines the phenomena of multi-SPAD signals and multi-SPAD drivers.

6.2.1 The multi-SPAD signal population

A multi-SPAD signal is defined as one which has had two or more SPADs in the preceding five years.

Chart 18 plots the number of multi-SPAD signals over the 52 weeks up to 26 March 2011, along with the annual moving average. This shows that the number of listed signals has fluctuated between 146 and 158 over that period. There were 152 such signals listed as of a year ago and 150 as at 26 March 2011. Of these signals, 86 (57%) are fitted with TPWS.

Chart 18 Multi-SPAD signals – 52 weeks up to week ending 26 March 2011



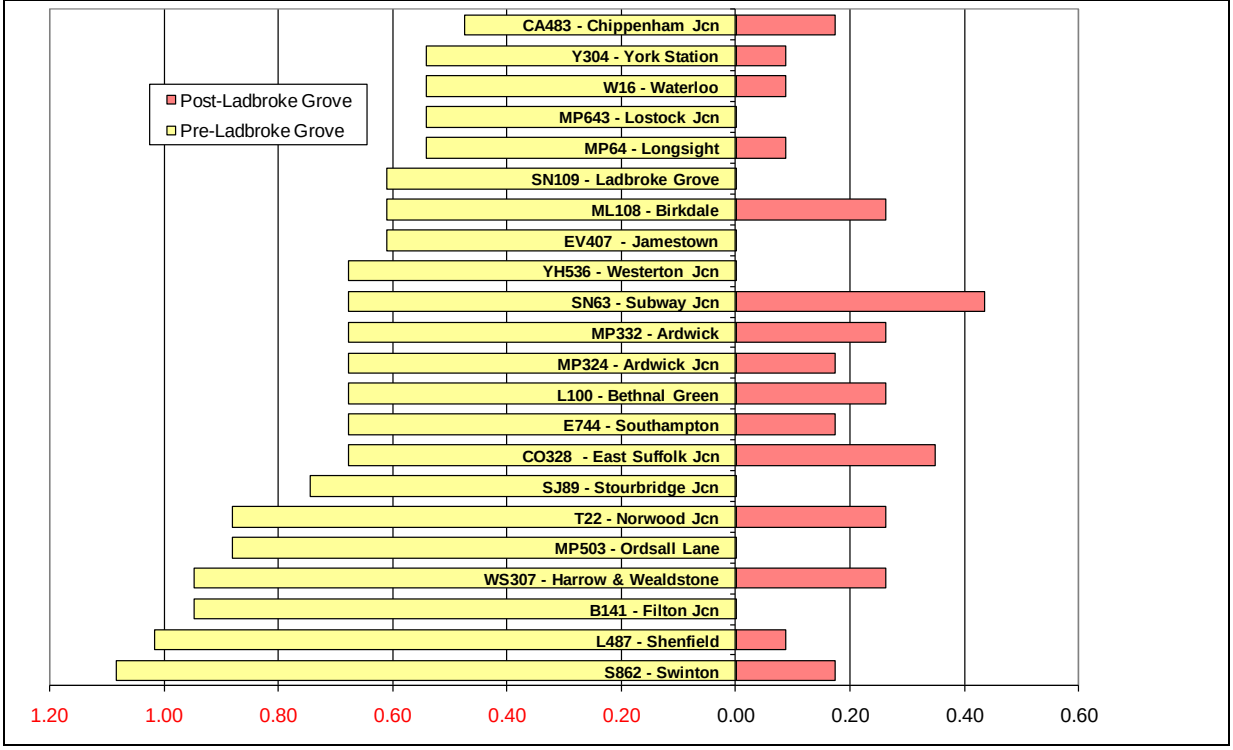
Prioritisation of SPAD mitigation measures can be difficult when there are a large number of signals on the weekly multi-SPAD list. Whilst all multi-SPAD signals require attention, there is a degree of random chance that a signal will be subject to a second SPAD within five years. However, there is less likelihood that a third SPAD will occur at random within five years at a given signal. Analysis is therefore undertaken to identify signals that have had three or more SPADs in the last five years to determine those that require more immediate attention. Those multi-SPAD signals which have accrued three or more SPADs within five years currently number 30 (20% of the multi-SPAD signal population), which is the same number as at the end of Q3. These signals are listed in Appendix 5.

6.2.2 Improvement Notice signals (T22 & IN)

Following the Ladbroke Grove collision on 5 October 1999, the then Health & Safety Executive (HSE) issued two improvement notices relating to multi-SPAD signals. One of these notices was applied to the 22 'most SPADed' signals (the 'top 22' or 'T22') - including SN109, the passing of which led to the Ladbroke Grove collision; the second notice was applied to a further 206 multi-SPAD signals (the 'Improvement Notice' or 'IN' signals). The Improvement Notices were dated 8 October 1999.

Chart 19 shows the SPAD performance of the 'top 22' (T22) signals. It shows the annual SPAD rate for each of the signals (ie, the number of SPADs per year) pre- and post-Ladbroke Grove. Those designated as pre-Ladbroke Grove occurred during the period January 1985 up to and including 8 October 1999 (a period of 177 months) and post-Ladbroke Grove from 9 October 1999 to 31 March 2010 (138 months).

Chart 19 'Top 22' Multi-SPAD signals: Annual SPAD rate



Of the 22 signals listed in Chart 18 above, one has seen a further SPAD since this chart was last published. This was at T22 at Norwood Junction (Sussex Route) on 1 January 2011.

The mitigation measures which were applied post-Ladbroke Grove have resulted in a reduction in the rate of SPADs at all of the 'Top 22' signals. Notably, seven signals have recorded no further events. However, four are currently classified as multi-SPAD. These are L100 at Bethnal Green, CO328 at East Suffolk Junction (both Anglia Route), SN63 at Subway Junction, (Western Route) and T22 at Norwood Junction (Sussex Route).

Of the 206 signals on the second improvement notice ('IN' signals) 13 (6%) remain on the multi-SPAD list. These are listed in Appendix 11.

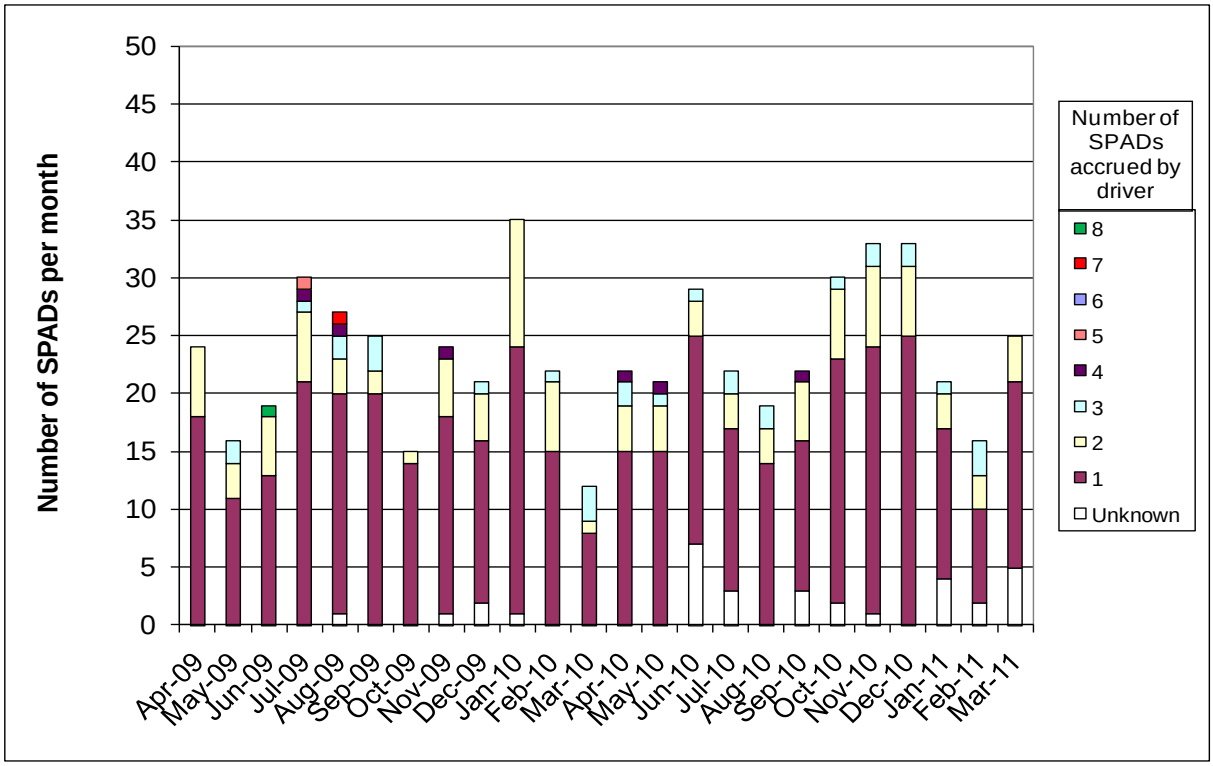
A current list of multi-SPAD signals may be found at www.opsweb.co.uk.

