



## Category A SPAD and TPWS activity report, Quarter 3 – 2010/2011

If you would like to give feedback on any of the material contained in this report, or if you have any suggestions for future editions, please contact:

**Roger Badger**  
Senior Safety Intelligence Analyst  
RSSB  
Block 2, Angel Square  
1 Torrens Street  
London EC1V 1NY  
020 3142 5484  
Mail to: [roger.badger@rssb.co.uk](mailto:roger.badger@rssb.co.uk)

The report may be downloaded from the RSSB website: [www.rssb.co.uk](http://www.rssb.co.uk).

Additional hard copies may be ordered at cost price by contacting the RSSB enquiry desk on 020 3142 5400.

© Rail Safety and Standards Board 2011

<b>1</b>	<b>Introduction</b>	<b>7</b>
1.1	Report scope	7
1.2	SPAD risk	7
1.3	Data quality	7
1.4	Operational safety	8
<b>2</b>	<b>Industry developments</b>	<b>9</b>
<b>3</b>	<b>SPAD performance</b>	<b>10</b>
3.1	SPAD numbers	10
3.1.1	Key Facts: December 2010	10
3.1.2	Key Facts: Quarter 3-2010/11 – 1 October to 31 December 2010	10
3.1.3	SPAD numbers	11
3.2	SPADs risk ranked 16+ and 20+	12
3.2.1	SPADs risk ranked 16+	12
3.2.2	SPADs risk ranked 20+	13
3.2.3	SPAD trends	13
3.3	SPAD risk	15
3.4	Other SPAD issues	17
3.4.1	Brake performance in wintry conditions	17
3.4.2	European Rail Traffic Management System (ERTMS)	18
3.4.3	Railway Group Standard GO/RT3119 – Version 2	18
3.5	TPWS brake demands at category A SPADs	19
3.5.1	Brake demand numbers	19
3.5.2	TPWS Reset & Continue	20
<b>4</b>	<b>SPAD performance by route</b>	<b>21</b>
4.1	SPAD numbers by route	21
<b>5</b>	<b>SPAD performance by Railway Undertaking</b>	<b>23</b>
5.1	SPAD performance	23
5.1.1	SPADs year-on-year by Railway Undertaking	23
5.2	Railway Undertakings - freight	24
5.3	Engineering machines	24
5.4	Possession-related SPADs	25
5.4.1	SPADs entering, leaving, or within a possession	25
5.5	Normalised SPAD performance	26
5.5.1	SPADs normalised by million train miles	26
5.5.2	SPADs normalised by driver population	27
<b>6</b>	<b>Further analysis of SPAD occurrence</b>	<b>28</b>
6.1	SPADs by train type	28
6.2	SAS and SOY SPADs	29
6.3	Multi-SPAD signals and drivers	31

6.3.1	The multi-SPAD signal population	31
6.3.2	Improvement Notice signals (T22 & IN)	31
6.3.3	Multi-SPAD drivers	33
<b>7</b>	<b>Train Protection and Warning System</b>	<b>34</b>
7.1	TPWS Brake Demands at signals	34
7.2	TPWS Brake Demands at PSRs	34
7.3	TPWS Brake Demands approaching buffer stops	35
7.4	Interventions and activations at Category A SPADs	36
7.5	TPWS 'Reset and Continue' (at Category A SPADs)	37
<b>8</b>	<b>SPADs: an international perspective</b>	<b>38</b>
8.1	SPAD-related events in Europe	38

## Index of charts

Chart 1	All SPADs – monthly variation	11
Chart 2	SPADs risk ranked 16+ – monthly variation	12
Chart 3	All SPADs – Annual moving totals	14
Chart 4	Change in SPAD risk Since Sept 2006.	16
Chart 5	TPWS activity at category A SPADs	19
Chart 6	TPWS activations and interventions at category A SPADs	20
Chart 7	SPADs by Route – AMMA	21
Chart 8	SPADs by Route – AMMA	22
Chart 9	SPADs by Freight Railway Undertakings	24
Chart 10	SPADs by engineering machines	25
Chart 11	Possession related SPADs	25
Chart 12	Annual SPAD numbers, normalised by million train miles	27
Chart 13	SPADs by train type - Annual Moving Totals	28
Chart 14	SAS & SOY SPADs	29
Chart 15	SAS SPADs – by train type	30
Chart 16	SOY SPADs – by train type	30
Chart 17	Multi-SPAD signals – 52 weeks up to week ending 25 December 2010	31
Chart 18	'Top 22' Multi-SPAD signals: Annual SPAD rate	32
Chart 19	Numbers of SPADs attributed to driver.	33
Chart 20	TPWS brake demands approaching signals at danger (no SPAD)	34
Chart 21	TPWS brake demands approaching PSRs	35
Chart 22	TPWS brake demands approaching buffer stops	35
Chart 23	TPWS interventions and activations at Cat A SPADs	36

**Index of tables**

**Table 1 All SPADs – monthly, quarterly and annual totals 11**

**Table 2 16+ SPADs – monthly, quarterly and annual totals 12**

**Table 3 SPADs risk ranked 20+ – monthly, quarterly and annual totals 13**

**Table 4 Year-on-year changes in SPAD count – All, 16+, 20+ 13**

**Table 5 Route Performance – Comparison of Moving Annual Totals 23**

**Table 6 Possession related SPADs 26**

**Table 7 Improvement notices' signals remaining multi-SPAD 33**

**All SPADs : monthly totals 48**

**SPADs risk ranked 16+ : monthly totals 48**

**SPADs risk ranked 20+ : monthly totals 48**

**Company performance – year-on-year – All SPADs 51**

## Executive summary

### At a glance

There were 34 SPADs in December, bringing the total for 2010/11 so far to 236, which compares to 204 at the same point in 2009/10. The annual moving total is now 307, against 261 a year ago.

	Current SPAD Figures	Comparison with last year
SPAD risk <sup>1</sup>	December 2009 – 63% December 2010 – 76%	■ 13% worse: Representing a 21% change over the year
All SPADs	December 2010 - 34 Q3-2010/11 - 100 12 months to date - 307	■ 62% worse ■ 67% worse ■ 18% worse
16+ SPADs	December 2010 - 12 Q3-2010/11- 31 12 months to date - 92	■ 140% worse ■ 72% worse ■ 23% worse
20+ SPADs	December 2010 - 5 Q3-2010/11- 10 12 months to date - 18	■ 67% worse ■ 43% worse ■ 6% worse

### Headlines

- **SPAD risk**

SPAD risk was 76%<sup>1</sup> at the end of Q3-2010/11. At the end of Q3-2009/10, it was 63%.

- **SPAD numbers**

There were 307 Category A SPADs in the 12 months to the end of December 2010. This compares to 261 to the same point in 2009 and a three-year average of 301. This is a statistically significant increase at the 90% confidence level.

- **Quarter 3-2010/11 SPADs**

There were 100 SPADs in Q3-2010/11. This compares with 60 during Q3-2009/10, which is 67% worse. The three-year average for Q3 is 80.

---

<sup>1</sup> Against the September 2006 baseline figure

- **December SPADs**

There were 34 Category A SPADs during December. This compares to 21 during the previous December and a three-year average of 23.

- **SPADs risk ranked 16+ and 20+**

There were 31 SPADs with a risk ranking score of 16 or more during Q3-2010/11, which compares with 18 during Q3-2009/10. This represents an increase of 72%, and an increase of 35% on the three-year average of 23.

There were ten SPADs with a risk ranking score of 20 or more during Q3-2010/11, compared to seven during Q3-2009/10.

- **SPADs involving (alleged) frozen brakes**

There have been two Category A SPADs during December, which have been alleged to have had reduced braking performance, caused by wintry weather, as a contributory factor.

- **Incidents on ERTMS line**

There was an incident at Porthmadog on the newly-commissioned ERTMS section of the Cambrian coast line in December. Although subject to investigation, this is currently being treated as a Category A SPAD.

- **Multi-SPAD signals**

Of the 155 multi-SPADs signals listed at 25 December 2010, 91 (59%) are fitted with TPWS.

- **TPWS**

Of the 100 SPADs in Q3-2010/11, 51 (51%) involved a Train Protection and Warning System (TPWS) brake demand, comprising 17 interventions, 33 activations and one where the TPWS involvement is currently unknown.

There was one TPWS 'reset and continue' event during Q3-2010/11. This occurred on 17 December, and is detailed in Section 3.5.2. This was the second such incident since December 2009, the previous one being on 30 September.

# 1 Introduction

## 1.1 Report scope

The information herein covers the period 1 October to 31 December 2010.

## 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 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 which have been 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*)<sup>2</sup> 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.

---

<sup>2</sup> See [www.rgsonline.co.uk](http://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](http://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<sup>3</sup>

*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](http://www.opsweb.co.uk).

---

<sup>3</sup> 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<sup>4</sup>) within ten years<sup>5</sup>. In the intervening period it has become clear that the roll-out of ERTMS will take considerably longer than this and hence TPWS will be the primary means of mitigating SPAD risk for a period significantly beyond that originally envisaged.

At the operational risk conference held in July 2008, the ORR gave a presentation on 'Managing and Reducing Operational Safety Risk'. In this presentation, a concern was highlighted 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](http://www.rssb.co.uk/safety/safety_strategies/TPWS%20Strategy.asp)  
There is also a TPWS strategy action plan at [www.Opsweb.co.uk](http://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](mailto:colin.dennis@rssb.co.uk).

---

<sup>4</sup> For more information on ERTMS, see [www.ertms.com](http://www.ertms.com)

<sup>5</sup> Prof. John Uff QC FREng and the Rt Hon Lord Cullen PC, *The Southall and Ladbrooke Grove Joint Inquiry into Train Protection Systems* (HSE Books, 2001).

## 3 SPAD performance

### 3.1 SPAD numbers

#### 3.1.1 Key Facts: December 2010

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

<b>December 2010:</b>	34 category A SPADs during December, which is 13 more than December 2009, which is 62% worse. December 2010 was also 50% worse than the three-year average of 23.
<b>Risk ranking:</b>	12 SPADs were risk ranked 16 or above (five of which were risk ranked 20+). This compares to five in 2009 (three of which were risk ranked 20+).
<b>TPWS:</b>	Five TPWS interventions (TPWS applied the brakes before, or in the absence of, driver action). 11 TPWS activations (the driver initiated braking before the system). One where the TPWS involvement is currently unknown. There was one 'reset and continue' event.
<b>Multi-SPADs:</b>	Eight SPADs by multi-SPAD drivers (two or more since qualifying as a driver), Three of which register within the current five-year period. Seven SPADs at multi-SPAD signals (two or more within the current five-year period).

#### 3.1.2 Key Facts: Quarter 3-2010/11 – 1 October to 31 December 2010

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

<b>Quarter 3:</b>	100 category A SPADs during Q3 2010/11, which is 40 more than Q3 2009/10, which is 67% worse. Q3-2010/11 was also 25% worse than the three-year average of 80.3.
<b>Risk ranking:</b>	31 SPADs were risk ranked 16 or above (Ten of which were risk ranked 20+). This compares to 18 in Q3-2009/10 (of which seven were risk ranked 20+).
<b>TPWS:</b>	17 TPWS interventions (TPWS applied the brakes before, or in the absence of, driver action). 34 TPWS activations (the driver initiated braking before the system). One where the TPWS involvement is currently unknown. There was one 'reset and continue' event.
<b>Multi-SPADs:</b>	23 SPADs by multi-SPAD drivers (two or more since qualifying as a driver), 13 of which register within the current five-year period. 27 SPADs at multi-SPAD signals (two or more within the current five-year period).

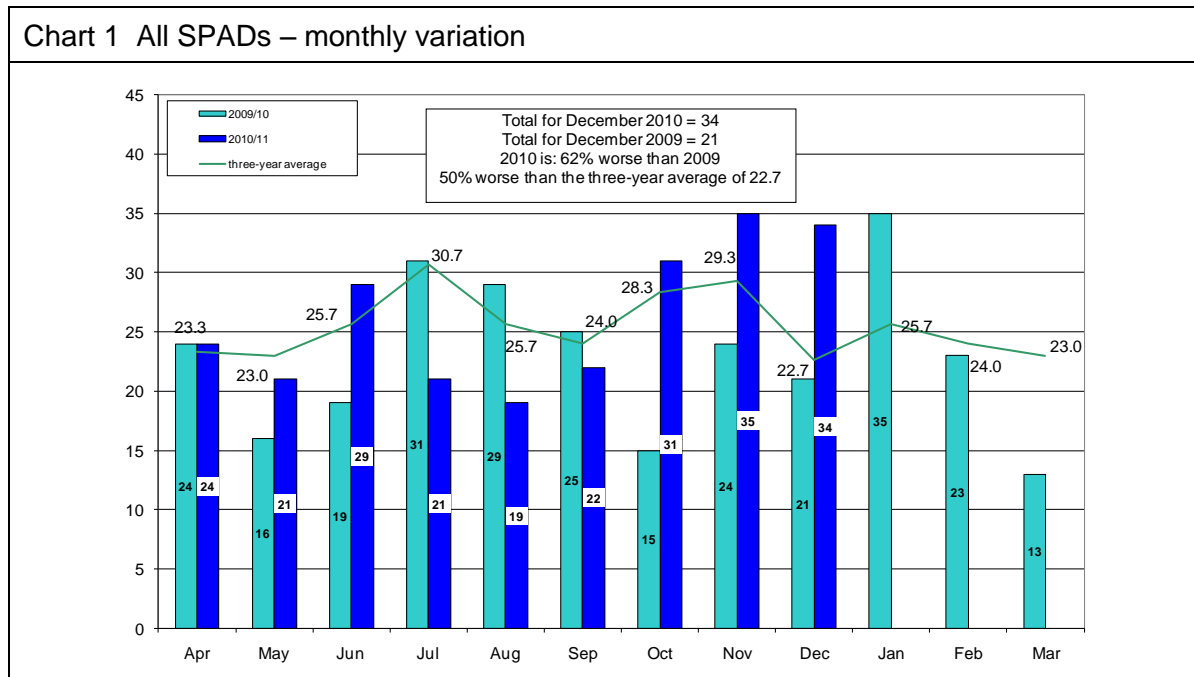
### 3.1.3 SPAD numbers

Table 1 presents the monthly, quarterly and annual totals for all category A SPADs. The coloured panels show the quarterly 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	21	19	22	31	35	34				74	62	100		
Difference from previous year	0	5	10	-10	-10	-3	16	11	13				15	-23	40		
Percentage change from previous year	0.0%	31.3%	52.6%	-32.3%	-34.5%	-12.0%	106.7%	45.8%	61.9%				25.4%	-27.1%	66.7%		
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	325.0
Percentage change against three-year avge	2.9%	-8.7%	13.0%	-31.5%	-26.0%	-8.3%	9.4%	19.3%	50.0%				2.8%	-22.8%	24.5%		

During Q3-2010/11, there were 100 SPADs, which compares with 60 during the same period in 2009/10. This represents an increase of 66.7%, as well as an increase of 24.5% against the three-year average of 80.3. This brings the total number of Category A SPADs during the 12 months to the end of December to 307.