6.2.3 Multi-SPAD drivers

Chart 20 shows the numbers of SPADs per month since April 2009. Each of the bars is divided into the total number of SPADs accrued by the driver. This indicates that the great majority of SPAD incidents involve a driver who has not previously had a SPAD, as represented by the maroon sections of the bars. Some drivers who have previously SPADed do then go on to have further incidents. Over the past year, 68% of SPADs involved a driver who had not previously been involved in a SPAD. However, 25% of category A SPADs involve a driver who has been involved in one or more previous incidents (The remaining 7% relates to those for which the drivers' SPAD histories have not been supplied by the RU.)

The fact the 25% (ie; one in every four) of all category A SPADs involve a driver who has previously SPADed is worth noting. When considering the total driver population, it is believed that the proportion of drivers who have never been involved in a SPAD is likely to be greater than 75%. This would indicate that there is an increased propensity to SPAD amongst those drivers who have SPADed previously.

Chart 20 Numbers of SPADs attributed to driver.



7 Train Protection and Warning System

TPWS brake demands are classified as being interventions or activations. These two words are often perceived as being mutually interchangeable; however, they do each have their own distinct meanings, which should be used when referring to TPWS brake demands.

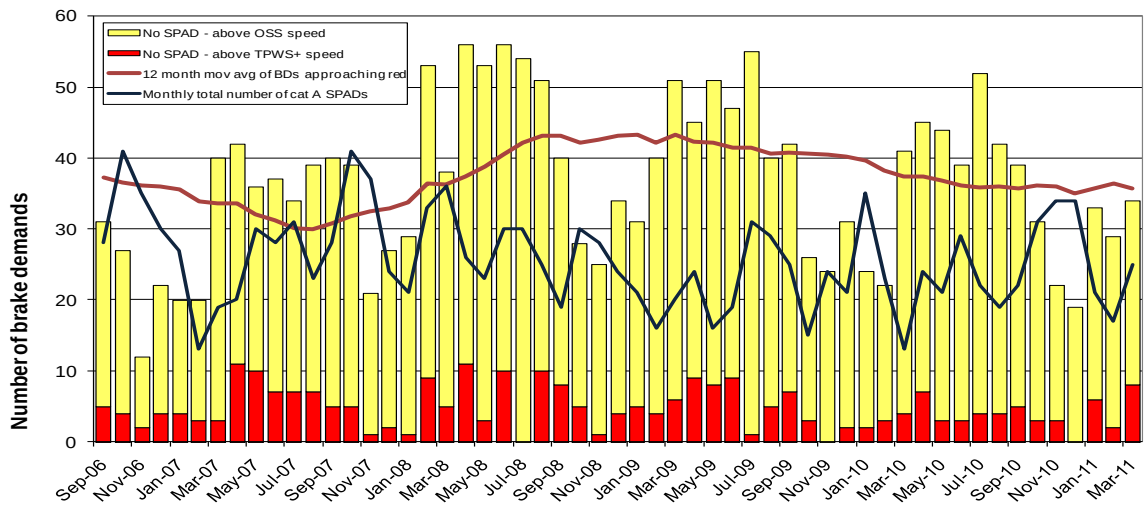
In short, an intervention occurs if the driver has not taken the appropriate action with regard to braking; an activation occurs when a driver has applied the brakes in an attempt to stop at the signal, but still passes it. A fuller explanation of the distinction between the two terms may be found in Appendix 2.

7.1 TPWS brake demands at signals

Chart 21 shows monthly brake demand figures in respect of trains passing over the overspeed sensor (OSS) for a signal at danger, in excess of the set speed. The bars also indicate those which occurred at the TPWS+ loop (where fitted). From the chart it may be seen that brake demands decrease around the end of each year and into the following year, then increase towards a peak each summer.

TPWS brake demands, especially those on the approach to signals at danger are considered to be precursors to category A SPADs. It would be reasonable, therefore, to expect there to be a correlation between the seasonal pattern shown in Chart 21, and that for category A SPADs. The black line on this chart shows the number of SPADs each month. However, there does not seem to be any between this line and the numbers of TPWS brake demands. The moving annual average is also shown.

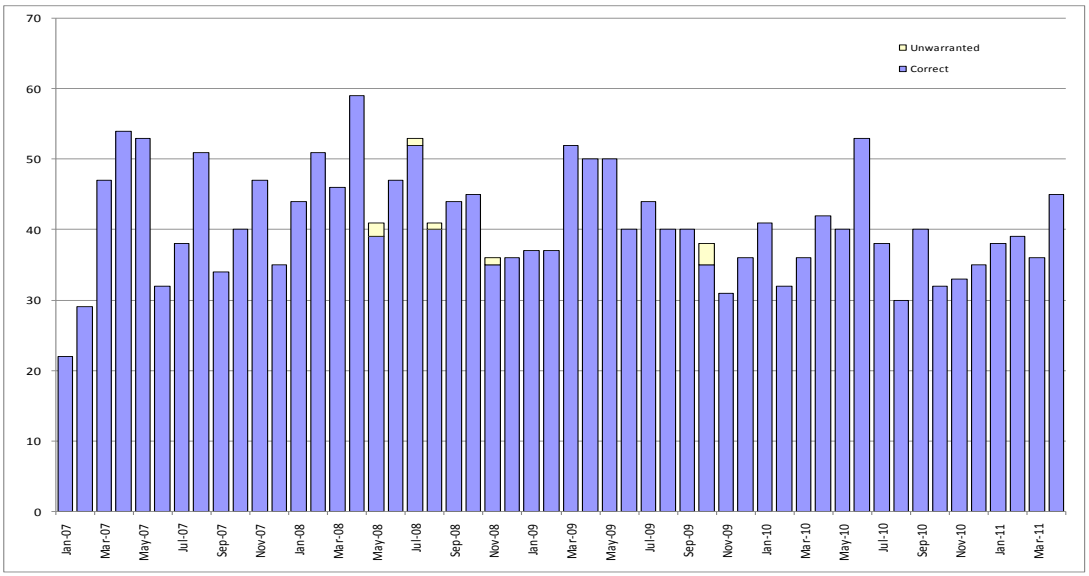
Chart 21 TPWS brake demands approaching signals at danger (no SPAD)



7.2 TPWS brake demands at PSRs

Chart 22 shows the monthly number of TPWS brake demands at the OSS approaching permanent speed reductions (PSR). This shows that these have been occurring at the rate of between 30 and 40 per month, although some months have been higher, but with no noticeable trend over time.

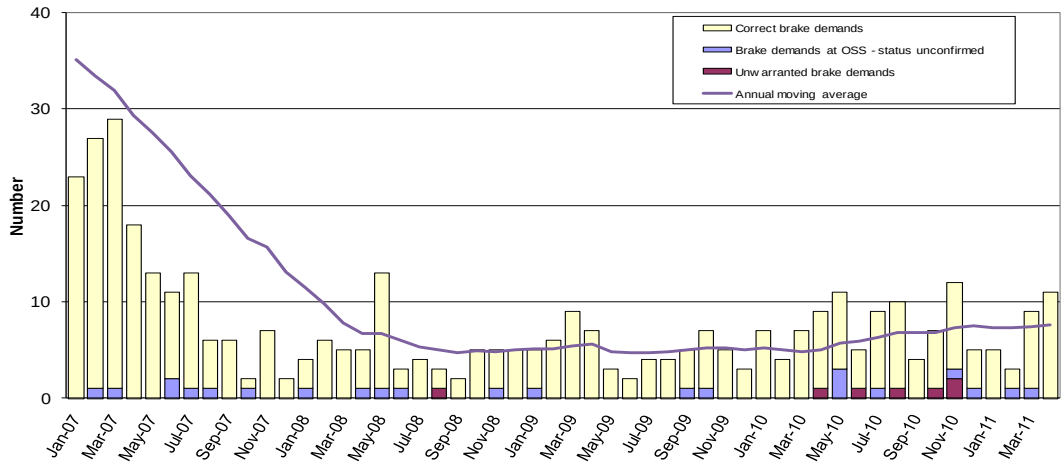
Chart 22 TPWS brake demands approaching PSRs



7.3 TPWS brake demands approaching buffer stops

Chart 23 shows the monthly number of TPWS brake demands at OSS loops approaching buffer stops since the beginning of 2007. This indicates a decrease at the beginning of the period shown, since when these brake demands have been in the region of five to ten per month. Numbers were higher before January 2007, which was prior to the programme to increase the trip speed marginally at these locations. The annual moving average indicates that the number of these brake demands had levelled out at between five and six per month, however, a slight increase has been evident from March 2010, although the total number of events has remained low.

Chart 23 TPWS brake demands approaching buffer stops



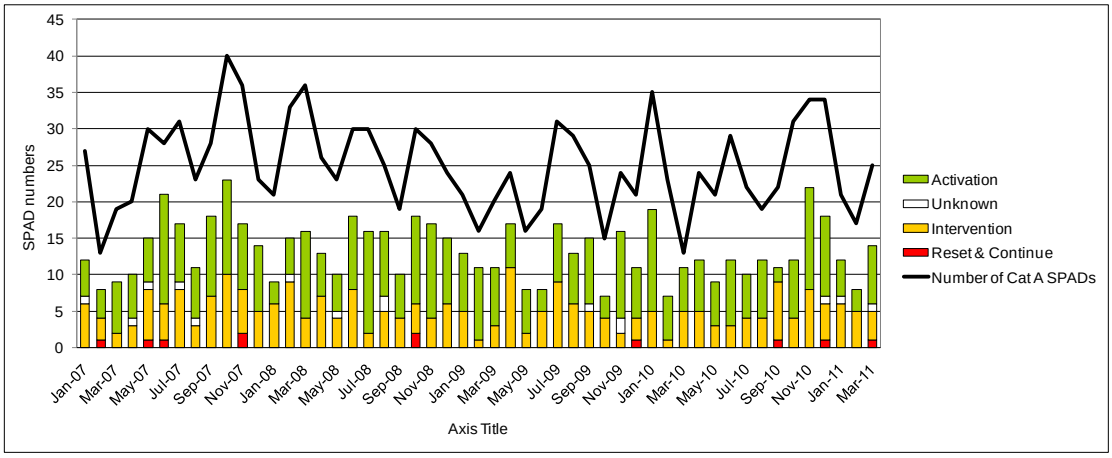
7.4 Interventions and activations at Category A SPADs

Chart 24 shows the monthly number of TPWS interventions and activations that have occurred in association with category A SPADs since the beginning of 2007. Please see section 3.5.1 for analysis of the proportions of interventions and activations. In addition to activations (green) and interventions (yellow), this chart shows the ten incidents since January 2007 (red) where the driver has reset the TPWS following a brake demand and continued forwards without the signaller's authority.

The most recent 'reset & continue' incident was at Stoats Nest Junction (Sussex Route) on 14 March. This brings the total number of 'reset & continue' incidents, as at that date, to 35.

The black line on the chart indicates the monthly numbers of category A SPADs. The white sections on the bars relate to those incidents where it has not been possible to ascertain whether it was the driver or the TPWS equipment which first initiated the brake application.

Chart 24 TPWS interventions and activations at Cat A SPADs



7.5 TPWS ‘reset and continue’ (at category A SPADs)

Chart 25 TPWS ‘reset and continue’

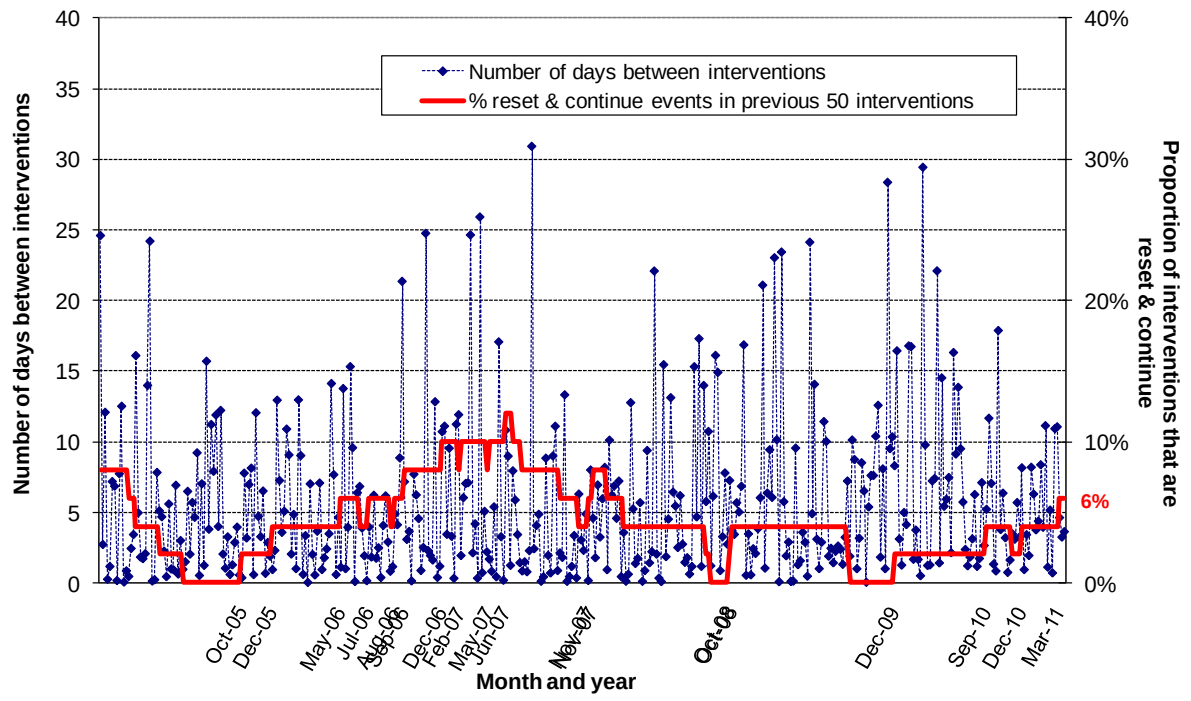


Chart 25 looks at the frequency of TPWS ‘reset and continue’ incidents. The red line represents the proportion of TPWS interventions that are ‘reset & continue’ events. This has been based on a measure of the previous 50 TPWS interventions, shifting on a scale over the period January 2007 - March 2011. The blue peaks and troughs represent the number of days between each intervention.

In mid-2007, this measure peaked at 12%, however, since then the proportion decreased, reaching zero again for short periods during mid-2008 and between August and December 2009. Following the most recent incident at Stoats Nest Junction, this measure is now 6%, a level which it has not reached since January 2008.

Although the frequency of ‘reset and continue’ events is low, the industry must remain vigilant to the risk from such events.

8 SPADs: an international perspective

8.1 SPAD-related events in Europe

Spain: Collision at El Clot, Barcelona, 28 April 2011

At 09:50 (local time) on 28 April, a commuter train carrying around 70 passengers collided with an empty stationary sleeper service at El Clot station, Barcelona. There were 18 injuries. A SPAD is suspected.

8.2 SPAD-related events outside Europe

Australia: Signal passed at danger at Yerong Creek, NSW, 25 February 2011 (ATSB)

At around 10:28 (local time) on Friday 25 February 2011, a southbound freight train passed the Yerong Creek home signal at red without authority. There were no injuries or damage as a result of the incident.

The recorded data showed that the train was beyond the distant signal and that virtually the whole length of the train (1,115 metres) was on the falling grade when the locomotive dynamic brake was first engaged. If the dynamic brake is to be used in such topography (rather than the train brake), it is essential to ensure that the whole train has crested the grade before engaging dynamic brake, otherwise the train will transition from a draft (stretched) to buff (bunched) condition with greater force and unpredictability.

The data corroborated the train handling method described by the driver and his contention of sub-optimal dynamic braking performance.

The train driver had been qualified as a driver for about three years. He had operated over the Melbourne to Junee section of track as a second person for about seven months and had been qualified to drive over this section for one month. The 25 February 2011 trip from Junee south was the first time he had operated over this section of track during daylight hours. He had been assessed as competent to drive over the route by an employee of a company subcontracted to Interail Australia.

The train crew were tested for the presence of alcohol or illicit drugs at Culcairn and were relieved from duty at 13:11. The drug and alcohol tests returned zero results.

The train was driven in a manner that reduced the in-train forces as it crested the rising gradient at the distant signal on the approach to Yerong Creek. Notwithstanding this, and the sub-optimal dynamic braking performance of the train, an earlier application of the dynamic brake or earlier introduction of the train brake ‘over the top’ of the dynamic brake was needed on this occasion.

The incident highlights the need for frank and complete reporting by persons in the field to network controllers in regard to operations on the rail network. In this instance, the driver was ‘silent’ on the issue of the location of his train in relation to red signal YC05 at Yerong Creek. The network controller, not being at the controlling board applicable to the train, had no information that signal YC05 had been passed at red.

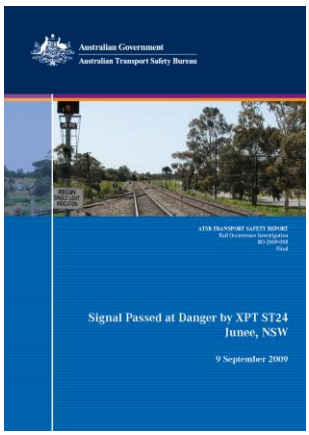
In addition, the incident highlights the need for a network controller to be monitoring the movement of trains at each active workstation effectively.

Israel: Collision near Netanya, 7 April 2011

On the morning of 7 April 2011, 60 people were injured when two passenger trains collided near Netanya after one of them had passed a signal at danger and switched to a line on which another train was coming from the south. The trains glanced off one another and two coaches were derailed.

8.3 SPAD-related investigation reports received

Australia: Signal passed at danger by an XPT passenger service at Junee, NSW, 9 September 2009



At about 14:11 (local time) on 9 September 2009, an XPT passenger train, en route from Melbourne to Sydney, passed signal JE02 (Junee) at red by around 33 metres. There were no reported injuries.