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



## 3.2 SPADs risk ranked 16+ and 20+

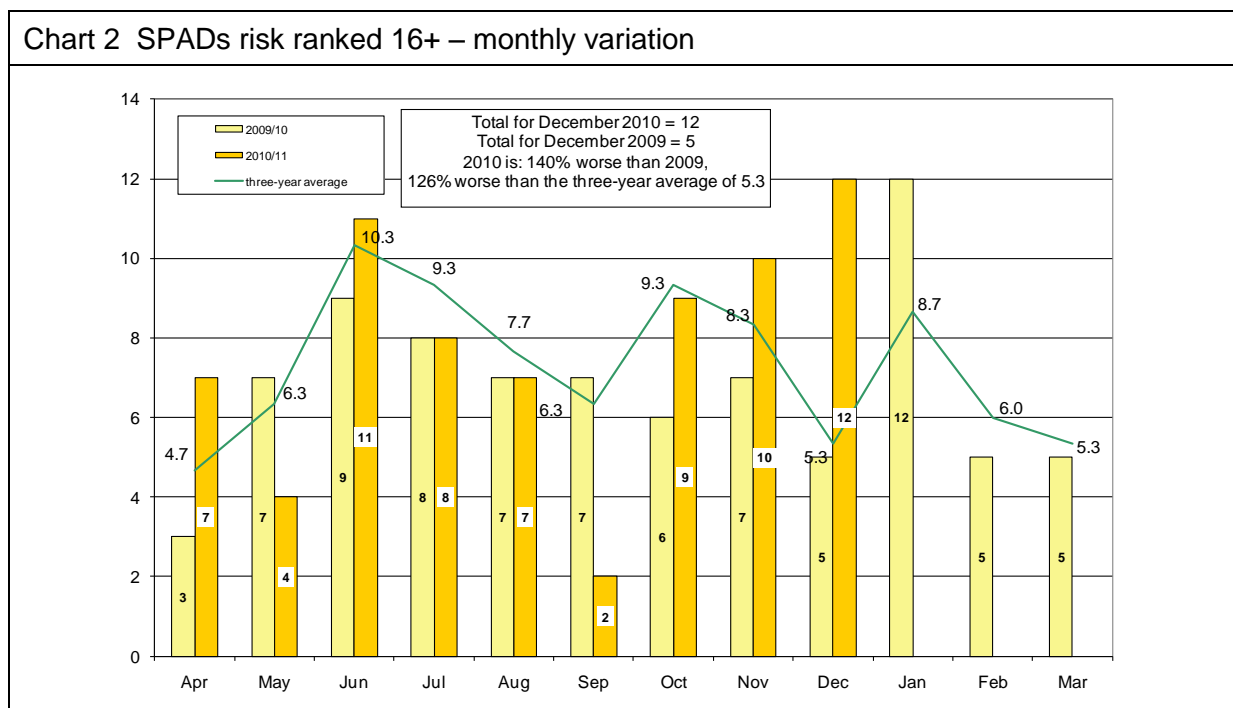
### 3.2.1 SPADs risk ranked 16+

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

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	8	7	2	9	10	12				22	17	31		
Difference from previous year	4	-3	2	0	0	-5	3	3	7				3	-5	13		
Percentage change from previous year	133.3%	-42.9%	22.2%	0.0%	0.0%	-71.4%	50.0%	42.9%	140.0%				15.8%	-22.7%	72.2%		
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	96.0
Percentage change against three-year avge	50.0%	-36.8%	6.5%	-14.3%	-8.7%	-68.4%	-3.6%	20.0%	125.0%				3.1%	-27.1%	34.8%		

There were 31 SPADs with a risk ranking score of 16 or more during Q3-2010/11, bringing the total for the 12 months to the end of December to 92. This compares to 18 in Q3-2009/10 and a three-year average of 23.0. It represents an increase of 72.2% over the same period last year.

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



### 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.

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	0	0	1	2	3	5				3	1	10		
Difference from previous year	0	-1	0	-1	0	-2	1	0	2				-1	-3	3		
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 ten SPADs with a risk ranking score of 20 or more during Q3-2010/11, which compares to seven in Q3-2009/10. Details of these ten incidents may be found in Appendix 10. This brings the total for the 12 months to the end of December to 18.

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

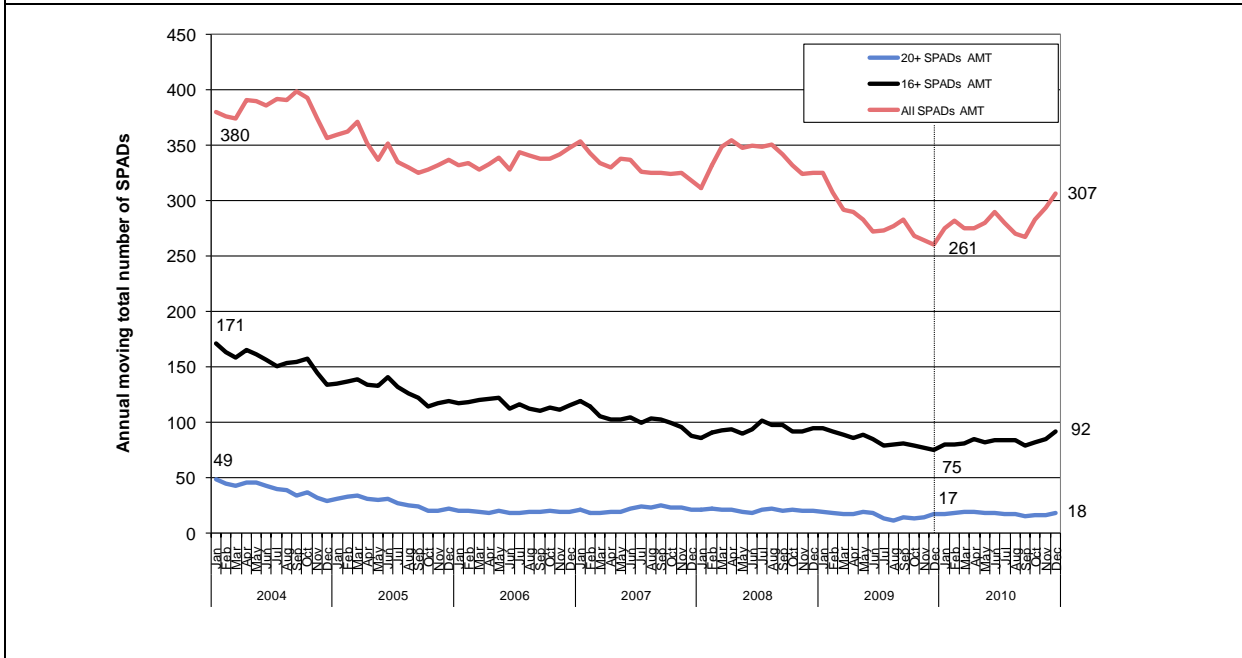
Table 4 shows a summary of the change in SPAD numbers over the 12-month periods ending December 2010 and December 2009. This indicates that overall SPAD numbers have increased by 17.6%, 16+ SPADs have increased by 22.7%, and 20+ SPADs have increased by 5.9% during the past twelve months. The increase from 261 to 307 is statistically significant at the 90% confidence level.<sup>6</sup>

	12 months ending		Difference	Percentage change	Statistically Significant?
	Dec 2009	Dec 2010			
All SPADs	261	307	46	17.6%	Yes
16+ SPADs	75	92	17	22.7%	-
20+SPADs	17	18	1	5.9%	-

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

<sup>6</sup> 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.

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.<sup>7</sup> However, this measure has shown an increase during 2010, with a marked upturn being apparent during Q3. At the end of September it was 267, whereas by the end of December it had risen to 307. The AMT for ‘16+ SPADs’ has shown a similar pattern, though less pronounced, reaching 92 as at the end of December.

Any measurement which uses an annual moving total figure will, necessarily, be as sensitive to figures dropping out of the total as it is to new figures being included. The monthly SPAD numbers which were accrued during Q3-2009/10, and which consequentially dropped out of the AMT a year later, were lower those which would normally be expected for the time of year. These figures are laid out within Table 1 in section 3 above. October 2009 had seen 15 SPADs, which was the lowest October on record<sup>7</sup> amounting to half the number during October 2008 (which was itself the lowest October prior to 2009). Both November and December were also low. November again having been the lowest on record and December the second lowest. As a result, Q3-2009/10 recorded a total of 60 SPADs: an unusually low quarterly figure, especially when recognising that the autumn months traditionally see a higher number of SPADs. All in all, autumn 2009 was good, in so far as SPAD numbers were concerned.

However, the corresponding months in Q3-2010/11 were not atypically low: they were more in keeping with normal expectations, or even marginally higher. The result of the combination of a good Q3-2009/10 and a possibly slightly inflated Q3-2010/11 is that the AMT has shown an upwards blip at the end of the calendar year.

<sup>7</sup> Since the systematic collection of SPAD data started in 1985.

The increase in SPAD numbers which was seen during the early part of 2008 elicited a lot of discussion and speculation as to what the underlying cause(s) may have been. Despite a considerable amount of analysis having been carried out at the time, no common factor could be identified. One theory which was expounded was that there may have been a link between the incidence of SPADs and the prominence of apparently unconnected events, such as the national financial situation. (It was during the latter months of 2007 that the U.K. banking crisis came to the fore, firstly with Northern Rock, and then other financial institutions.)

The increase in SPAD numbers which has been seen during the latter months of 2010 may have such a basis, though this is unconfirmed.

A further analysis of the increase in SPAD numbers indicates the following contributory factors:

- A number of SPADs, albeit a relatively small one (as discussed in section 3.4.1), have had a causal factor of wintry weather impacting upon train braking performance.
- The increase in SPADs in Q3-2010/11 has primarily involved passenger trains over other types of train (See section 6.1).
- There has been an increase in SAS SPADs. These have mainly involved multiple-unit stock and freight trains, although freight train SOY SPADs have shown a decrease (See section 6.2).

A TPWS brake demand at the OSS approaching a signal at danger is considered a pre-cursor to a Category A SPAD. It would be reasonable to expect an increase in such brake demands correlating with an increase in SPADs. However, this has not been found to have been the case. Section 7.1 examines the numbers of these brake demands and observes that there was a decrease towards the end of 2010, contrary to what may be expected when SPAD numbers increase. The annual cycle of increases and decreases in this type of brake demand appears to have little correlation with Category A SPADs.

### **3.3 SPAD risk**

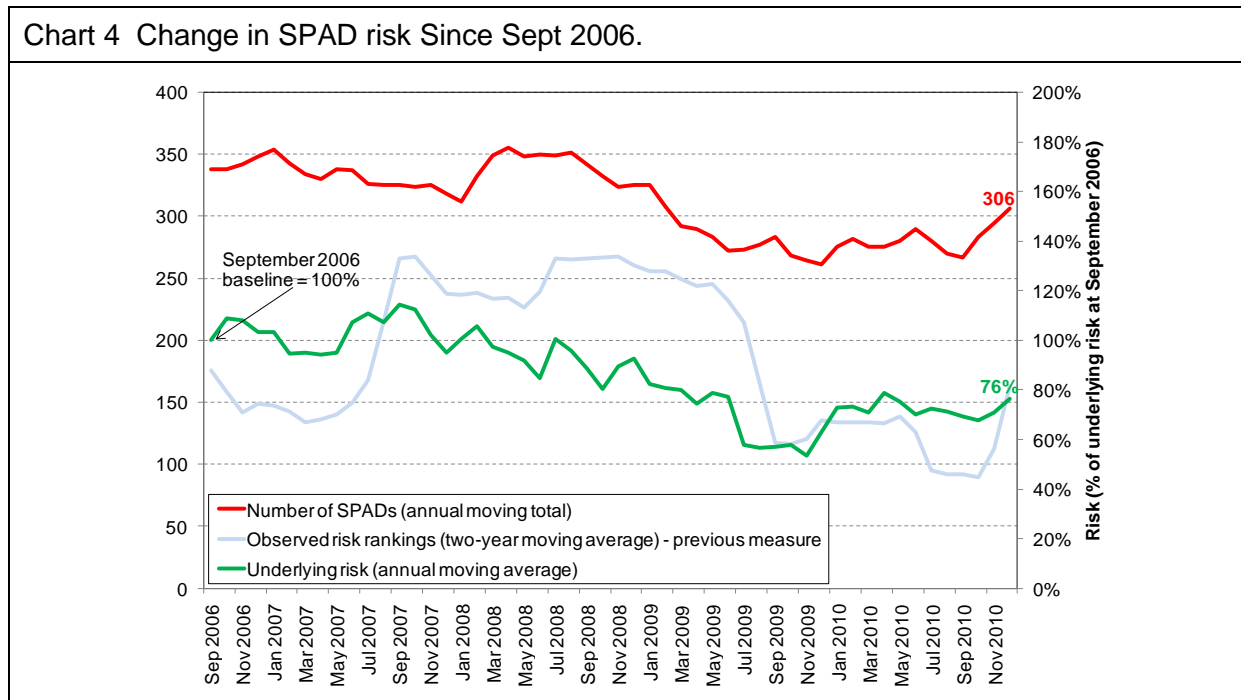
SPAD risk is calculated system-wide using a consistent and objective measure applied by the SPAD risk ranking tool (SRRT). The risk ranking score assigned to each SPAD is then used to track changes in SPAD risk over time.

SPAD risk used to be calculated using March 2001 as the benchmark date. However, as this predated the introduction of TPWS (completed at the end of 2003) and the elimination of Mk 1 rolling stock (substantially completed by the end of October 2005). The combination of both of these initiatives has had a positive effect on the level of SPAD risk. To discount these two factors from the calculations, and portray a more current indication of trends in risk, a new benchmark date of September 2006 has now been adopted.

RSSB has devised a new method of assessing trends in SPAD risk to assess whether a change in SPAD risk ranking results is representative of any underlying change in risk rather than just volatility in the data. This metric, which is less vulnerable to one high-risk SPAD

than the former measure was, is similarly based on the SPAD risk ranking tool (hence it continues to reflect changes in both frequency and potential consequence) but it is a more robust method for identifying changes in the underlying risk.

Chart 4 shows the SPAD risk, using both the new and the old metrics for comparison. Please note that this is the last time that the old metric, based on the March 2001 baseline, will be shown on this chart.



The green line shows the underlying risk from SPADs. It is modelled using the individual components of SPAD risk ranking scores over a rolling 12-month period. This indicates that the risk from SPADs has fallen to 76% of this benchmark level during the period of the chart.

This line indicates that there was an increase in SPAD risk between December 2009 and January 2010 (from 54% to 73% of the benchmark level). These two months saw a total of 56 SPADs (whereas the preceding two months had seen 39). Not only was this an increase in total SPAD numbers, but the proportions of 16+ and 20+ SPADs was also greater. In addition, the risk ranking scores within these groups were biased towards the higher end of the range.

Between January and December 2010, the SPAD risk metric has remained broadly level, showing only slight increases and decreases, during that period. As at the end of December, it was 76% of the benchmark level.

The blue line is the measure that has been used to monitor SPAD risk in previous reports, using the 'old' metric, based on the overall risk ranking scores for a rolling 24-month period. This is the measure that has been used to monitor SPAD risk in previous reports and is shown on the chart for the last time to enable a comparison to be made.

As the industry widens its operational safety net, the focus must remain on the management of resources in the mitigation of risk from Category A SPADs.

## **3.4 Other SPAD issues**

### **3.4.1 Brake performance in wintry conditions**

Severe winter weather was a major factor during 2009/10. On 22 December 2009, a freight train passed MC408 signal at danger at Carstairs (Scotland Route) by 910 yards, during which distance it also passed MC414 at danger. A collision with a passenger train was narrowly avoided by the signaller's actions. The freight train's braking performance was found to have been compromised by an accumulation of snow and ice on the brake gear. RAIB published their report into this incident on 31 January 2011, which is available at [www.raib.gov.uk](http://www.raib.gov.uk)

On 29 December 2009, Freightliner issued a notice to its drivers, reminding them of the Rule Book requirements to carry out running brake tests in snowy conditions

On 4 January 2010, a freight train passed AC336 signal at danger at Carrbridge (Scotland Route) by 520 yards, becoming derailed on the run out. As with the Carstairs incident, the train's braking performance was found to have been compromised by an accumulation of snow and ice on the brake gear. The RAIB investigation into this incident is due to be published in February 2011.

On 4 January 2010, Network Rail issued an urgent operating advice, requesting all train operators to remind drivers of module TW1, section 18 of the Rule Book. This resulted from the Carstairs and Carrbridge incidents noted above.

On 8 January 2010, a passenger train passed A146 signal at danger at Christon Bank (LNE Route) by 5 yards. Again, the train's braking performance was found to have been compromised by snow and ice.

In October 2010 the Rail Freight Operations 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.

On 3 December 2010, a freight train which had been brought to a stand at Holytown, slipped backwards despite its brakes being fully applied. A subsequent investigation revealed that the brake blocks and brake gear had iced up prior to the incident.

On 20 December 2010, a passenger train, formed by an HST set, passed B9 signal at Uphill Junction (Western Route) at danger by 380yds, running through a crossover fitted with High Performance Switch System (HPSS) points, but not derailed. When questioned, the driver stated that snow had affected braking on the approach to the signal. This SPAD has a risk ranking of 26 and is subject to an RAIB investigation.

An Urgent Operating Advice (issued under GO/RT 3350) was subsequently raised, which advised that the build up of ice and snow underneath the train had impeded its braking performance, 'despite the undertaking of the laid down brake gear de-icing tasks prior to the

train entering service that morning'. The train was withdrawn from service for post-incident tests.

On 22 December 2010, a freight train passed SD5 137 signal at Stafford North Jn. (LNW Route) at red by 12yds. When questioned, the driver cited poor braking performance as being the cause. This SPAD is subject to an investigation.

The subject of train braking performance during winter conditions was discussed by OFG at the January 2011 meeting. The issues regarding the Rules in respect of train braking is to be discussed at the next Train Operations and Management Standards Committee (TOM-SC) meeting in February.

### **3.4.2 European Rail Traffic Management System (ERTMS)**

On 3 December the driver of a passenger train reported that the train had suffered a brake demand at Porthmadog, whilst running under the recently commissioned ERTMS signalling on the Cambrian Coast line. On investigation it came to light that this was an instance of an End of Authority marker (MH1230) being passed without authority. This incident is subject to an investigation, and is currently being treated as a Category A SPAD.

Although outside the period of this report, there have since been three further incidents on the Cambrian Coast ERTMS section. These occurred on 17 January, 8 February and 17 February and are currently subject to investigation.

### **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.

GO/RT3119 sub-divides Category A SPADs into four different types: A1, A2, A3 and A4. These are detailed in Appendix 2.

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.

The categorisation of SPADs as per the requirements of the new version of this standard will be reflected in future editions of this report.

The SPAD data collection forms RT3119A and RT3119B are currently being reviewed to reflect the new categories of SPAD and to align them more closely to current SMIS data entry requirements.

### 3.5 TPWS brake demands at category A SPADs

#### 3.5.1 Brake demand numbers

Chart 5 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.

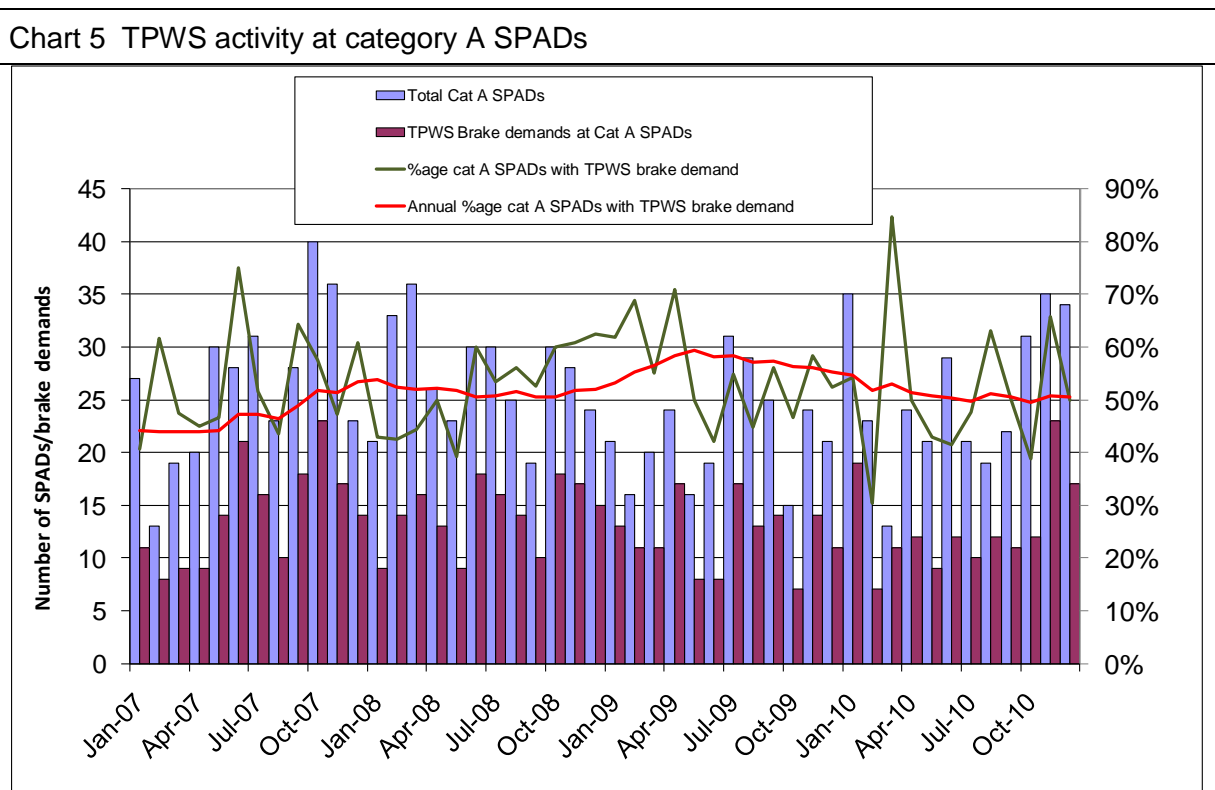


Chart 6 TPWS activations and interventions at category A SPADs

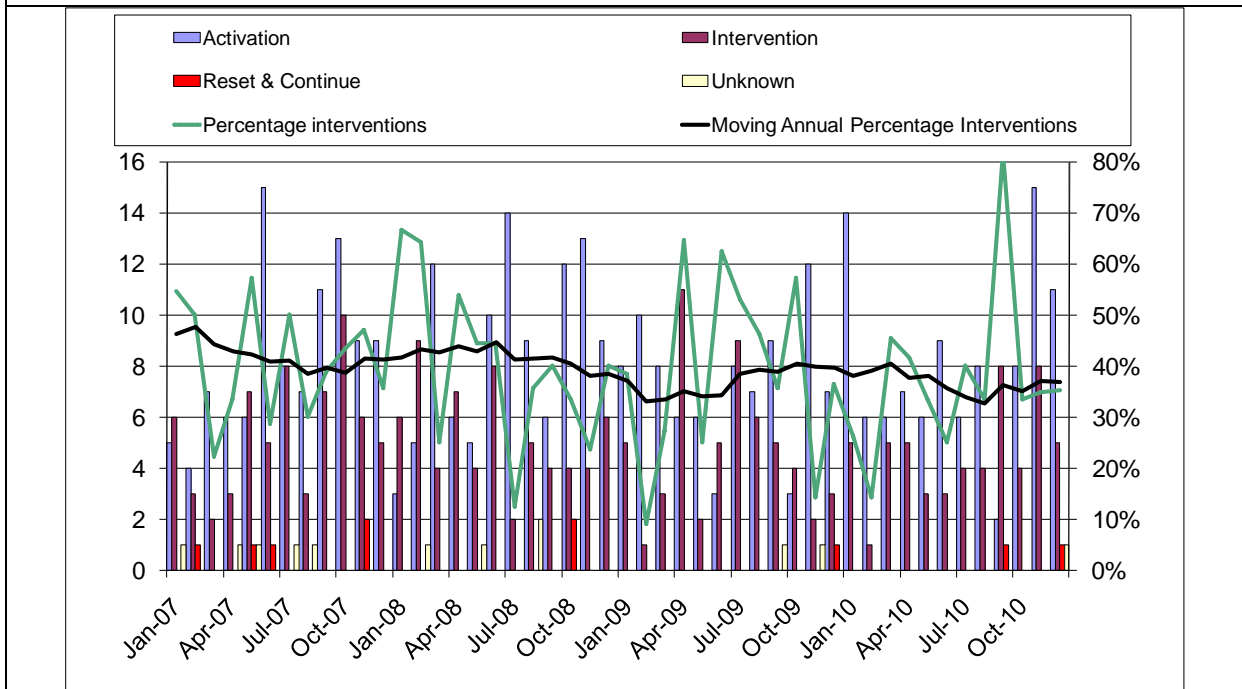


Chart 6 shows TPWS activations and interventions at Category A SPADs. The black and green lines, which are both plotted against the right-hand axis, represent the percentage of all SPADs with TPWS involvement which are interventions (green line) and the moving annual percentage (black line). From this, it may be seen that the monthly percentage does vary considerably month on month. The trend line, however, remains consistently between approximately 35%-40%.

### 3.5.2 TPWS Reset & Continue

There was one TPWS ‘reset & continue’ incident during Q3-2010/11.

On 17 December, an ECS train passed WM825 signal on the down Willesden relief line at Sudbury Jn. (LNW Route) at danger by a total of 66 yards. The train was stopped by a TPWS intervention within this distance, but the driver reset the TPWS and continued forward without authority, subsequently stopping the train at its intended stopping point, ready to make a reversing movement from beyond the signal. This SPAD has a risk ranking of 16 as the length of the overrun was short, the permissible speed was low (20mph) and the potential conflict being between two empty coaching stock trains.

Prior to this, the most recent such incident was at Kent House station (Kent Route) on 30 September 2010.

Although outside the period of this report, there has since been another ‘reset & continue’ incident. This occurred on 17 February at St. Margarets (Wessex Route) and is currently subject to investigation.

## 4 SPAD performance by route

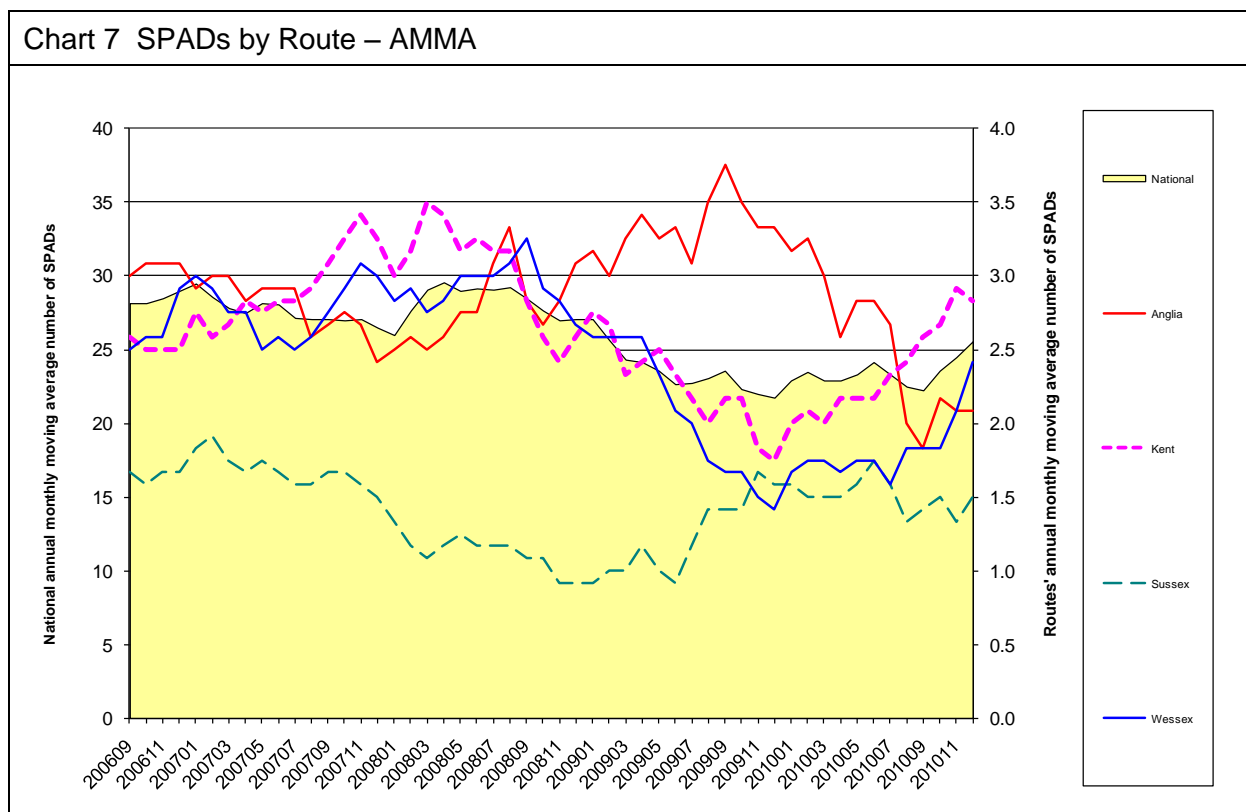
### 4.1 SPAD numbers by route

Charts 7 and 8 illustrate the annual monthly moving average (AMMA) number of SPADs, for each individual route over the past three years, plotted against the right-hand axis. The national AMMA is also shown for comparison, plotted against the left-hand axis. The Wessex, Sussex, Kent and Anglia Routes are shown on Chart 7, whereas Western, Midland & Continental, Scotland, LNE and LNW are shown separately on Chart 8 for clarity.

From Chart 7, it may be seen that the increase the Anglia Route had shown in 2009, has since reversed. SPADs on the Kent and Wessex Routes were decreasing up to the end of 2009, though they have shown an upturn during 2010.

Chart 8 shows that Scotland, LNE<sup>8</sup> 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.



<sup>8</sup> 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 8 SPADs by Route – AMMA

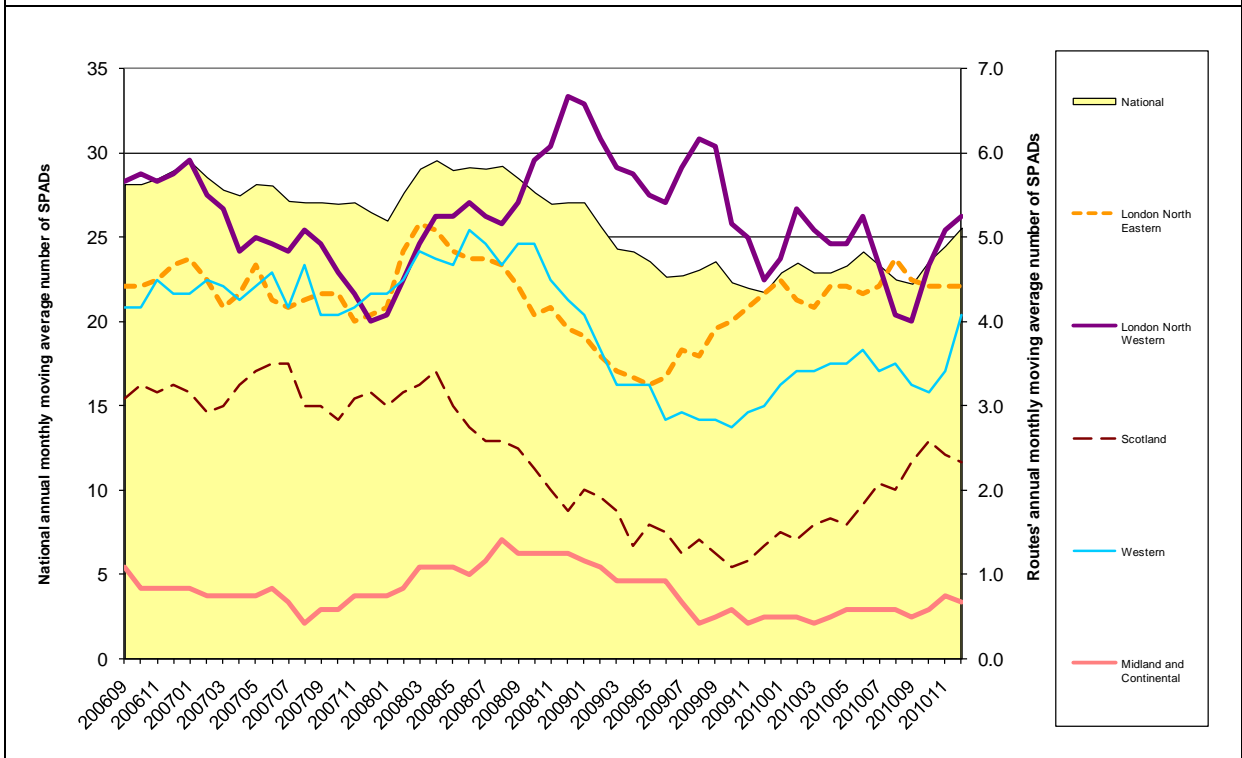


Table 5 examines performance by route for All SPADs and those risk ranked 16+. The percentage changes are based on a comparison between the annual moving totals as at the end of December 2009 and 2010. If any of the changes in SPAD numbers are statistically significant (at the 90% confidence level), then this is indicated in the right-hand column of the table.