The driver reported that JE26 signal (the one before JE02) was displaying a 'medium turnout' indication, meaning that JE02 would be showing a proceed aspect. Several other rail employees also said that signal JE26 was displaying a 'medium turnout' indication. However, the investigation concluded that it was almost certain that signal JE26 was displaying a 'caution turnout', which would have resulted in signal JE02 displaying a stop aspect. The investigation concluded that the driver's perception of signal JE26 was influenced by expectation, distraction and possibly fatigue, and that the employee witnesses' perception of the signal was influenced by expectation, 'confirmation bias' and 'group think'.

There was no RailCorp instruction that specifically referred to the need for train crew to prioritise tasks at safety critical locations or at times when workload is high. The ATSB believes that safety could be improved if train crews were provided with guidance regarding prioritisation of critical tasks such as when departing stations, running through station yards, approaching track gangs or level crossings and so on.

The full report may be downloaded here:

http://www.atsb.gov.au/publications/investigation_reports/2009/rair/ro-2009-008.aspx

Appendix 1 - Glossary

Acronym	Expansion
AHB	automatic half barrier level crossing
AMA	annual moving average
ASC	area signalling centre
AWS	Automatic Warning System
DMU	diesel multiple unit
DRA	Driver Reminder Appliance
ECS	empty coaching stock
EMU	electric multiple unit
ERTMS	European Rail Traffic Management System
FOC	freight operating company – now known as a 'freight railway undertaking'
HPSS	High Performance Switch System
HSE	Health and Safety Executive
IECC	integrated electronic control centre
IN	ORR (formerly HSE) Improvement Notice
LOS	limit of shunt
MPV	multi-purpose vehicle
NRMI	Network Rail managed infrastructure
NSFG	National SPAD Focus Group (Superseded by OFG)
OFG	Operations Focus Group
OOARL	on or affecting a running line
ORR	Office of Rail Regulation
OSS	overspeed sensor
OTDR	on-train data record
OTM	on-track machine
PICOP	person in charge of possession
PLS	position light signal
PSB	power signal box
PSR	permissible speed reduction
RAIB	Rail Accident Investigation Branch
RGS	Railway Group Standard
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 1995
RISAS	Railway Industry Supplier Approval Scheme
RMMM	rail-mounted maintenance machine
RRV	road-rail vehicle
RSSB	Rail Safety and Standards Board
RU	railway undertaking
SC	signalling centre
SMIS	Safety Management Information System
SPAD	signal passed at danger
SRRT	SPAD risk ranking tool
SSP	Strategic Safety Plan
TOC	train operating company – now known as a 'passenger railway undertaking'
TPWS	Train Protection and Warning System
TSS	Train stop system
16+	Potentially significant – rated 16 or above (16 to 28)
20+	Potentially severe – rated 20 or above (20 to 28)

Appendix 2 - Definitions

SPADs

A SPAD is a signal passed at danger (without authority). According to Railway Group Standard GO/RT3119, SPADs fall into one of four categories.

Category	Description *(Notes: No degree of severity or importance is implied within or between these categories).*
A	**A1** When a SPAD has occurred and, according to available evidence, a stop aspect, indication or end of in-cab signalled movement authority was displayed or given correctly and in sufficient time for the train to be stopped safely at it.
	A2 When a SPAD has occurred and, according to available evidence, the stop aspect, indication or end of in-cab signalled movement authority concerned was not displayed or given correctly, but was preceded by the correct aspects or indications.
	A3 When a SPAD has occurred and, according to available evidence, verbal and/or visual permission to pass a signal at danger was given by a handsignaller or other authorised person without the authority of the signaller.
	A4 When a SPAD has occurred and, according to available evidence, a stop aspect, indication or end of in-cab signalled movement authority was displayed or given correctly and in sufficient time for the train to be stopped safely at it, but the train driver was unable to stop his train owing to circumstances beyond his control *(for example, poor rail head adhesion, train braking equipment failure or malfunction etc.).*
B	**B1** When a SPAD has occurred because a stop aspect, indication or end of in-cab signalled movement authority, that previously showed a proceed indication, was displayed because of infrastructure failure *(for example, signalling or level crossing equipment has failed or malfunctioned)*.
	B2 When a SPAD has occurred because a stop aspect, indication or end of in-cab signalled movement authority, that previously showed a proceed indication, was displayed because it was returned to danger or displayed in error.
C	When a SPAD has occurred because a stop aspect, indication or end of in-cab signalled movement authority was not displayed in sufficient time for the train to be stopped safely at the signal, indication or end of in-cab signalled movement authority as it had been returned to danger automatically or in an emergency in accordance with GE/RT8000 Rule Book.
D	When a SPAD has occurred because vehicles without any traction unit attached, or a train which is unattended, had run away past the signal at danger or without an in-cab movement authority.

Any SPAD allocation is considered to be provisional, until such time as the SPAD investigation process is finalised and the initial allocation is either confirmed or recategorised. During the interim, the SPAD classification carries the suffix '(P)' for 'provisional'.

NB: SPADs which occurred prior to the inception of version 2 of GO/RT3119 remain categorised according to version 1 of that Standard (i.e. A, B, C or D). The sub-categories (A1, A2, etc.) are only applicable after the issue of version 2.

On or affecting a running line (OORL)

The criterion for a category A SPAD to be included in this report is that it occurred on NRMI. SPADs that have occurred in sidings and depots that are off running lines, but on NRMI, are therefore present. However, SPADs that have occurred within facilities operated by third parties are only included if the passing of the signal caused the train to enter or affect NRMI. This is a slightly wider definition than that used in Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR).

The RIDDOR requirement for reporting to the Office of Rail Regulation (ORR) is:

'*any case where a train, travelling on a running line or entering a running line from a siding, passes without authority a signal displaying a stop aspect unless the stop aspect was not displayed in sufficient time for the driver to stop safely at the signal*'.

This RIDDOR-based subset of the full NRMI SPAD data is referred to in RSSB's safety performance reports as 'on or affecting running line' (OOARL) SPADs. The OOARL and ORR reportable incidents can be fewer in number than those on NRMI.

SPAD risk ranking tool (SRRT)

The need both to understand SPADs better and to quantify the risk more effectively led, in 2001, to the development of a SPAD risk ranking methodology. This involves Network Rail and the Railway Undertaking involved in rating a SPAD against a number of criteria within five days of its occurrence.

The ratings are related to the likelihood of an accident and its potential consequences. Specifically, it has been designed to:

- Measure changes to the overall potential risk from SPADs.
- Identify those SPADs that are potentially significant and potentially severe.
- Inform the SPAD investigation process.

The risk ranking tool is made up of three elements:

- Part 1 - An initial collision potential assessment.
- Part 2 - An accident vulnerability ranking.
- Part 3 - The risk ranking score.

In general, this report uses the part 3 score only. However, in Appendices 3 and 4 (last column), the complete three-part code is quoted. In the example, 'YD21', 'Y' comprises part 1, 'D' part 2, and '21' part 3. A detailed explanation of each element is given below.

Part 1: Initial collision potential assessment

The first character of the complete code will either be Y representing 'yes' or N meaning 'no'. This character is registered in response to the question: *following the Category A SPAD, could the train, before it reached another stop aspect, have come into conflict with another train on a cleared route joining or crossing the route ahead of the signal passed at danger?*

Part 2: SPAD accident vulnerability ranking

The second character of the complete code provides weighting to the probability and severity of the incident and will be one of the following ten options:

A	Accident occurred.
B	SPAD train stopped on the first potential conflict point, with potential conflicting train stopped by actions of the driver and/or signallers prior to collision [Collision only prevented by recovery action].
C	SPAD train stopped on the first potential conflict point, with potential conflicting train stopped by automatic action of signalling system (ie signal flank protection) prior to collision.
D	SPAD or potential conflict train crossed the potential conflict zone without accident [Restricted time window for accident].
E	SPAD train stopped less than or equal to 50 metres in rear of the first potential conflict point by actions of signallers prior to accident [Potential for accident prevented by recovery action].
F	SPAD train stopped less than or equal to 50 metres in rear of the first potential conflict point by actions of the driver alone (with NO TPWS, ATP or a Trip cock system activation or intervention) [Escalation of SPAD required before accident could occur].
G (i) intervention (ii) activation	SPAD train stopped less than or equal to 50 metres in rear of the first potential conflict point with activation or intervention of TPWS, ATP or a tripcock system (with or without driver action to apply the brakes) [Escalation of SPAD required before accident could occur].
H	SPAD train stopped more than 50 metres in rear of the first potential conflict point by actions of signallers prior to accident [Potential for accident prevented by recovery action].
I	SPAD train stopped more than 50 metres in rear of the first potential conflict point by actions of the driver alone (with NO TPWS, ATP or a Trip cock system activation or intervention) [Significant escalation of SPAD required before accident could occur].
J (i) intervention (ii) activation	SPAD train stopped more than 50 metres in rear of the first potential conflict point with activation or intervention of TPWS, ATP or a trip-cock system (with or without driver action to apply the brakes) [Significant escalation of SPAD required before accident could occur].
K	SPAD where the design of the track layout and / or signalling controls prevents the possibility of a conflict in advance of the signal (eg at first signal of a double blocking), or in degraded working (eg T3 possessions or single line working) where all arrangements were in place for the safe passage of the train. [accident highly unlikely].
U	Unknown risk ranking result (generally relates to events from 2002 to 2004 that have not been ranked, plus a few current events for which results are still awaited).