Table 5 Route Performance – Comparison of Moving Annual Totals

	Route	Annual moving total December 2009	Annual moving total December 2010	Difference in annual total	%age change in annual rate	Annual change significant?
All SPADs	Anglia	40	25	-15	-38%	Yes
	Kent	21	34	13	62%	-
	London North Eastern	52	53	1	2%	-
	London North Western	54	63	9	17%	-
	Midland and Continental	6	8	2	33%	-
	Scotland	16	28	12	75%	Yes
	Sussex	19	18	-1	-5%	-
	Wessex	17	29	12	71%	-
	Western	36	49	13	36%	-
16+ SPADs	Anglia	13	10	-3	-23%	-
	Kent	4	12	8	200%	Yes
	London North Eastern	22	15	-7	-32%	-
	London North Western	13	13	0	0%	-
	Midland and Continental	1	2	1	100%	-
	Scotland	5	12	7	140%	-
	Sussex	6	2	-4	-67%	-
	Wessex	3	11	8	267%	Yes
	Western	8	15	7	88%	-

## 5 SPAD performance by Railway Undertaking

### 5.1 SPAD performance

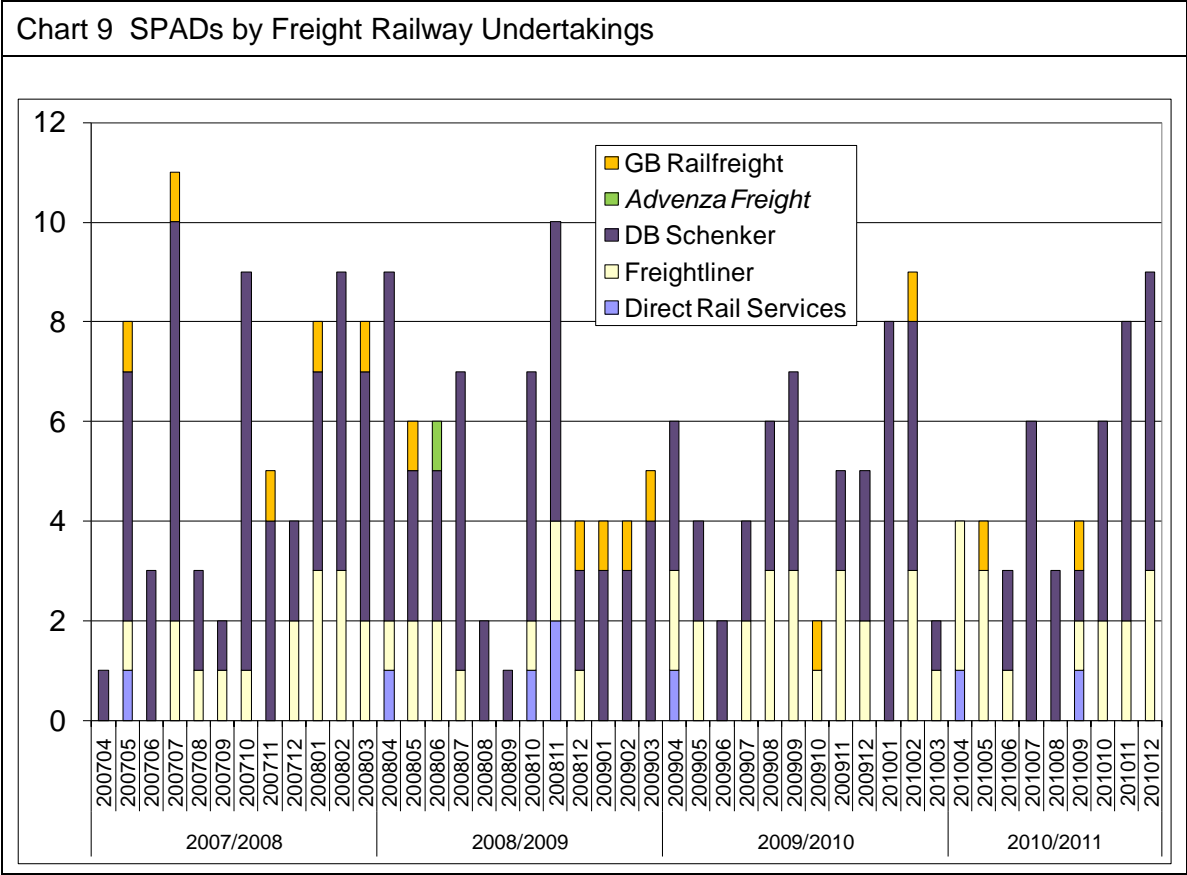
#### 5.1.1 SPADs year-on-year by Railway Undertaking

The table in Appendix 9 shows the current annual total, classified by railway undertaking (RU), for the 12 months to the end of Q3-2010/11, 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, National Express East Anglia has shown a statistically significant decrease (at the 90% confidence level), whereas South West Trains has shown a statistically significant increase.

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



\* Advenza Freight ceased trading in 2009

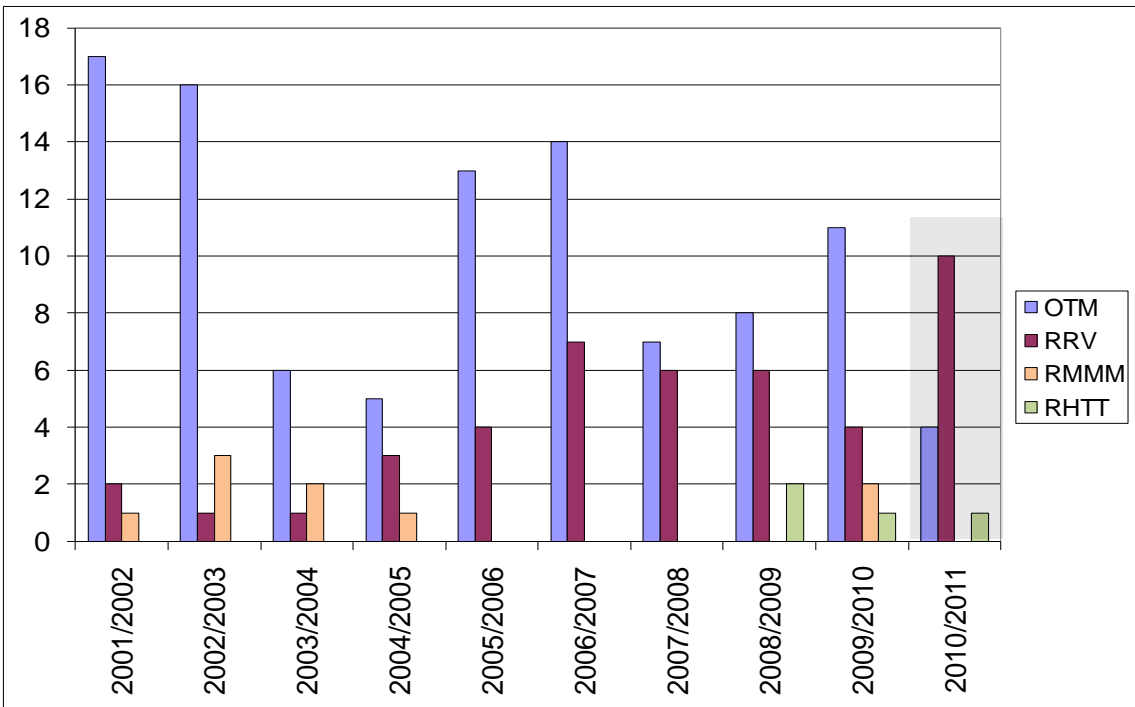
Chart 9 shows the monthly numbers of SPADs by freight Railway Undertakings, from the beginning of 2007/08 on a monthly basis. This chart presents raw SPAD numbers which have not been normalised against train miles run.

It may be seen from this chart that there were 23 freight train SPADs during Q3-2010/11. This was ten more than during the previous quarter.

## 5.3 Engineering machines

Chart 10 shows the number of category A SPADs involving engineering machines. This shows that there have been 15 SPADs in the first three quarters of 2010/11 (represented by the bars within the grey shaded area) against 18 during the whole of 2009/10 and 16 in 2008/9. Of the 15, four involved on-track machines (two tampers, one stone blower and one ballast regulator coupled to a tamper), one a rail-head treatment train and ten involved road/rail vehicles.

Chart 10 SPADs by engineering machines



## 5.4 Possession-related SPADs

### 5.4.1 SPADs entering, leaving, or within a possession

Chart 11 Possession related SPADs

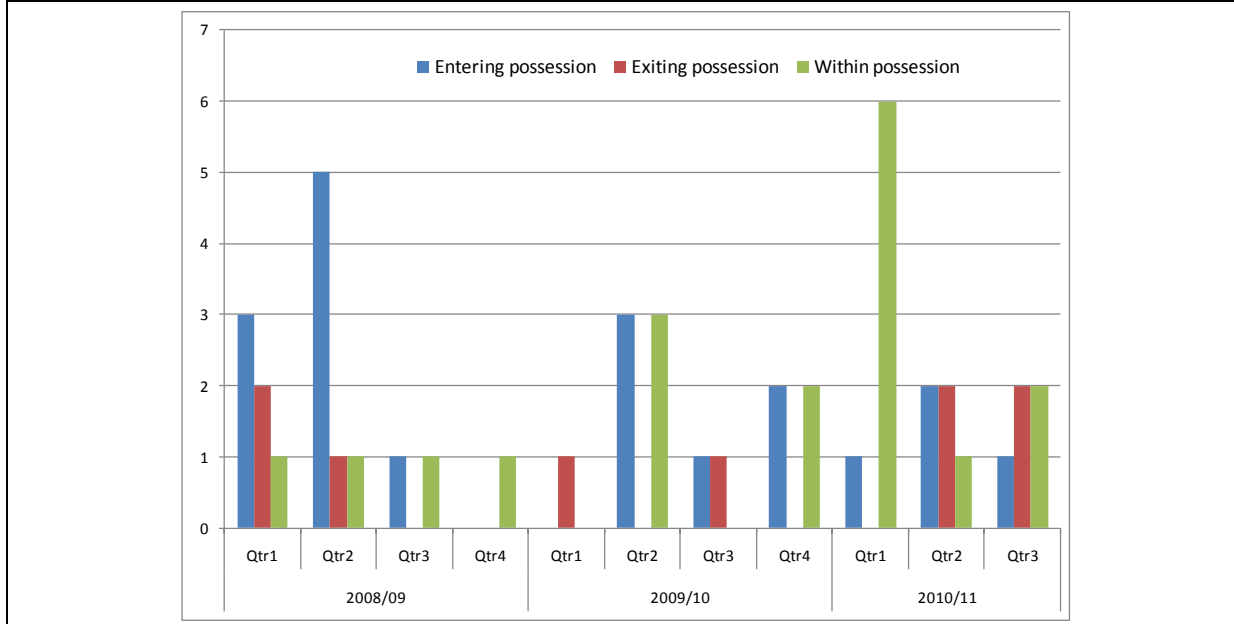


Chart 11 indicates the number of possession-related SPADs, broken down by whether the movement concerned was entering, leaving or within a possession at the time of the SPAD.

This chart shows that there have been 17 possession-related SPADs during the first three quarters of 2010/11, compared to 13 during the whole of 2009/10 and 16 in 2008/9. Four of these occurred when movements were entering possessions, four when movements were exiting possessions and nine within possessions.

Table 6 shows the breakdown of these SPADs by Network Rail route.

Table 6 Possession related SPADs																		
		A	KT	LNE	LNW	M&C	SC	SX	W	WX	Total			Entering possession	Exiting possession	Within possession	Total	
2007/08	Qtr1								1		1	2007/08	Qtr1				1	1
	Qtr2			1					2	1	4		Qtr2	1	1		2	4
	Qtr3			3					1		4		Qtr3	1	1		2	4
	Qtr4				1				1	1	3		Qtr4	1	1		1	3
2008/09	Qtr1			1	2				3		6	2008/09	Qtr1	3	2		1	6
	Qtr2	1			2		1		3		7		Qtr2	5	1		1	7
	Qtr3			1	1						2		Qtr3	1			1	2
	Qtr4	1									1		Qtr4				1	1
2009/10	Qtr1			1							1	2009/10	Qtr1			1		1
	Qtr2	3		1	2						6		Qtr2	3			3	6
	Qtr3			1					1		2		Qtr3	1	1			2
	Qtr4			1	2					1	4		Qtr4	2			2	4
2010/11	Qtr1	4		2					1		7	2010/11	Qtr1	1			6	7
	Qtr2			1	2				1	1	5		Qtr2	2	2		1	5
	Qtr3		1	1	1		1		1		5		Qtr3	1	2	2	2	5
		9	1	15	14		2		15	4	60			22	13	25	60	

## 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.

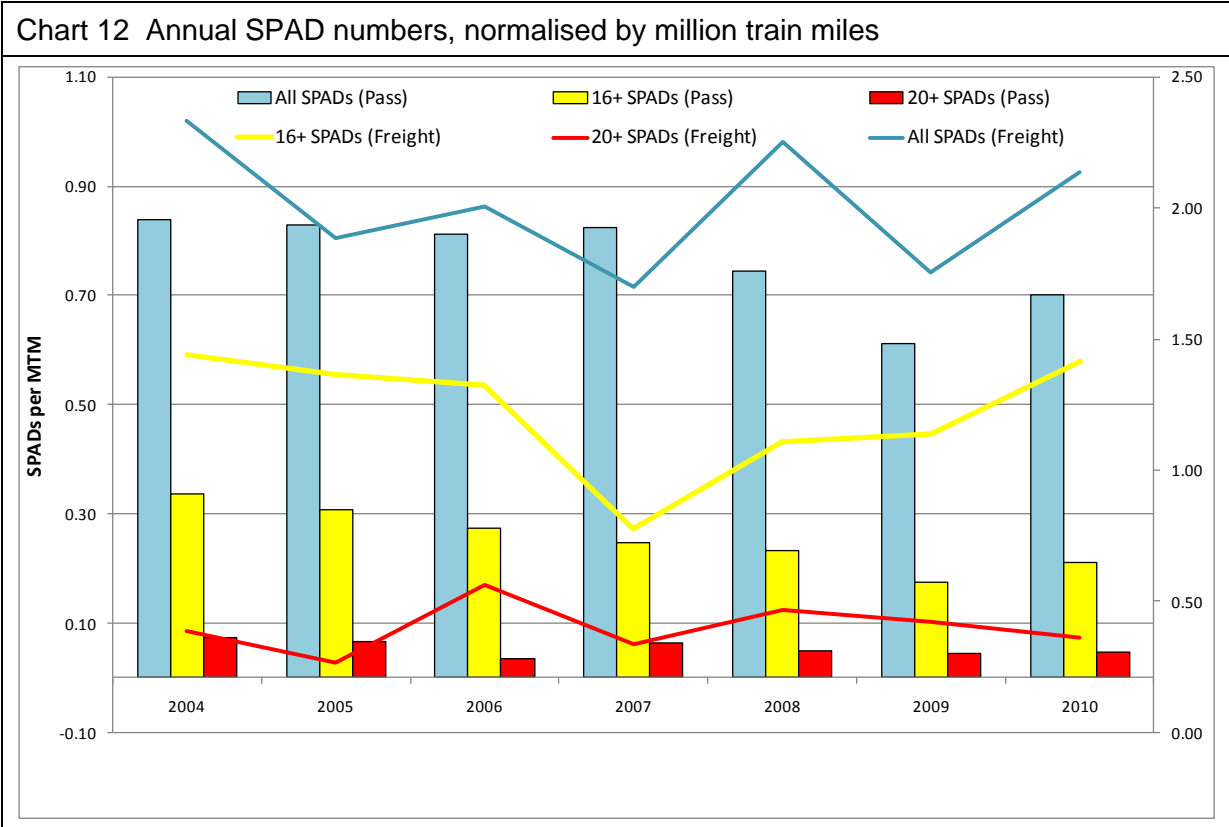
The main part of the table is divided into two. Passenger train operators are shown separately to freight train operators. This allows separate group rates to be shown for these two types of operators and should enable more meaningful comparisons to be made.

Chart 12 shows this graphically. The numbers of '16+' and '20+' SPADs are also shown, as subsets to '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, whereas the lines represent freight figures. The 'All SPADs (Freight)' rate is plotted against the right axis for clarity.

This chart shows that there has been a decrease in the passenger train SPAD rate during 2008 and 2009, however 2010 has shown an increase. This statement is true of all of the bands of passenger train SPADs indicated.

Freight train SPADs in the '16+' band have shown a year on year increase since reaching a low of 0.27 SPADs/MTM in 2007, whereas 'All SPADs' and '20+ SPADs' have shown no discernable trend over this period.



Note that this chart is comparing calendar years.

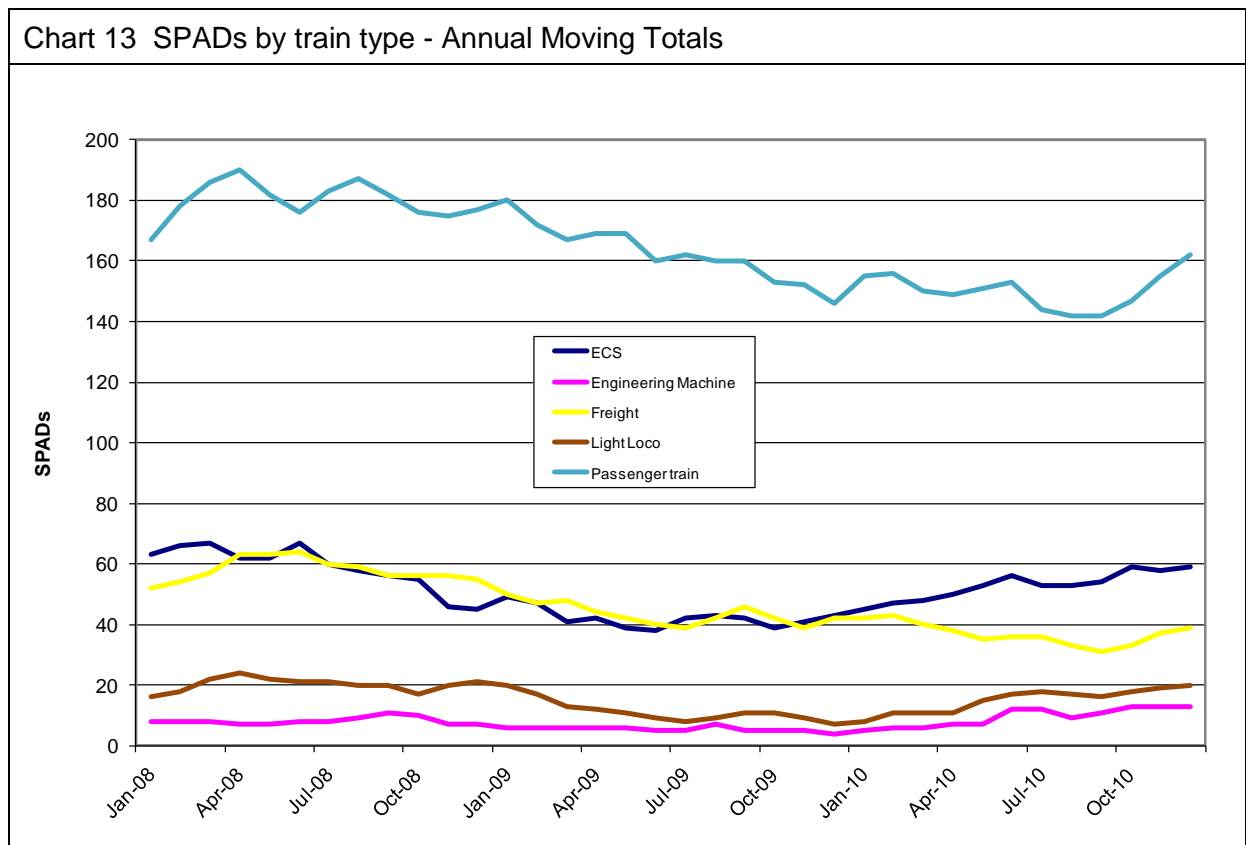
5.5.2 SPADs normalised by driver population

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 SPADs by train type

Chart 13 shows the annual moving total number of SPADs since January 2008, by train type. It may be seen that SPADs involving passenger trains had been falling during 2009. Those involving empty coaching stock (ECS) trains had also been decreasing, an increase has become evident since late 2009. SPADs involving freight trains showed a decrease during 2009, but have since remained fairly level. Those involving light locomotives and engineering machines have increased over the past year.



## 6.2 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 14 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 the number of SOY SPADs occurring since August 2010. The reasons for this are remain unclear, though this will continue to be observed closely over the coming months.

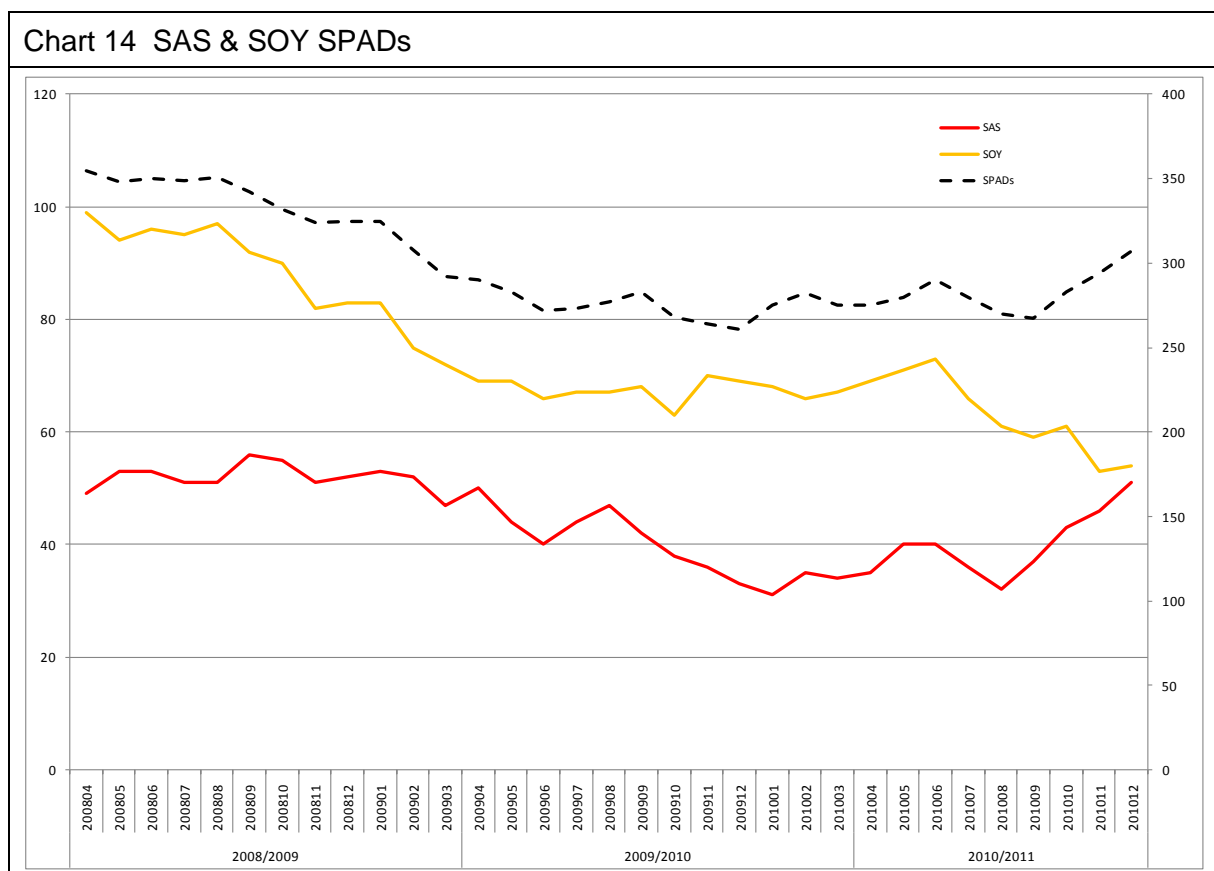


Chart 15 plots SAS SPADs over the same period, by train type. Multiple-unit stock SPADs are plotted against the left axis: all other train types are against the right. It may be seen from this that SAS SPADs involving multiple-unit stock contribute the greater portion of these incidents. The numbers had been decreasing since mid-2008, as had those for loco-hauled freight trains: however, the latter half of 2010 saw an increase in this type of SPAD involving such trains.

It must be noted that there is a greater number of multiple-unit type trains in service compared to other train types.

Chart 15 SAS SPADs – by train type

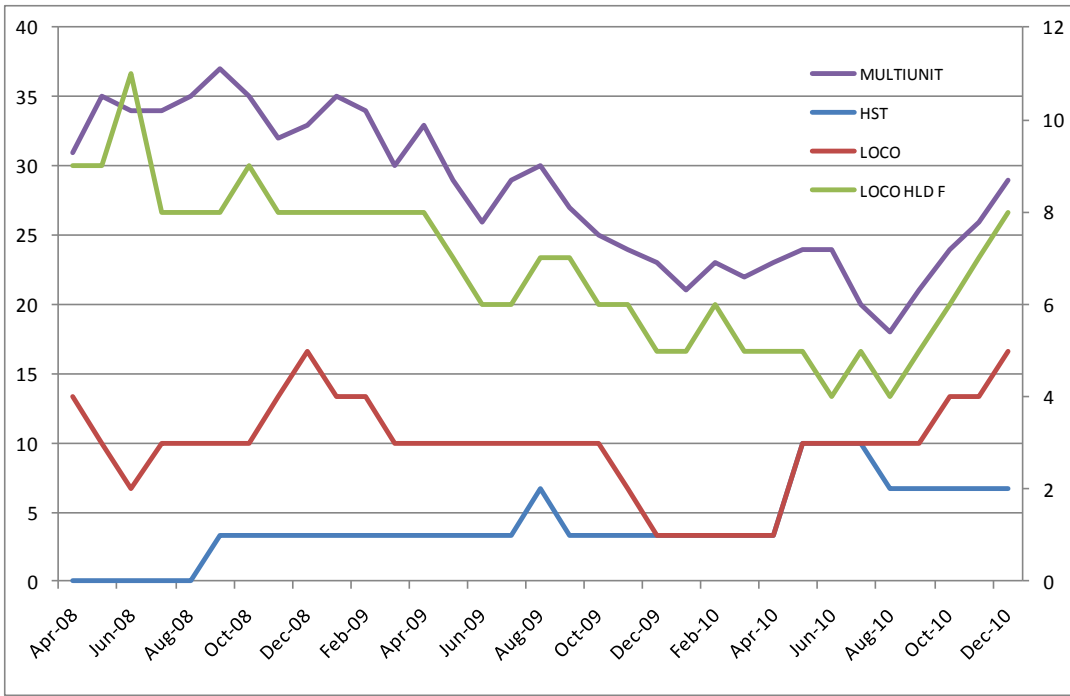
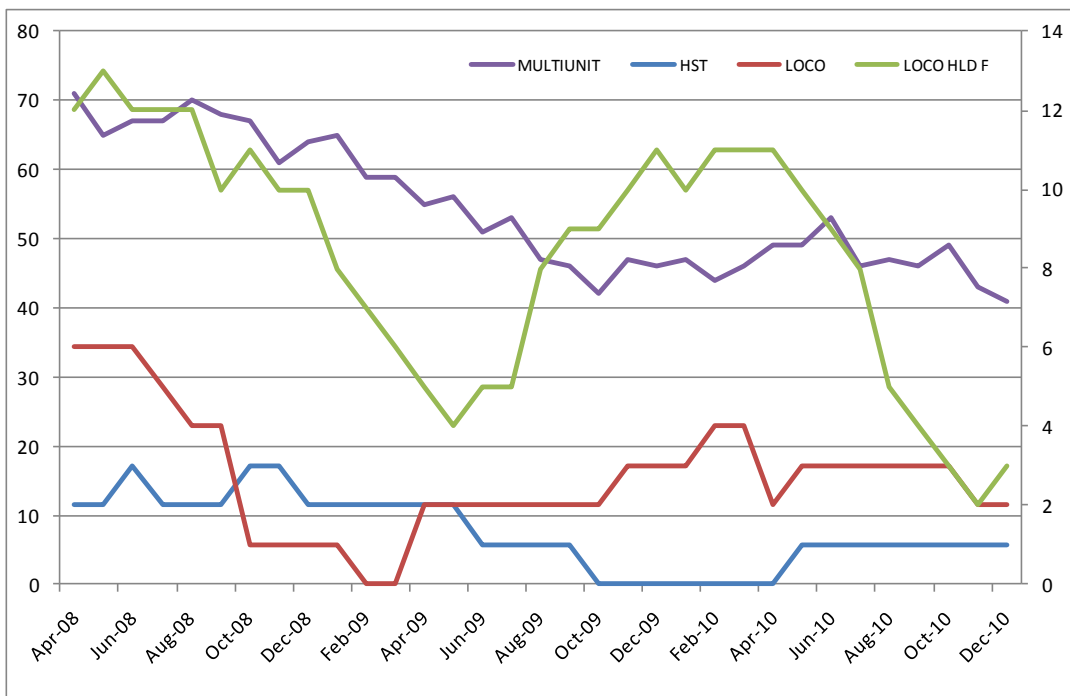


Chart 16 plots SOY SPADs, again for the same period. Again, multiple-unit stock SPADs are plotted against the left axis, whereas all other train types are against the right. As with SAS SPADs, multiple-unit stock contributes the greatest number of SOY SPADs, and has been showing a downward trend prior to September 2009, after which they have remained generally level. SOY SPADs involving freight trains have shown a large variation over the period of the chart, although the numbers involved are much lower.