Part 3: SPAD risk ranking score

The risk ranking system provides each SPAD with a score, which is between zero (no risk) and twenty-eight (a very high risk). To assist with reporting, the SPAD risk ranking scores will be grouped into severity bands as follows:

- Risk rankings of 0 to 15 are classified as **not significant risk**.
- Risk rankings of 16 to 19 are classified as **potentially significant**.
- Risk rankings of 20 and above are classified as **potentially severe**.

TPWS interventions and activations

TPWS brake demands are classified as being **interventions** or **activations**. These two terms are sometimes viewed as being mutually interchangeable, however, they do each have their own distinct meanings, which should be used when referring to TPWS brake demands associated with category A SPADs, as follows:

a) TPWS Intervention

A TPWS intervention occurs when the TPWS applies the brakes in the absence of (or prior to) the driver doing so. For example:

- A train starting against a TPWS-fitted signal at danger without authority will result in an **intervention** when the train passes the signal.
- A driver taking no action to apply the brake on approaching a signal at danger and passing over the overspeed loops too quickly will also result in an **intervention.**

In short the safety system 'intervenes' if the driver has not taken the appropriate action.

b) TPWS Activation

This occurs when a driver has already applied the brakes before the TPWS operates. For example:

- A driver might already be braking on the approach to a red signal, but still passes over the overspeed sensor too quickly, resulting in an **activation**.
- If a train passes a TPWS-fitted signal at danger, despite having applied the brakes in an attempt to stop at it, then an **activation** results.

In short the safety system 'activates' to back up the driver's brake application.

Multi-SPAD signals

At any point in time, a signal is said to be a multi-SPAD signal if there have been two or more SPADs at the signal during the five years prior to that point.

Multi-SPAD drivers

At any point in time, a driver is said to be a multi-SPAD driver if he/she has had two or more SPADs since qualification.

Appendix 3 - Potentially significant Cat A SPADs (risk ranked 16-19) Q4-2010/11

Date	Time	Signalbox	Signal	Location	Territory	Duty holder	Class	Overrun	Overlap	Total SPAD at signal since 1/1/85	Date of Previous SPAD	Total number of SPADs by Driver	Date of Driver's Previous SPAD	Passenger line	TPWS operation	Signal category	Risk rank
15-Jan-11	21:50:00	Doncaster	D182	Bawtry	LNE	Freightliner	6	2035	221	1		1		Y	NIL	4	ND19
21-Jan-11	07:07:00	Ashford	NK437	Gravesend	SE	Southeastern	2	44	200	1		1		Y	NIL	3	NI16
22-Jan-11	11:48:00	Tonbridge	PE411	Tunbridge Wells Tunnel Jn	SE	Southeastern	1	100	151	1		1		Y	ACT	3	NJ16
29-Jan-11	17:52:00	Marston Vale	MV24	Millbrook	LNW	London Midland	2	165	0	1		1		Y	ACT	2	ND18
04-Feb-11	19:04:00	Glasgow	G624	Polokshields West	Sc	First ScotRail	2	69	289	1		2	29-Sep-93	Y	NIL	4	ND18
04-Feb-11	21:36:00	Glasgow	G624	Polokshields West	Sc	First ScotRail	2	69	262	2	04-Feb-11	1		Y	NIL	4	ND18
08-Feb-11	09:28:00	Colchester	CO326	Ipswich	SE	National Express East Anglia	1	4	219	1		3	07-Jun-05	Y	INT	4	NG16
15-Feb-11	17:29:00	Wimbledon	W162	Durnsford Road	SE	South West Trains	5	25	200	3	12-May-97	2	06-Sep-09	Y	NIL	4	NI19
26-Feb-11	08:15:00	Rugby	TK5191	Ledburn Jn	LNW	London Midland	2	11	220	1		1		Y	INT	4	YJ18
01-Mar-11	07:55:00	Slough	SN30	Subway Jn	W	First Great Western	1	12	212	3	16-Jun-00	1		Y	ACT	2	YJ17
09-Mar-11	09:37:00	London Bridge	L84	Borough Market Jn	SE	Southeastern	2	4	17	2	18-Oct-00	1		Y	INT	4	NG16
15-Mar-11	00:05:00	Kings Cross	K508	New Barnet	LNE	Freightliner	4	83	374	1		1		Y	ACT	3	NJ18
25-Mar-11	11:54:00	Wimbledon	W315	Wandsworth Town	SE	South West Trains	5	5	200	2	15-Aug-03			Y	NIL	4	NI18
28-Mar-11	06:53:00	Ashford	NK484	Gravesend	SE	Southeastern	2	5	0	1		2	12-Sep-07	Y	NIL	4	NF16

Appendix 4 - Potentially severe Cat A SPADs (risk ranked 20+) - 2010/11

Quarter	Date	Time	Signalbox	Signal	Location	Territory	Duty holder	Class	Overrun	Overlap	Total SPAD at signal since 1/1/85	Date of Previous SPAD	Total number of SPADs by Driver	Date of Driver's Previous SPAD	Passenger line	TPWS operation	Signal category	Risk rank
Q1	12-Apr-10	18:19	Edinburgh	EH507	Haymarket	Sc	First Transpennine Express	1	10	5	1		2	01-Nov-93	Y	NIL	4	NI20
	28-May-10	18:55	Liverpool St	L731	Springfield	A	National Express East Anglia	1	525	200	1		2	18-June-03	Y	NIL	4	NI23
	23-Jun-10	17:44	Yoker	YH527	Anniesland	Sc	First Scotrail	2	278	91	11	28-May-03	1		Y	NIL	3	NH20
Q2	26-Jul-10	16:21	Saltley	SY456	Landor St Jn	LNW	DB Schenker	6	224	0	2	3-Jun-06			N	NIL	P	YD20
	30-Sep-10	16:33	Victoria	VS157	Kent House	Kt	Southeastern	2	493	310	1		2	11-July-06	Y	R&C	4	NI21
Q3	11-Oct-10	14:45	Henwick	HK21	Henwick	W	First Great Western	1	3762	0	4	15-Dec-04	1		Y	NIL	S	NH21
	19-Oct-10	17:47	Merseyrail	ML1763	Rock Ferry	LNW	Merseyrail	5	66	0	6	23-Nov-05	1		Y	NIL	P	YI20
	03-Nov-10	07:45	Kings Cross	K180	Welwyn Garden City	LNE	First Capital Connect	5	330	0	3	28-Mar-03	1		N	NIL	P	NB22
	04-Nov-10	08:50	Saltley	SY395	Tamworth	LNW	CrossCountry	1	594	301	2	24-Nov-09	1		Y	ACT	3	NJ25
	25-Nov-10	10:10	York	Y438	Thirsk	LNE	Freightliner	6	440	200	1		1		Y	NIL	3	NI21
	10-Dec-10	23:10	Victoria	VC160	Streatham Hill	SE	Southern	5	301	0	1		1		Y	NIL	P	ND20
	17-Dec-10	09:32	Truro	T7	Truro	W	Amey Rail	6	8474	0	1		2		Y	NIL	S	ND20
	20-Dec-10	09:45	Bristol	B9	Uphill Jn	W	First Great Western	1	380	298	1		1		Y	ACT	3	YC26
	29-Dec-10	13:45	Victoria	VS62	Battersea	SE	DB Schenker	6	275	131	1		2	22-May-01	Y	TSO	3	NE20
	31-Dec-10	19:27	York	Y195	Dringhouses	LNE	CrossCountry	1	200	252	1		1		Y	NIL	4	NI20
Q4	15-Jan-11	23:32	Feltham	F398	Richmond	Wx	South West Trains	5	405	0	1		2	04-Nov-07	Y	NIL	P	ND20
	14-Mar-11	00:52	Three Bridges	T184	Stoats Nest Jn	Sx	First Capital Connect	2	400	200	3	8-Feb-96			Y	R&C	4	ND20

Full details of all category A SPADs for the review period, plus historic data from January 1998, is available at www.opsweb.co.uk

Appendix 5 - Signals with 3 or more SPADs during last 5 yrs. (As at 2 March 2011)

This appendix lists those signals which have been passed at danger three (or more) times during the five-year period ending 26 March 2011. Lists of those signals which fall within the standard definition of a multi-SPAD signal (2 or more occasions in five years) are produced every week and posted at www.opsweb.co.uk