Chart 16 SOY SPADs – by train type



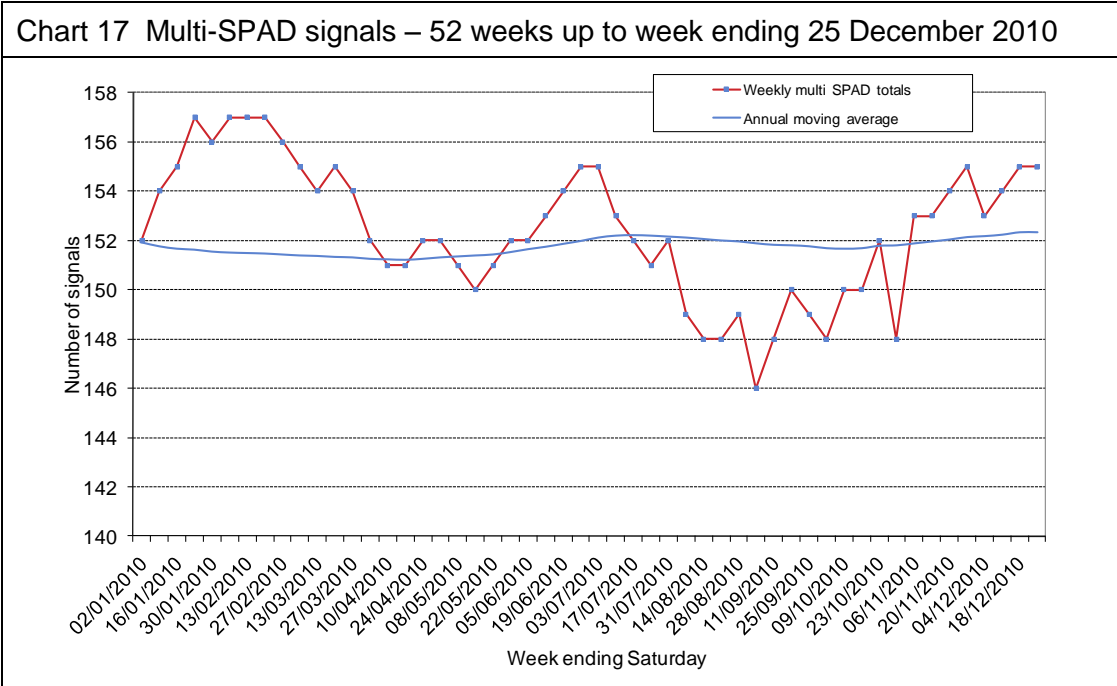
### 6.3 Multi-SPAD signals and drivers

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

#### 6.3.1 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 17 plots the number of multi-SPAD signals over the 52 weeks up to 25 December 2010, along with the annual monthly moving average. This shows that the number of listed signals has fluctuated between 146 and 157 over that period. There were 155 such signals listed as at 25 December 2010. Of these signals, 91 (59%) are fitted with TPWS.



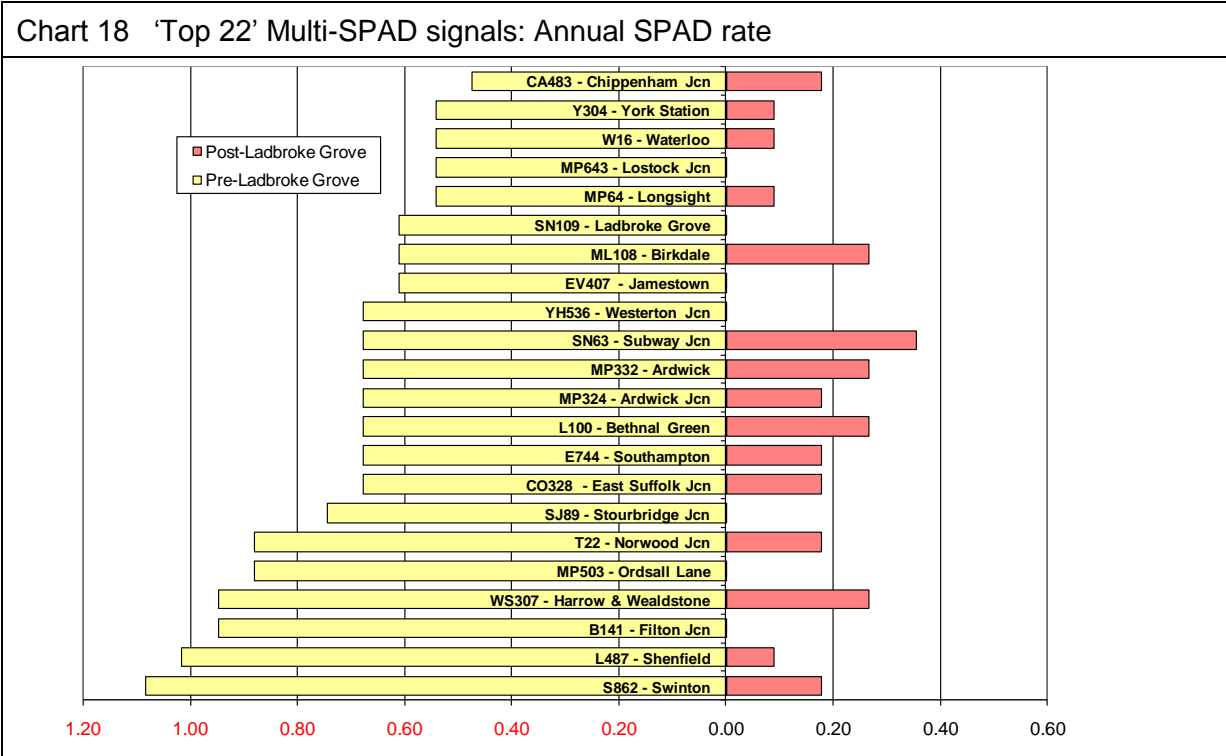
Prioritisation of SPAD mitigation measures can be difficult when there are a large number of signals on the weekly multi-SPAD list. Whilst all multi-SPAD signals require attention, there is a degree of random chance that a signal will be subject to a second SPAD within five years. However, there is less 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 (19% of the multi-SPAD signal population), which is an increase from 27 at the end of Q2. These signals are listed in Appendix 5.

#### 6.3.2 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 18 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 December 2010 (135 months).



Of the 22 signals listed in chart 18 above, two have seen further SPADs since this chart was last published (September 2009). These are T22 at Norwood Junction (Sussex Route) and SN63 at Subway Junction (Western Route).

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, two are currently classified as multi-SPAD. These are SN63 at Subway Junction, (Western Route) and CO328 at East Suffolk Junction (Anglia Route).

Of the 206 signals on the second improvement notice ('IN' signals) 203 have since been removed, the three signals remaining being DJ505 at Deansgate Junction, WS35 at Stonebridge Park and WS55 at Harrow & Wealdstone (All LNW Route).

Table 7 gives details of the signals cited above. When this table was last published, there were 13 signals listed.

Table 7 Improvement notices' signals remaining multi-SPAD

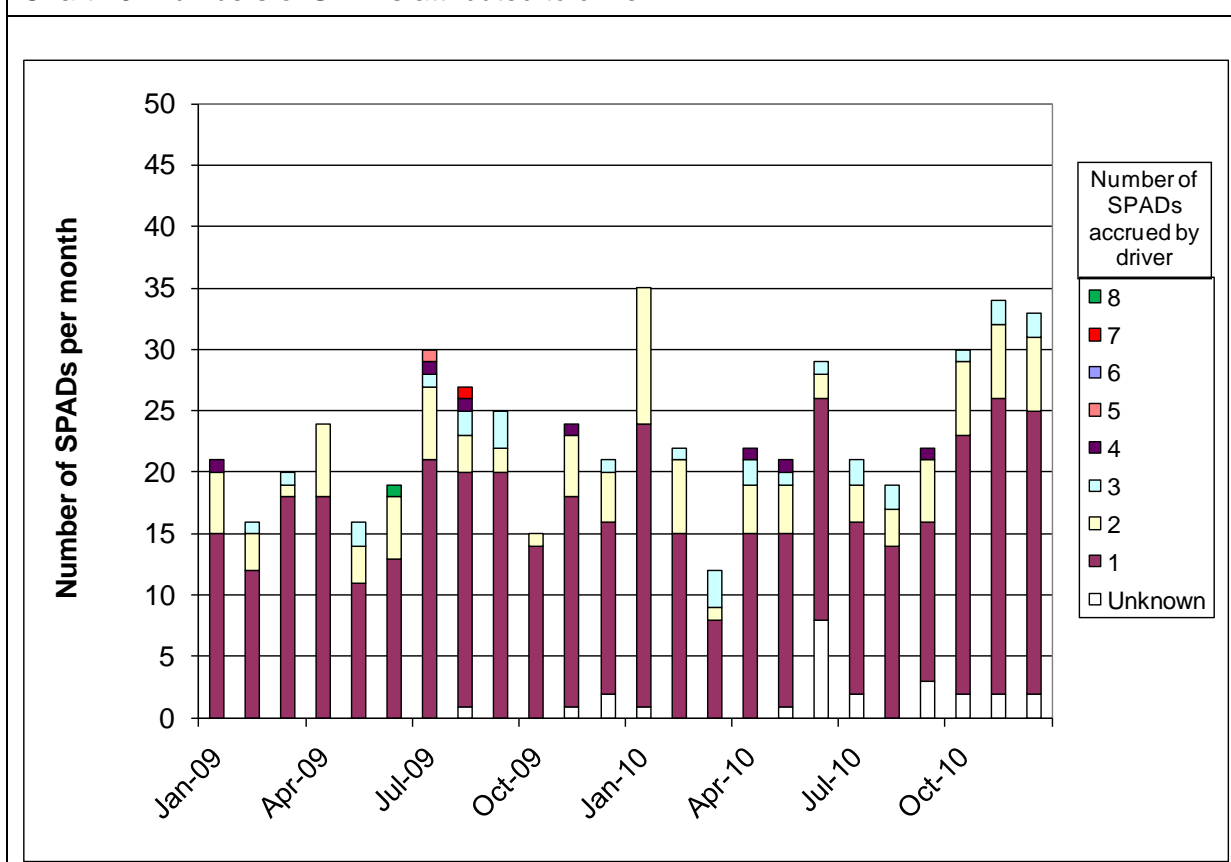
Multi-tag	Route	Signal	Line	Location	ELR	Signalbox	Date of latest SPAD	Maximum risk ranking	Events since 1985	Events in current 5 years
T22	Anglia	CO328	Up/Down Lowestoft (Up Dir)	East Suffolk Jn	LTN1	Colchester	22/03/2010	16	14	3
T22	Western	SN63	Line 4 (Down Direction)	Subway Jn	MLN1	Slough	07/07/2010	15	15	4
IN	LNW	DJ505	Outbound Line	Deansgate Jn	CDM1	Deansgate Jn	14/03/2009	17	10	4
IN	LNW	WS35	Down Dc	Stonebridge Park	CWJ0	Wembley Mainline	07/03/2009	16	15	6
IN	LNW	WS55	Down Dc	Harrow & Wealdstone	CWJ0	Wembley Mainline	08/11/2009	11	11	4

A current list of multi-SPAD signals may be found at [www.opsweb.co.uk](http://www.opsweb.co.uk).

### 6.3.3 Multi-SPAD drivers

Chart 19 shows the numbers of SPADs per month since January 2009. Each of the bars is divided into the 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, 67% of SPADs involved a driver who had not previously been involved in a SPAD.

Chart 19 Numbers of SPADs attributed to driver.

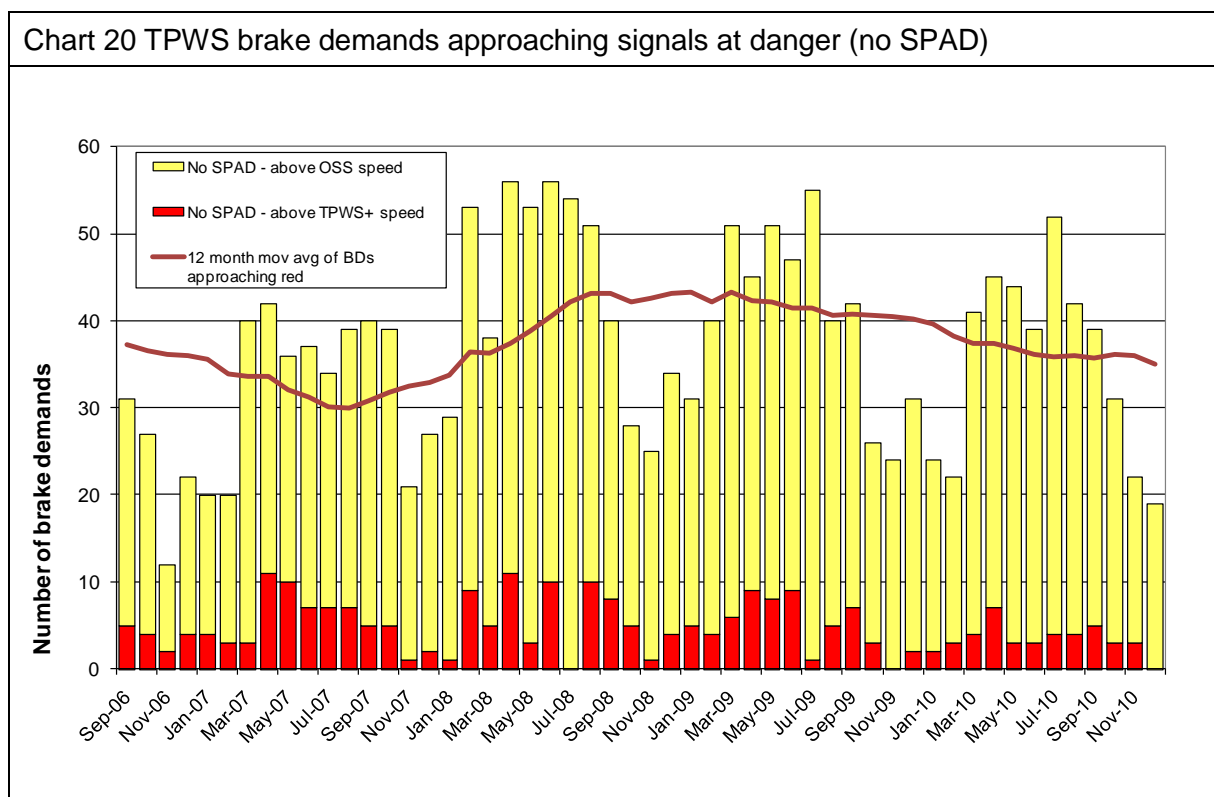


## 7 Train Protection and Warning System

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. An explanation of the distinction between the two terms may be found in Appendix 2.

### 7.1 TPWS Brake Demands at signals

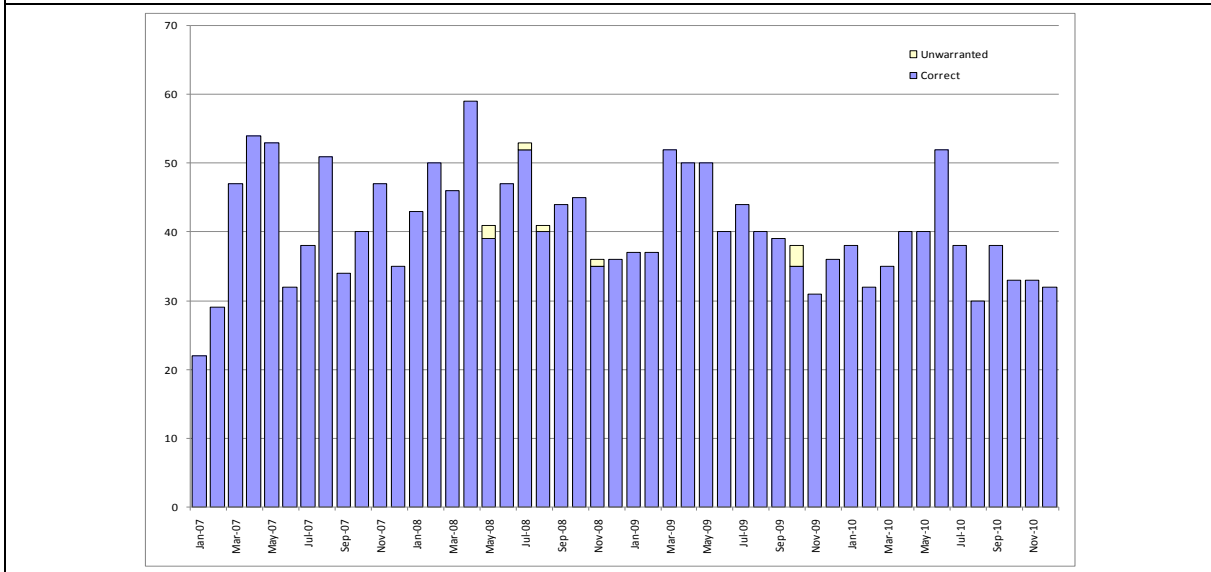
Chart 20 shows monthly brake demand figures in respect of trains passing over the overspeed sensor (OSS) for a signal at danger, in excess of the set speed. The bars also indicate those which occurred at the TPWS+ loop (where fitted). From the chart it may be seen that brake demands decrease around the end of each year and into the following year, then increase towards a peak each summer. The moving annual average is also shown.