Route	Signal	Location	Line	ELR	Signalbox	Date of latest SPAD	Total events since 1/1/1985	Events in current five years	Tag	Signal TPWS fitted	Gantry	Highest risk ranking score
Anglia	CO328	East Suffolk Jn	Up/Down Lowestoft (Up Direction)	LTN1	Colchester	22/03/2010	14	3	T22	Y	N	16
	GB10	**Gunnersbury**	**Up North London**	**SAR1**	**Richmond**	**05/03/2011**	**7**	**4**	**M**	**N**	**N**	**10**
	GB14	Kew Gardens	Up Richmond	SAR2	Richmond	12/08/2009	3	3	M	N	N	24
	L1072	Broxbourne	Up Main	BGK0	Liverpool Street	18/12/2010	3	3	M	N	N	19
	L91	Bethnal Green	Down Suburban	LTN1	Liverpool St	23/10/2010	6	3	M	N	Y	22
	UR702	Low St	Up Tilbury	TLL0	Upminster	27/06/2010	3	3	M	N	N	18
	UR708	East Tilbury	Up Tilbury	TLL0	Upminster	27/06/2010	3	3	M	N	N	18
Kent	L18	Waterloo East	Up Slow	NKL0	London Bridge	23/02/2008	5	4	M	Y	Y	11
	L45	**Metropolitan Jn**	**Down Slow**	**XTD0**	**London Bridge**	**23/02/2011**	**5**	**4**	**M**	**Y**	**Y**	**11**
	L70	Cannon Street	B Line	CBM0	London Bridge	21/05/2010	8	5	M	Y	Y	16
	L91	Borough Market Jn	Down Main	CBM0	London Bridge	19/01/2010	4	3	M	Y	Y	0
	NK494	Dartford Jn	Reversible (Up Dir)	HDR0	Ashford	16/01/2010	7	3	M	Y	Y	13

	NK495	Dartford	Reversible (Dn Dir)	HDR0	Ashford	25/01/2010	9	4	M	Y	Y	14
LNE	K697	Hitchin	Down Slow	ECM1	Kings Cross	05/11/2010	7	3	M	Y	N	16
	L3654	Leeds Station	Up Through	LWW1	York	19/07/2007	4	3	M	Y	Y	17
	S908	Hunslet Station Jn	Reception Line	TJC3	York	29/04/2009	3	3	M	N	N	10
	T198	Tyne Yard	Up & Down Goods Line	ECM5	Tyneside	12/02/2008	3	3	M	N	N	15
LNW	DJ505	Deansgate Jn	Outbound Line	CDM1	Deansgate Jn	14/03/2009	10	4	IN	N	Y	17
	LJ7302	Tyseley	Carriage Wash Line	DCL0	West Midlands	08/10/2010	3	3	M	N	N	13
	ML556	Conway Park	Up West Kirby	CWK1	Merseyrail	07/12/2008	3	3	M	N	N	12
	WM284	Euston	Line C	LEC1	Wembley Mainline	24/12/2010	5	4	M	Y	Y	13
	WS35	Stonebridge Park	Down Dc	CWJ0	Wembley Mainline	07/03/2009	15	6	IN	N	N	16
	WS55	Harrow & Wealdstone	Down Dc	CWJ0	Wembley Mainline	08/11/2009	11	4	IN	Y	N	11
	WS8	Queens Park	Up Dc	CWJ0	Wembley Mainline	12/05/2010	9	3	M	N	N	17
Scotland	MY334	Mossend	Down Goods	SCM2	Motherwell	28/12/2007	4	3	M	Y	N	0
Wessex	W59	Waterloo	Up Main Relief (Down Direction)	BML1	Wimbledon	22/12/2009	15	5	M	Y	Y	14
Western	B35	Bristol West Jn	Bi-Directional Carriage (Up Dir)	MLN1	Bristol Temple Mds	18/08/2008	8	3	M	Y	Y	10
	SN232	Swindon Down Yard	Siding	MLN1	Swindon	08/04/2010	4	3	M	N	N	10
	SN6195	Hayes	Up Tarmac Sidings	LCH0	Slough	19/11/2010	3	3	M	N	N	10
	SN63	Subway Jn	Line 4 (Down Direction)	MLN1	Slough	07/07/2010	15	4	T22	Y	Y	15

Note: Signals highlighted in **blue** are either new to the list or have had an additional event in the review period.

Appendix 6 – Monthly SPAD tables

All SPADs : monthly totals

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
2001/02	36	56	32	50	48	30	40	43	31	20	26	21	**433**
2002/03	22	35	40	36	37	23	58	37	27	36	23	28	**402**
2003/04	21	32	29	37	33	28	44	46	36	23	19	26	**374**
2004/05	38	31	25	43	32	36	38	27	19	26	22	34	**371**
2005/06	19	16	40	26	27	31	41	31	24	21	24	28	**328**
2006/07	24	22	29	42	24	28	41	35	30	27	13	19	**334**
2007/08	20	30	28	31	23	28	40	36	23	21	33	36	**349**
2008/09	26	23	30	30	25	19	30	28	24	21	16	20	**292**
2009/10	24	16	19	31	29	25	15	24	21	35	23	13	**275**
2010/11	24	21	29	22	19	22	31	34	34	21	17	25	**299**

SPADs risk ranked 16+ : monthly totals

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
2001/02	27	41	21	37	33	19	28	29	17	10	16	10	**288**
2002/03	12	22	28	20	17	16	33	21	16	14	13	13	**225**
2003/04	6	12	13	22	13	12	19	25	17	6	5	9	**159**
2004/05	12	8	9	16	16	13	22	12	6	7	7	11	**139**
2005/06	7	7	17	7	10	9	14	15	8	5	8	13	**120**
2006/07	8	8	7	11	6	7	17	13	12	9	3	5	**106**
2007/08	5	8	9	6	10	6	14	9	4	7	8	7	**93**
2008/09	6	4	13	14	6	6	8	9	7	7	5	4	**89**
2009/10	3	7	9	8	7	7	6	7	5	12	5	5	**81**
2010/11	7	4	11	9	7	2	9	10	12	5	5	6	**87**

SPADs risk ranked 20+ : monthly totals

Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
2001/02	7	17	8	28	14	8	15	14	7	6	5	5	**134**
2002/03	5	11	12	10	9	7	20	10	5	6	5	4	**104**
2003/04	1	1	4	8	4	6	3	9	3	1	1	2	**43**
2004/05	4	1	1	5	3	1	6	4	0	3	3	3	**34**
2005/06	1	0	2	1	1	0	2	4	2	1	3	2	**19**
2006/07	0	2	0	1	2	0	3	3	2	3	0	2	**18**
2007/08	1	2	3	3	1	2	1	3	0	3	1	1	**21**
2008/09	1	0	2	6	2	0	2	2	0	2	0	0	**17**
2009/10	1	2	1	1	0	3	1	3	3	2	1	1	**19**
2010/11	1	1	1	1	0	1	2	3	5	1	0	1	**17**

Appendix 7 – SPADs per million train miles, by RU

Data as at the end of March 2011

Passenger national rate

Rate per MTM all								Rate per MTM 16+								Rate per MTM 20+							
2005	2006	2007	2008	2009	2010	2011		2005	2006	2007	2008	2009	2010	2011		2005	2006	2007	2008	2009	2010	2011	
0.83	0.81	0.82	0.75	0.61	0.70	0.63		0.31	0.27	0.25	0.23	0.18	0.21	0.18		0.07	0.03	0.06	0.05	0.04	0.05	0.03	

Passenger train operators

	Rate per MTM all							Rate per MTM 16+							Rate per MTM 20+							
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	
Arriva Trains Wales	1.19	1.16	0.58	0.99	0.48	0.91	1.50	0.24	0.22	0.29	0.28	0.07	0.21	0.00	0.00	0.00	0.07	0.07	0.00	0.00	0.00	
c2c	1.49	0.26	0.00	0.49	0.47	0.00	0.00	0.50	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Chiltern Railways	0.74	0.00	0.34	0.50	0.32	0.84	0.00	0.19	0.00	0.17	0.17	0.00	0.17	0.00	0.19	0.00	0.17	0.00	0.00	0.00	0.00	
CrossCountry	0.45	0.28	0.50	0.32	0.65	0.46	0.00	0.28	0.11	0.11	0.16	0.20	0.25	0.00	0.06	0.00	0.00	0.00	0.10	0.10	0.00	
East Coast	0.35	0.26	0.51	0.08	0.08	0.33	0.00	0.26	0.09	0.26	0.00	0.08	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	
East Midlands Trains	0.92	0.76	0.27	1.04	0.22	0.36	0.00	0.31	0.30	0.00	0.32	0.00	0.07	0.00	0.15	0.15	0.00	0.08	0.00	0.00	0.00	
Eurostar	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
First Capital Connect	0.48	0.74	0.87	0.74	0.98	0.92	1.07	0.21	0.14	0.20	0.14	0.33	0.26	0.27	0.00	0.00	0.13	0.00	0.07	0.07	0.27	
First Great Western	0.36	0.55	0.94	0.69	0.52	0.68	0.63	0.12	0.24	0.27	0.27	0.11	0.23	0.16	0.00	0.00	0.04	0.08	0.00	0.11	0.00	
First Hull Trains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
First ScotRail	0.78	0.95	1.08	0.53	0.42	0.73	0.78	0.21	0.25	0.29	0.20	0.12	0.31	0.31	0.04	0.04	0.12	0.04	0.08	0.04	0.00	
First Transpennine Express	0.25	1.15	0.55	0.31	0.69	0.29	0.40	0.12	0.46	0.00	0.21	0.49	0.29	0.00	0.00	0.12	0.00	0.10	0.10	0.10	0.00	
Grand Central	0.00	0.00	0.00	0.00	2.90	0.00	0.00	0.00	0.00	0.00	0.00	1.45	0.00	0.00	0.00	0.00	0.00	0.00	1.45	0.00	0.00	
Heathrow Connect	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Heathrow Express	5.19	2.14	0.00	2.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
London Midland	0.00	0.00	4.41	0.74	0.76	0.55	0.89	0.00	0.00	1.89	0.16	0.07	0.00	0.59	0.00	0.00	0.63	0.08	0.00	0.00	0.00	
London Overground	0.00	0.00	21.08	1.40	1.86	0.67	2.18	0.00	0.00	0.00	0.47	1.39	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	
London Underground	2.82	2.73	2.33	1.71	2.40	1.23	1.22	0.47	0.91	0.47	0.29	0.53	0.00	0.00	0.00	0.45	0.00	0.29	0.00	0.00	0.00	
Merseyrail	1.38	1.66	1.38	1.08	0.80	2.38	0.00	0.28	0.28	0.00	0.00	0.00	1.06	0.00	0.28	0.00	0.00	0.00	0.00	0.26	0.00	
National Express East Anglia	1.02	1.06	0.91	1.09	0.95	0.45	0.40	0.31	0.35	0.25	0.40	0.25	0.05	0.20	0.05	0.05	0.10	0.10	0.10	0.05	0.00	
Nexus	0.56	0.00	1.14	0.56	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Northern Rail	1.19	0.61	0.65	0.90	0.69	0.79	0.45	0.61	0.23	0.19	0.15	0.35	0.22	0.00	0.15	0.00	0.00	0.04	0.07	0.00	0.00	
Serco Metrolink	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
South West Trains	0.89	1.26	1.18	1.00	0.51	1.05	0.50	0.28	0.65	0.49	0.36	0.08	0.36	0.50	0.04	0.08	0.08	0.16	0.00	0.04	0.17	
Southeastern	1.36	1.49	1.48	1.14	0.88	1.16	1.88	0.63	0.32	0.47	0.31	0.21	0.42	0.75	0.10	0.00	0.11	0.00	0.10	0.05	0.00	
Southern	0.74	0.57	1.13	0.63	0.82	0.79	0.56	0.26	0.26	0.31	0.19	0.18	0.09	0.00	0.16	0.05	0.10	0.00	0.00	0.05	0.00	
Victa Westlink Rail	10.20	7.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Virgin West Coast	0.50	0.43	0.21	0.36	0.09	0.31	0.37	0.36	0.14	0.14	0.24	0.00	0.13	0.00	0.07	0.00	0.07	0.00	0.00	0.04	0.00	
West Coast Railway	12.84	5.99	10.06	0.00	0.00	3.81	0.00	0.00	0.00	5.03	0.00	0.00	0.00	0.00	0.00	0.00	5.03	0.00	0.00	0.00	0.00	

Freight national rate

Rate per MTM all								Rate per MTM 16+								Rate per MTM 20+							
2005	2006	2007	2008	2009	2010	2011		2005	2006	2007	2008	2009	2010	2011		2005	2006	2007	2008	2009	2010	2011	
1.89	2.01	1.70	2.25	1.76	2.18	1.24		0.55	0.54	0.27	0.43	0.45	0.62	0.28		0.03	0.17	0.06	0.12	0.10	0.11	0.00	

Freight train operators

	Rate per MTM all							Rate per MTM 16+							Rate per MTM 20+							
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	
DB Schenker	2.24	2.29	2.08	2.74	2.09	2.67	0.78	0.62	0.57	0.26	0.51	0.56	0.79	0.00	0.04	0.26	0.10	0.17	0.07	0.14	0.00	
Direct Rail Services	0.00	0.00	1.29	2.49	0.46	1.05	3.18	0.00	0.00	0.64	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Freightliner	1.37	1.58	1.00	1.70	1.70	1.85	1.94	0.53	0.32	0.20	0.38	0.50	0.41	0.78	0.00	0.00	0.00	0.09	0.20	0.10	0.00	
GB Railfreight	0.77	2.72	2.45	1.65	1.48	1.46	0.00	0.00	2.04	0.61	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Infrastructure companies

	Number of category A SPADs							Number of 16+ category A SPADs							Number of 20+ category A SPADs							
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	
Alstom	0	0	0	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	
Amey Rail	0	1	0	2	2	3	0	0	1	0	0	0	2	0	0	0	0	0	0	1	0	
Babcock Rail	2	3	2	3	0	0	1	2	1	1	2	0	0	0	0	0	0	0	0	0	0	
Balfour Beatty Rail	2	4	1	2	5	2	2	0	0	1	1	3	1	0	0	0	0	0	0	0	0	
Carillion Rail	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Colas	2	4	4	2	3	1	0	1	3	1	1	0	0	0	0	1	0	0	0	0	0	
Harsco Rail	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Jarvis Rail	4	5	2	5	2	0	0	2	2	1	2	1	0	0	0	0	0	0	0	0	0	
Serco Rail Operations	1	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
VolkerRail	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

This table is divided into three sections: All SPADs, 16+ SPADs and 20+ SPADs. The national SPAD rates for each risk ranking band are also shown, highlighted in yellow. Those RUs which have a SPAD rate which is lower than the national rate for both 'all SPADs' and for '16+ SPADs' are coloured green. Those with one such rate lower than the national rate, and one higher are coloured orange, whereas those with both rates higher than the national rate are coloured red. The '20+ SPAD' rates are not reflected in the colour coding, due to the small number of events per company.

The infrastructure companies' SPADs are not normalised as it would be inappropriate to do so in view of the limited number of miles accrued by these undertakings. Instead, raw SPAD numbers are given. Alstom's SPAD figures are also raw SPAD numbers, as the miles accrued are small.

Appendix 8 – SPADs normalised by driver population

NB: This table now reads chronologically from left to right for consistency with Appendix 7

Annual SPAD rate per 100 drivers per month

Driver Owner	2006	2007	2008	2009	2010	2011
Passenger train operators						
Arriva Trains Wales	0.24	0.12	0.19	0.37	0.69	0.26
c2c	0.05	0.00	0.10	0.38	0.00	0.00
Chiltern Railways	0.00	0.07	0.11	0.30	0.75	0.00
CrossCountry			0.09	0.81	0.62	0.00
East Midlands Trains			0.60	0.56	0.93	0.00
Eurostar	0.00	0.00	0.00	0.00	0.00	0.00
Grand Central			0.00	0.00	0.00	0.00
First Capital Connect		0.13	0.18	0.96	0.89	0.26
First Great Western		0.24	0.17	0.53	0.68	0.15
First Hull Trains	0.00	0.00	0.00	0.00	0.00	0.00
First Scotrail	0.22	0.25	0.11	0.39	0.67	0.18
First TransPennine	0.28	0.14	0.08	0.78	0.44	0.11
Heathrow Express	0.21	0.00	0.17	0.00	0.00	0.00
London Midland			0.13	0.63	0.46	0.17
London Overground			0.15	0.78	0.39	0.39
London Underground	0.06	0.05	0.05	0.32	0.14	0.04
Victa Westlink Rail	0.64	0.00	0.00	0.00	0.00	0.00
Merseyrail	0.23	0.19	0.16	0.47	1.41	0.00
National Express East Anglia	0.22	0.19	0.23	0.79	0.37	0.08
East Coast			0.05	0.10	0.42	0.00
Nexus	0.00	0.10	0.05	0.00	0.22	0.00
Northern Rail	0.12	0.11	0.16	0.52	0.58	0.08
Stagecoach Metrolink	0.15	0.15	0.15	0.60	0.30	0.00
Southern	0.11	0.22	0.13	0.74	0.74	0.12
Southeastern	0.26	0.27	0.21	0.60	0.88	0.35
South West Trains	0.24	0.22	0.18	0.38	0.77	0.09
Virgin Trains	0.10	0.05	0.12	0.13	0.47	0.13
West Coast Railways	0.28	0.56	0.00	0.00	0.83	0.00
average group rate	***0.16***	***0.16***	***0.15***	***0.51***	***0.60***	***0.13***
Freight operators						
Direct Rail Services	0.00	0.17	0.30	0.30	0.60	0.30
DB Schenker	0.21	0.17	0.22	0.56	0.71	0.06
Freightliner	0.27	0.18	0.55	2.09	2.21	0.62
GB Railfreight	0.53	0.53	0.21	0.83	0.83	0.00
Serco Railtest	0.00	0.00	0.45	0.00	0.00	0.00
average group rate	***0.22***	***0.18***	***0.27***	***0.72***	***0.86***	***0.13***
Infrastructure maintenance						
Amey Railways	0.17	0.00	0.34	1.36	2.04	0.00
Balfour Beatty Rail	0.31	0.08	0.17	1.70	0.68	0.68
Babcock Rail	0.63	0.42	0.45	0.00	0.00	0.61
Carillion Rail	0.06	0.06	0.00	0.00	0.25	0.00
Colas Rail	0.58	0.58	0.11	0.64	0.21	0.00
VolkerRail	0.00	0.38	0.00	0.00	2.38	0.00
Fastline	0.25	0.10	0.25	0.40	0.00	0.00
average group rate	***0.26***	***0.16***	***0.17***	***0.58***	***0.44***	***0.15***