### 7.2 TPWS Brake Demands at PSRs

Chart 21 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.

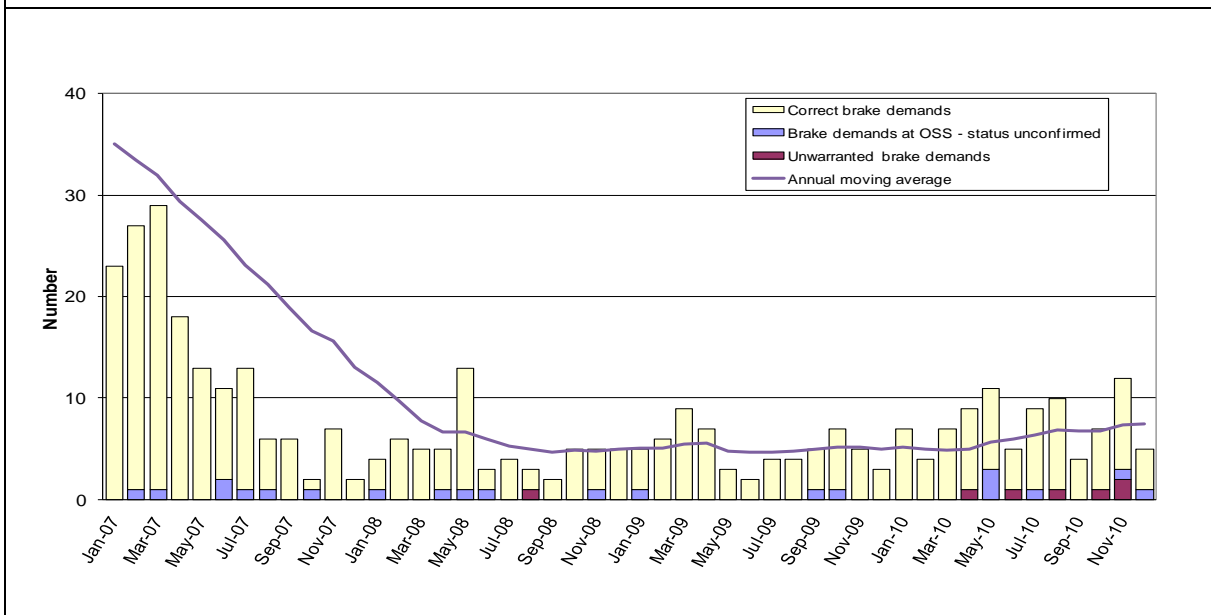
Chart 21 TPWS brake demands approaching PSRs



### 7.3 TPWS Brake Demands approaching buffer stops

Chart 22 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, but that it has shown a slight increase during the second half of 2010, although the number of these events has remained low. Two the unwarranted brake demands during 2010, were due to faulty on-train equipment, with the remainder being at Paddington.

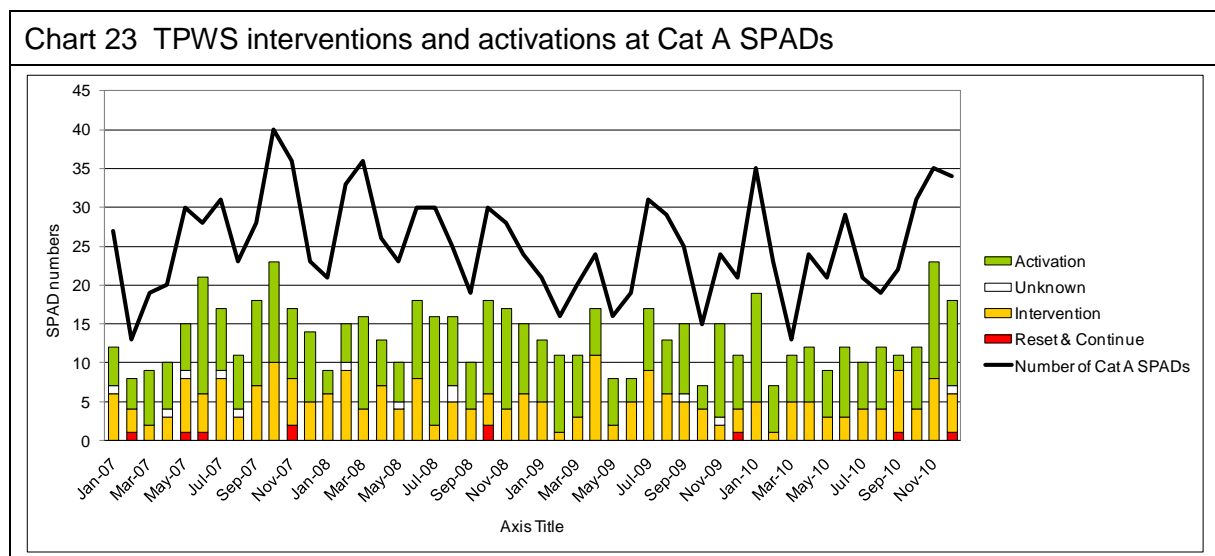
Chart 22 TPWS brake demands approaching buffer stops



## 7.4 Interventions and activations at Category A SPADs

Chart 23 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 Sudbury Junction. (LNW Route) on 17 December 2010. This brings the total number of 'reset & continue' incidents, as at that date, to 33. The black line 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.



## 7.5 TPWS ‘Reset and Continue’ (at Category A SPADs)

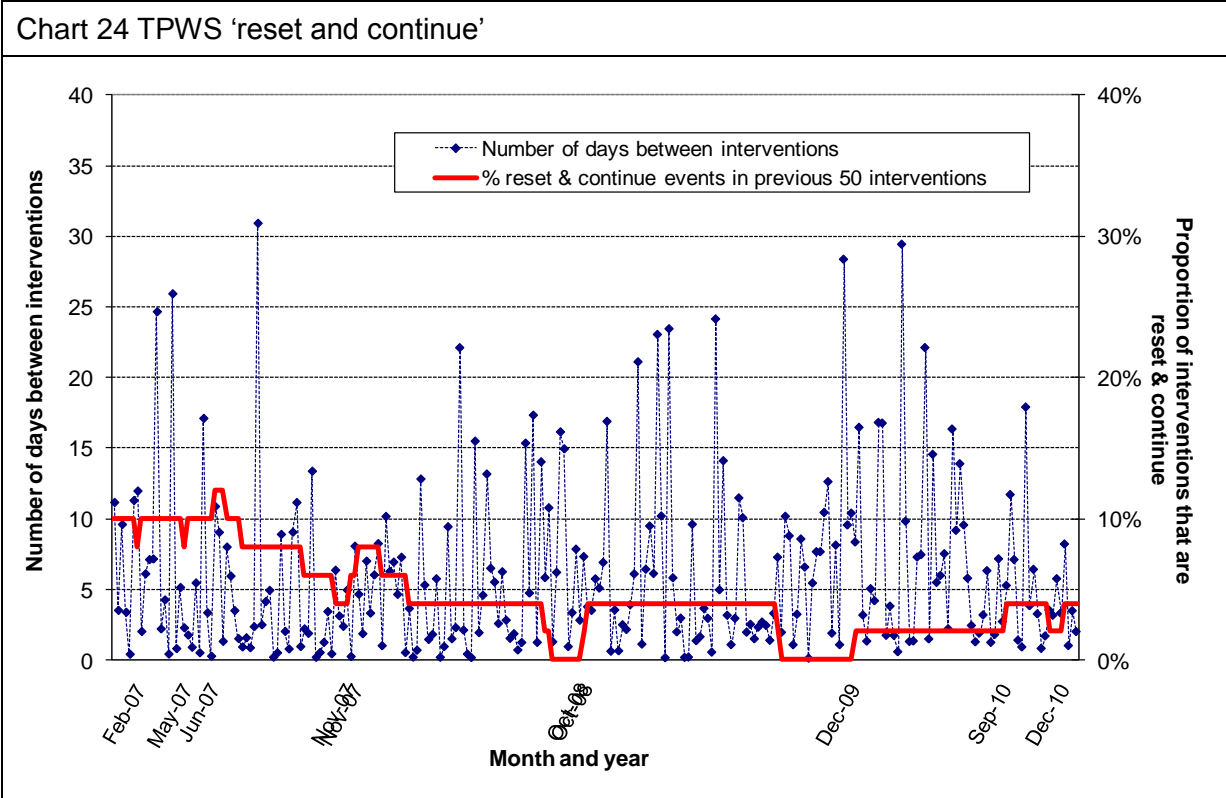


Chart 24 looks at the frequency of TPWS ‘reset and continue’ incidents. The red line represents the proportion of TPWS interventions that are ‘reset & continue’ events. This has been based on a measure of the previous 50 TPWS interventions, shifting on a scale over the period January 2007 - December 2010. The blue peaks and troughs represent the number of days between each intervention.

There have been two occasions during the period shown when none of the previous 50 TPWS interventions had resulted in a ‘reset & continue’ event. 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 Sudbury Junction, this measure is now 4%.

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

#### **Bulgaria: Head-on collision leads to 26 injuries, 4 October 2010**

At 07:77 (local time) on 4 October 2010, an international train travelling from Belgrade to Sofia collided with a local company train, 4 kilometres from the Bulgarian border.

The local train had been carrying employees of the Bulgarian state railroad company (BDZ). Approximately 90 people were travelling on the international train; 26 people were reported injured.

It is believed that the incident resulted from a SPAD. Four members of train staff were subsequently dismissed.

#### **Germany: Head-on collision kills ten, 29 January 2011**

At 22:30 (local time) on 29 January 2011, a freight train collided head on with a passenger service in fog on a single line near Magdeburg in eastern Germany. Ten people (including the passenger train driver) were killed; 23 were injured.

Whereas this incident is currently under investigation, it is believed that the freight train passed two signals at danger before the impact.

The line in question is not currently fitted with automatic train protection equipment.

## 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
<b>A</b>	<b>A1</b> 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.
	<b>A2</b> 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.
	<b>A3</b> 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.
	<b>A4</b> 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 ( <i>for example, poor rail head adhesion, train braking equipment failure or malfunction etc.</i> ).
<b>B</b>	<b>B1</b> 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 ( <i>for example, signalling or level crossing equipment has failed or malfunctioned</i> ).
	<b>B2</b> 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.
<b>C</b>	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.
<b>D</b>	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:

<b>A</b>	Accident occurred.
<b>B</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].
<b>C</b>	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.
<b>D</b>	SPAD or potential conflict train crossed the potential conflict zone without accident [Restricted time window for accident].
<b>E</b>	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].
<b>F</b>	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].
<b>G</b> (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].
<b>H</b>	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].
<b>I</b>	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].
<b>J</b> (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].
<b>K</b>	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].
<b>U</b>	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) Q3-2010/11

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
05-Oct-10	01:32	Leamington Spa	LN45	Leamington Spa	LNW	DB Schenker	6	645	301	1		1		Y	NIL	3	ND19
15-Oct-10	09:25	Tyneside	T671	Plessey	LNE	Northern Rail	2	51	200	2	10-Oct-07	1		Y	ACT	3	NJ17
15-Oct-10	14:31	Shirley	SH4	Shirley	LNW	DB Schenker	3	35	200	2	13-Jul-95	2	30-Jul-08	Y	NIL	S	NI17
18-Oct-10	18:30	Goole	G50	Goole	LNE	Northern Rail	5	30	300	2	16-Jun-99	2	11-May-10	Y	NIL	3	NI17
20-Oct-10	18:04	London Bridge	L82	Cannon St	SE	Southeastern	2	12	51	2	12-Dec-96	1		Y	INT	3	NG16
31-Oct-10	10:42	Wylam	WM6414	Wylam	LNE	Northern Rail	2	11	443	1		1		Y	ACT	2	NG17
31-Oct-10	11:00	Peterborough	P531	Lolham	LNE	DB Schenker	6	20	300	2	15-Nov-00	0		Y	TSO	3	ND18
05-Nov-10	11:25	London Bridge	L168	Blue Anchor Jn	SE	Southeastern	2	22	198	2	11-Oct-08	1		Y	ACT	4	NJ16
05-Nov-10	13:21	Kings Cross	K697	Hitchin	LNE	First Capital Connect	1	66	323	7	20-Mar-09			Y	ACT	3	NJ16
05-Nov-10	14:52	March East	ME45	March East	SE	CrossCountry	1	197	135	1		1		Y	ACT	3	ND18
08-Nov-10	20:59	Rhyl	RL87	Rhyl	W	Virgin West Coast	1	880		1		1		Y	NIL	S	NI19
11-Nov-10	20:56	Woking	WK334	Hampton Court Jn	SE	South West Trains	2	96	200	1		2	22-Dec-09	Y	NIL	4	NI19
14-Nov-10	14:20	Slough	SN276	Southall West Jn	W	Amey Rail	6	77	222	5	01-Feb-09	0		Y	TSO	4	NI18
18-Nov-10	07:28	Westbury	W308	Warminster	W	Freightliner	0	100		2	24-May-90	1		Y	NIL	2	NI18
02-Dec-10	18:34	Barnsley Station Junction	BY1038	Barnsley	LNE	DB Schenker	2	66	200	1		3	06-Nov-07	Y	ACT	4	YJ19
09-Dec-10	18:55	Colchester	CO308	Ipswich	SE	Freightliner	4	23	131	3	20-Oct-99	1		Y	INT	4	NG18
10-Dec-10	13:27	Feltham	F160	Hounslow Jn	SE	South West Trains	2	11	100	1		1		Y	ACT	3	NJ16
14-Dec-10	13:36	Greenford East	GE73	Greenford	W	DB Schenker	0	3	0	1		1		Y	NIL	D	NI19
17-Dec-10	22:44	Wembley Mainline	WM825	Sudbury Jn	LNW	Chiltern Railways	5	66	115	2	03-Sep-07			Y	R&C	4	YI16
28-Dec-10	16:00	Severn Bridge Jn	SBJ24	Severn Bridge Jn	W	Arriva Trains Wales	1	52	0	1		1	12-Oct-02	Y	NIL	S	NI19
30-Dec-10	15:13	Wimbledon	W233	New Malden	SE	South West Trains	1	118	223	1		3	17-May-05	Y	ACT	4	NJ16

## Appendix 4 - Potentially severe Cat A SPADs (risk ranked 20+) Q1, 2 & 3 - 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	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	

Full details of all category A SPADs for the review period, plus historic data from January 1998, is available at [www.opsweb.co.uk](http://www.opsweb.co.uk)

## Appendix 5 - Signals with 3 or more SPADs during last 5 yrs. (As at 25 December 2010)

This appendix lists those signals which have been passed at danger three (or more) times during the five-year period ending 25 December 2010. 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](http://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	30/06/2009	6	3	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	04/11/2008	4	3	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	21	19	22	31	35	34	0	0	0	236

### 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	8	7	2	9	10	12	0	0	0	70

### 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	0	0	1	2	3	5	0	0	0	14

## Appendix 7 – SPADs per million train miles, by RU

Passenger national rate	Rate per MTM all							Rate per MTM 16+							Rate per MTM 20+						
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
	0.84	0.83	0.81	0.82	0.75	0.61	0.70	0.34	0.31	0.27	0.25	0.23	0.18	0.21	0.07	0.07	0.03	0.06	0.05	0.04	0.05
<b>Passenger train operators</b>	Rate per MTM all							Rate per MTM 16+							Rate per MTM 20+						
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
Arriva Trains Wales	0.86	1.19	1.16	0.58	0.99	0.48	0.91	0.47	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
c2c	1.25	1.49	0.26	0.00	0.49	0.47	0.00	0.50	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
Chiltern Railways	0.19	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
CrossCountry	0.56	0.45	0.28	0.50	0.32	0.65	0.51	0.34	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
East Coast	0.42	0.35	0.26	0.51	0.08	0.08	0.33	0.34	0.26	0.09	0.26	0.00	0.08	0.00	0.08	0.17	0.00	0.00	0.00	0.00	0.00
East Midlands Trains	0.95	0.92	0.76	0.27	1.04	0.22	0.36	0.41	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
Eurostar	0.00	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
First Capital Connect	0.74	0.48	0.74	0.87	0.74	0.98	0.92	0.12	0.21	0.14	0.20	0.14	0.33	0.26	0.00	0.00	0.00	0.13	0.00	0.07	0.07
First Great Western	0.54	0.36	0.55	0.94	0.69	0.52	0.68	0.27	0.12	0.24	0.27	0.27	0.11	0.23	0.12	0.00	0.00	0.04	0.08	0.00	0.11
First Hull Trains	1.56	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	0.83	0.78	0.95	1.08	0.53	0.42	0.73	0.58	0.21	0.25	0.29	0.20	0.12	0.31	0.08	0.04	0.04	0.12	0.04	0.08	0.04
First Transpennine Express	0.24	0.25	1.15	0.55	0.31	0.69	0.29	0.12	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
Grand Central	0.00	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
Heathrow Express	0.99	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
London Midland	0.00	0.00	0.00	4.41	0.74	0.76	0.55	0.00	0.00	0.00	1.89	0.16	0.07	0.00	0.00	0.00	0.00	0.63	0.08	0.00	0.00
London Overground	0.00	0.00	0.00	21.08	1.40	1.86	0.67	0.00	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
London Underground	3.34	2.82	2.73	2.33	1.71	2.40	1.23	0.00	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
Merseyrail	1.59	1.38	1.66	1.38	1.08	0.80	2.38	1.06	0.28	0.28	0.00	0.00	0.00	1.06	0.27	0.28	0.00	0.00	0.00	0.00	0.26
National Express East Anglia	1.08	1.02	1.06	0.91	1.09	0.95	0.45	0.22	0.31	0.35	0.25	0.40	0.25	0.05	0.00	0.05	0.05	0.10	0.10	0.10	0.05
Nexus	2.88	0.56	0.00	1.14	0.56	0.00	0.64	0.72	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	1.94	1.19	0.61	0.65	0.90	0.69	0.79	0.78	0.61	0.23	0.19	0.15	0.35	0.22	0.19	0.15	0.00	0.00	0.04	0.07	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	0.62	0.89	1.26	1.18	1.00	0.51	1.05	0.21	0.28	0.65	0.49	0.36	0.08	0.36	0.04	0.04	0.08	0.08	0.16	0.00	0.04
Southeastern	1.13	1.36	1.49	1.48	1.14	0.88	1.16	0.31	0.63	0.32	0.47	0.31	0.21	0.42	0.05	0.10	0.00	0.11	0.00	0.10	0.05
Southern	0.84	0.74	0.57	1.13	0.63	0.82	0.79	0.42	0.26	0.26	0.31	0.19	0.18	0.09	0.10	0.16	0.05	0.10	0.00	0.00	0.05
Victa Westlink Rail	12.66	10.20	7.85	0.00	0.00	0.00	0.00	12.66	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	0.49	0.50	0.43	0.21	0.36	0.09	0.31	0.16	0.36	0.14	0.14	0.24	0.00	0.13	0.16	0.07	0.00	0.07	0.00	0.00	0.04
West Coast Railway	0.00	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
<b>Freight national rate</b>	Rate per MTM all							Rate per MTM 16+							Rate per MTM 20+						
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
	2.33	1.89	2.01	1.70	2.25	1.76	2.14	0.59	0.55	0.54	0.27	0.43	0.45	0.58	0.08	0.03	0.17	0.06	0.12	0.10	0.07
<b>Freight train operators</b>	Rate per MTM all							Rate per MTM 16+							Rate per MTM 20+						
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
DB Schenker	2.51	2.24	2.29	2.08	2.74	2.09	2.60	0.56	0.62	0.57	0.26	0.51	0.56	0.72	0.08	0.04	0.26	0.10	0.17	0.07	0.07
Direct Rail Services	1.21	0.00	0.00	1.29	2.49	0.46	1.05	0.00	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
Freightliner	2.01	1.37	1.58	1.00	1.70	1.70	1.85	0.83	0.53	0.32	0.20	0.38	0.50	0.41	0.12	0.00	0.00	0.00	0.00	0.09	0.20
GB Railfreight	2.07	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
<b>Infrastructure companies</b>	Number of category A SPADs							Number of 16+ category A SPADs							Number of 20+ category A SPADs						
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
Alstom	0	0	0	0	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Arney Rail	0	0	1	0	2	2	3	0	0	1	0	0	0	2	0	0	0	0	0	0	1
Babcock Rail	0	2	3	2	3	0	0	0	2	1	1	2	0	0	0	0	0	0	0	0	0
Balfour Beatty Rail	0	2	4	1	2	5	2	0	0	0	1	1	3	1	0	0	0	0	0	0	0
Carillion Rail	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Colas	3	2	4	4	1	3	1	2	1	3	1	0	0	0	0	0	1	0	0	0	0
Harsco Rail	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jarvis Rail	6	4	5	2	5	2	0	3	2	2	1	2	1	0	1	0	0	0	0	0	0
Mowlem Civil Engineering	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Other	2	3	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Serco Rail Operations	0	1	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
VolkerRail	0	0	0	1	0	0	2	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	2005	2006	2007	2008	2009	2010
<b>Passenger train operators</b>						
Arriva Trains Wales	0.22	0.24	0.12	0.19	0.09	0.17
c2c	0.29	0.05	0.00	0.10	0.10	0.00
Chiltern Railways	0.15	0.00	0.07	0.11	0.07	0.19
CrossCountry				0.09	0.20	0.17
East Midlands Trains				0.60	0.14	0.23
Eurostar	0.10	0.00	0.00	0.00	0.00	0.00
Grand Central				0.00	0.00	0.00
First Capital Connect			0.13	0.18	0.24	0.22
First Great Western			0.24	0.17	0.13	0.17
First Scotrail	0.21	0.22	0.25	0.11	0.10	0.17
Heathrow Express	0.60	0.21	0.00	0.17	0.00	0.00
First Hull Trains	0.00	0.00	0.00	0.00	0.00	0.00
London Midland				0.13	0.16	0.11
London Overground				0.15	0.20	0.10
London Underground	0.06	0.06	0.05	0.05	0.08	0.04
Victa Westlink Rail	0.83	0.64	0.00	0.00	0.00	0.00
Merseyrail	0.19	0.23	0.19	0.16	0.12	0.35
National Express East Anglia	0.22	0.22	0.19	0.23	0.20	0.09
National Express East Coast				0.05	0.03	0.10
Nexus	0.05	0.00	0.10	0.05	0.00	0.05
Northern Rail	0.21	0.12	0.11	0.16	0.13	0.14
Stagecoach Metrolink	0.15	0.15	0.15	0.15	0.15	0.08
Southern	0.16	0.11	0.22	0.13	0.18	0.18
Southeastern	0.25	0.26	0.27	0.21	0.15	0.22
South West Trains	0.18	0.24	0.22	0.18	0.10	0.19
First TransPennine	0.06	0.28	0.14	0.08	0.19	0.11
Virgin West Coast	0.11	0.10	0.05	0.12	0.03	0.12
West Coast Railways	0.83	0.28	0.56	0.00	0.00	0.21
<b>average group rate</b>	<b>0.16</b>	<b>0.16</b>	<b>0.16</b>	<b>0.15</b>	<b>0.13</b>	<b>0.15</b>
<b>Freight operators</b>						
Direct Rail Services	0.00	0.00	0.17	0.30	0.07	0.15
DB Schenker	0.24	0.21	0.17	0.22	0.14	0.17
Freightliner	0.23	0.27	0.18	0.55	0.52	0.55
GB Railfreight	0.11	0.53	0.53	0.21	0.21	0.21
Serco Railtest	0.23	0.00	0.00	0.45	0.00	0.00
<b>average group rate</b>	<b>0.23</b>	<b>0.22</b>	<b>0.18</b>	<b>0.27</b>	<b>0.18</b>	<b>0.21</b>
<b>Infrastructure maintenance</b>						
Amey Railways	0.00	0.17	0.00	0.34	0.34	0.51
Balfour Beatty Rail	0.16	0.31	0.08	0.17	0.43	0.17
Babcock Rail	0.42	0.63	0.42	0.45	0.00	0.00
Carillion Rail	0.00	0.06	0.06	0.00	0.00	0.06
Colas Rail	0.35	0.58	0.58	0.05	0.16	0.05
GrantRail	0.00	0.00	0.38	0.00	0.00	0.60
Fastline	0.19	0.25	0.10	0.25	0.10	0.00
<b>average group rate</b>	<b>0.15</b>	<b>0.26</b>	<b>0.16</b>	<b>0.16</b>	<b>0.15</b>	<b>0.11</b>

## 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
National Express East Anglia	19	9	-10	Yes
London Underground	9	4	-5	-
First Transpennine Express	7	3	-4	-
CrossCountry	13	10	-3	-
London Midland	11	8	-3	-
London Overground	4	2	-2	-
c2c	2	0	-2	-
Colas	3	1	-2	-
Jarvis Rail	2	0	-2	-
Grand Central	2	0	-2	-
First Capital Connect	15	14	-1	-
Balfour Beatty Rail	3	2	-1	-
Serco Metrolink	2	1	-1	-
Southern	18	17	-1	-
Serco Rail	0	0	0	-
Transpennine Express	0	0	0	-
Babcock Rail	0	0	0	-
Serco Rail Operations	0	0	0	-
Heathrow Express	0	0	0	-
Alstom	1	1	0	-
First Engineering	0	0	0	-
GB Railfreight	3	3	0	-
Heathrow Connect	0	0	0	-
Victa Westlink Rail	0	0	0	-
Amec Rail	0	0	0	-
Amey Rail	2	2	0	-
Gatwick Express	0	0	0	-
Other	1	1	0	-
Freightliner	17	18	1	-
Nexus	0	1	1	-
Direct Rail Services	1	2	1	-
Carillion Rail	0	1	1	-
Northern Rail	20	22	2	-
East Midlands Trains	3	5	2	-
VolkerRail	0	2	2	-
East Coast Main Line	1	4	3	-
Chiltern Railways	2	5	3	-
First Great Western	14	18	4	-
Virgin West Coast	2	7	5	-
Merseyrail	3	9	6	-
Arriva Trains Wales	7	13	6	-
DB Schenker	30	36	6	-
First ScotRail	11	19	8	-
Southeastern	17	25	8	-
South West Trains	13	26	13	Yes

## Appendix 10 – Details of SPADs risk ranked 20+

There were ten SPADs with a risk ranking of 20+ during Q3-2010/11. The details are as follows:

- **SPAD risk ranking 21** - On 11 October a passenger train passed HK21 signal at danger on the down line at Henwick (Western Route) by approximately 2¼ miles. The main reasons for the high risk ranking of this SPAD are that: (a) this is a plain line signal that is not required to be fitted with TPWS, (b) the relatively long overrun past the signal, and (c) the consequences, had a collision occurred, could have been relatively high due to the possibility of a rear-end collision involving two passenger trains where the permissible speed is 75mph.
- **SPAD risk ranking 20** - On 19 October, an empty coaching stock train passed ML1763 signal at danger on the up Chester line (down direction) at Rock Ferry (LNW Route) by 66 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 heavily loaded passenger train.
- **SPAD risk ranking 25** - On 4 November a passenger train passed SY395 signal at danger on the up Derby line at Tamworth (LNW Route) by approximately 600 yards. The main reasons for the high risk ranking of this SPAD are that: (a) the benefit of TPWS was diminished owing to rail head contamination and, (b) the relatively long overrun past the signal, and (c) the consequences, had a collision occurred, could have been relatively high due to the possibility of a rear-end collision involving two heavily loaded passenger trains where the permissible speed is 100mph.
- **SPAD risk ranking 22** - On 4 November, an empty coaching stock train passed K180 signal at danger at the exit from Welwyn carriage sidings (LNE Route) by 330 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 heavily loaded passenger train.
- **SPAD risk ranking 21** - On 25 November a freight train passed Y438 signal at danger on the up slow line at Thirsk (London North Eastern Route) by approximately 440 yards. The main reasons for the high risk ranking of this SPAD are that: (a) this is a plain line signal that is not required to be fitted with TPWS, (b) the relatively long overrun past the signal, and (c) the consequences, had a collision occurred, could have been relatively high due to the possibility of a rear-end collision with a passenger train where the permissible speed is 80mph.
- **SPAD risk ranking 20** - On 10 December, an empty coaching stock train passed VC160 signal at danger on the up siding at Streatham Hill (Sussex Route) by 200 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 20** - On 17 December an on-track machine passed T17 signal at danger on the up line at Truro (Western Route) by approximately 4¾ miles. The main reasons for the high risk ranking of this SPAD are that: (a) the long overrun past the signal, and (b) the consequences, had a collision occurred, could have been relatively high due to the possibility of a rear-end collision with a heavily loaded passenger train.
- **SPAD risk ranking 26** - On 20 December a passenger train passed B9 signal at danger on the up line at Uphill Jn. (Western Route) by 380 yards. The main reasons for the high risk ranking of this SPAD are that: (a) the benefit of TPWS was diminished owing to

ice/snow and, (b) the relatively long overrun past the signal, and (c) the consequences, had a collision occurred, could have been relatively high due to the possibility of a head-on collision involving two passenger trains where the permissible speed is 100mph.

- **SPAD risk ranking 20** - On 29 December, an engineers' train passed VS62 signal at danger at Battersea (Kent Route) by 275 yards, coming out of an engineers' possession. The main reason for the high risk ranking of this SPAD is that (a) although the signal is fitted with TPWS, the driver operated the train stop override (TSO) believing that the correct authority to pass the signal at danger had been given, 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 20** - On 31 December a passenger train passed Y195 signal at danger on the down Leeds line at Dringhouses (London North Eastern Route) by approximately 200 yards. The main reasons for the high risk ranking of this SPAD are that: (a) the relatively long overrun past the signal, and (b) the consequences, had a collision occurred, could have been relatively high due to the possibility of a rear-end collision involving two passenger trains where the permissible speed is 90mph.

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

## 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	<b>1</b> - express passenger <b>2</b> - local passenger <b>3</b> - parcels/select empty coaching stock ECS <b>4</b> - express freight/freightliner <b>5</b> - empty coaching stock (ECS), <b>6, 7 or 8</b> - freight/engineering <b>9</b> - Eurostar. <b>0</b> - light locomotive	
Overlap column	A <i>blank</i> indicates the overlap is not known, a <i>0</i> indicates that the signal has no overlap, <i>other figures</i> are the distances in yards.	
Total number of SPADs by driver	<b>0</b> - 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	<b>T22</b> - One of the original multi-SPAD lists ('Top 22' in the 1998/1999 Year-end Safety Performance Report) <b>IN</b> - 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. <b>M</b> - 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	<b>ACT</b> Activation (Driver braked before TPWS initiated a brake application) <b>INT</b> Intervention (TPWS brake application before or without driver action) <b>A/I</b> TPWS initiated a brake application, but not known if Act or Int <b>NIL</b> No brake demand (non-fitment or short distance o/run) <b>NTI</b> No brake demand (token issued: Loops suppressed) <b>R&amp;C</b> TPWS initiated a brake application, but TPWS reset by driver, then continued <b>TSO</b> No brake demand (Train Stop Override operated) <b>UNK</b> Not known whether TPWS applied brakes	
Signal category	<b>2</b> two aspect colour light <b>3</b> three aspect colour light <b>4</b> four aspect colour light <b>D</b> disc <b>F</b> fixed signal (old) <b>FC</b> fixed colour light <b>FD</b> fixed distant <b>FS</b> fixed stop <b>H</b> hand signal <b>I</b> points indicator <b>L</b> limit of shunt (old) <b>LB</b> limit of shunt (board) <b>LP</b> limit of shunt (position light) <b>M</b> marker boards <b>O</b> other <b>P</b> position light <b>S</b> semaphore <b>SS</b> semaphore subsidiary <b>T</b> stop board <b>X</b> drivers crossing light	