Appendix 9 – RU SPADs – Year-on-year comparison

Company performance – year-on-year – All SPADs

Train Operator	Previous annual total	Current annual total	Difference in annual totals	Annual change significant
CrossCountry	14	7	-7	-
Balfour Beatty Rail	5	2	-3	-
First Transpennine Express	6	3	-3	-
London Midland	12	9	-3	-
National Express East Anglia	14	11	-3	-
Jarvis Rail	2	0	-2	-
Grand Central	2	0	-2	-
Colas	3	1	-2	-
London Overground	5	3	-2	-
East Midlands Trains	5	3	-2	-
London Underground	7	5	-2	-
c2c	1	0	-1	-
Carillion Rail	1	0	-1	-
Heathrow Express	0	0	0	-
Serco Rail	0	0	0	-
Transpennine Express	0	0	0	-
Amec Rail	0	0	0	-
Gatwick Express	0	0	0	-
Serco Rail Operations	0	0	0	-
First Hull Trains	0	0	0	-
Heathrow Connect	0	0	0	-
Serco Metrolink	1	1	0	-
Alstom	1	1	0	-
Amey Rail	2	2	0	-
Merseyrail	5	5	0	-
Southern	18	18	0	-
Freightliner	20	20	0	-
Babcock Rail	0	1	1	-
Harsco Rail	0	1	1	-
Nexus	0	1	1	-
GB Railfreight	1	2	1	-
Chiltern Railways	3	4	1	-
Virgin West Coast	4	5	1	-
Northern Rail	20	21	1	-
Direct Rail Services	1	3	2	-
DB Schenker	29	31	2	-
Arriva Trains Wales	11	14	3	-
First Capital Connect	13	16	3	-
First Great Western	15	18	3	-
East Coast Main Line	0	4	4	-
South West Trains	16	23	7	-
Southeastern	20	27	7	-
First ScotRail	11	19	8	-

Appendix 10 – Details of SPADs risk ranked 20+

There were two SPADs with a risk ranking of 20+ during Q4-2010/11. The details are as follows:

- **SPAD risk ranking 20** - On 15 January, an empty coaching stock train passed F398 signal at danger on the up line at Richmond (Wessex Route) by 405 yards. The main reason for the high risk ranking of this SPAD is that (a) this is a position light signal that is not required to be fitted with TPWS, and (b) the consequences, had a collision occurred, could have been relatively high due to the possibility of a head-on collision with a passenger train.
- **SPAD risk ranking 21** - On 13 March, a passenger train passed T184 signal at Stoats Nest Jn. (Sussex Route) by a short distance whilst the signal was showing a blank aspect. (The signal was blank owing to its undergoing tests following a report of an irregular aspect sequence.) The train was stopped by a TPWS intervention, but the driver then reset the TPWS and continued forward without authority, subsequently stopping the train approximately 400 yards beyond the signal. The main reasons for the high risk ranking of this SPAD are that: (a) the probability of a collision was high because, with the benefit of TPWS being negated, the train passed the conflict point, and (b) the consequences, had a collision occurred, could have been relatively high due to the possibility of a rear-end collision between two passenger trains where the permissible speed is 80mph.

As the information is taken from initial reports, it is subject to change pending the findings of investigations.

Appendix 11 – ‘T22’ and ‘IN’ signals

The signals listed below are those which were cited in the two post-Ladbroke Grove Improvement Notices, and which remain classified as Multi-SPAD as at the end on March 2011.

Improvement notices’ signals remaining multi-SPAD

Multi-tag	Route	Signal	Line	Location	ELR	Signalbox	Date of latest SPAD	Maximum risk ranking	Events since 1985	Events in current 5 years	Date when signal will drop off list (If no further SPAD)
T22	Anglia	CO328	Up/Down Lowestoft (Up Direction)	East Suffolk Jn	LTN1	Colchester	22/03/2010	16	14	3	27/04/2014
	Anglia	L100	Up Suburban	Bethnal Green	LTN1	Liverpool Street	18/01/2008	14	13	2	30/01/2012
	Sussex	T22	Up London Bridge Slow	Norwood Jn	LBW0	Three Bridges	01/01/2011	14	16	2	23/05/2014
	Western	SN63	Line 4 (Down Direction)	Subway Jn	MLN1	Slough	07/07/2010	15	15	4	17/02/2013
IN	Anglia	L491	Down Electric	Shenfield	LTN1	Liverpool Street	06/12/2007	18	7	2	01/09/2011
	Kent	L120	No 6 Up Line	London Bridge	LBW0	London Bridge	06/09/2010	10	10	2	05/10/2012
	LNE	P84	South Up Departure	Peterborough	ECM1	Peterborough	19/12/2007	18	8	2	30/10/2012
	LNW	DJ502	Inbound Line	Deansgate Jn	CDM1	Deansgate Jn	30/09/2009	20	7	2	11/03/2012
	LNW	DJ505	Outbound Line	Deansgate Jn	CDM1	Deansgate Jn	14/03/2009	17	10	3	28/10/2013
	LNW	ML23	Down Southport	Liverpool Central	HXS1	Merseyrail	16/02/2010	12	5	2	26/06/2012
	LNW	MP63	Down Slow	Longsight	CMP2	Manchester Piccadilly	25/06/2010	13	11	2	22/05/2013
	LNW	WS21	Down Dc	Kensal Green	CWJ0	Wembley Mainline	20/08/2009	14	14	2	13/03/2013
	LNW	WS35	Down Dc	Stonebridge Park	CWJ0	Wembley Mainline	07/03/2009	16	15	6	23/01/2014
	LNW	WS55	Down Dc	Harrow & Wealdstone	CWJ0	Wembley Mainline	08/11/2009	11	11	3	05/03/2013
	Sussex	T332	Up Main	Copyhold Jn	VTB3	Three Bridges	11/11/2008	16	8	2	24/05/2013
	Western	SN276	Up Relief	Southall West Jn	MLN1	Slough	14/11/2010	18	5	2	01/02/2014
	Western	TR134/R134	Down Relief	Reading East	MLN1	Reading	19/08/2010	22	14	2	16/07/2011

Notes applicable to Appendices

Duty holder	This is the name of the railway undertaking responsible for the train at the time of the SPAD. It should be noted that this company is not always the driver's employer.
Train class	**1** - express passenger **2** - local passenger **3** - parcels/select empty coaching stock ECS **4** - express freight/freightliner **5** - empty coaching stock (ECS), **6, 7** or **8** - freight/engineering **9** - Eurostar. **0** - light locomotive
Overlap column	A *blank* indicates the overlap is not known, a *0* indicates that the signal has no overlap, *other figures* are the distances in yards.
Total number of SPADs by driver	**0** - Provisionally driver not implicated in the SPAD. The number of SPADs by the driver is as reported by the train operator (mostly in information supplied directly to ORR. SPADs in previous employment may not be included.
Multi-tag column	**T22** - One of the original multi-SPAD lists ('Top 22' in the 1998/1999 Year-end Safety Performance Report) **IN** - With more than two SPADs since 1 April 1994 and subject to Improvement Notice I/RJS/991007/1. Note: the Improvement Notice requirement is for the period 9 October 1994 to 8 October 1999, however, actual coverage is from 1 April 1994. **M** – The signal meets the criteria to be classified as 'Multi-SPAD'
Passenger line	This shows whether the signal passed is on a line on which passenger trains operate or does it control entry onto a line over which passenger trains run - Yes/No
TPWS operation	**ACT** Activation (Driver braked before TPWS initiated a brake application) **INT** Intervention (TPWS brake application before or without driver action) **A/I** TPWS initiated a brake application, but not known if Act or Int **NIL** No brake demand (non-fitment or short distance o/run) **NTI** No brake demand (token issued: Loops suppressed) **R&C** TPWS initiated a brake application, but TPWS reset by driver, then continued **TSO** No brake demand (Train Stop Override operated) **UNK** Not known whether TPWS applied brakes
Signal category	**2** two aspect colour light **3** three aspect colour light **4** four aspect colour light **D** disc **F** fixed signal (old) **FC** fixed colour light **FD** fixed distant **FS** fixed stop **H** hand signal **I** points indicator **L** limit of shunt (old) **LB** limit of shunt (board) **LP** limit of shunt (position light) **M** marker boards **O** other **P** position light **S** semaphore **SS** semaphore subsidiary **T** stop board **X** drivers crossing light