SPAD and TPWS activity report

2014/15 half-year

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The report may be downloaded from the RSSB website: www.rssb.co.uk

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Executive summary

Key statistics¹

<table>
<thead>
<tr>
<th></th>
<th>2014/15</th>
<th>2013/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>All SPADs annual moving total (AMT)</td>
<td>300 ↑</td>
<td>Year ending Mar-14: 289</td>
</tr>
<tr>
<td>16+ SPADs AMT</td>
<td>84 ↓</td>
<td>Year ending Mar-14: 92</td>
</tr>
<tr>
<td>20+ SPADs AMT</td>
<td>17 ↑</td>
<td>Year ending Mar-14: 16</td>
</tr>
</tbody>
</table>

Multi-SPAD signals (two or more SPADs in five years)

<table>
<thead>
<tr>
<th></th>
<th>2014/15</th>
<th>2013/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>127 ↑</td>
<td>Year ending Mar-14: 122</td>
<td>Year ending Sep-13: 124</td>
</tr>
</tbody>
</table>

Half-year performance

SPAD numbers

<table>
<thead>
<tr>
<th></th>
<th>Q1 2013/14</th>
<th>Q2 2013/14</th>
<th>Q3 2013/14</th>
<th>Q4 2013/14</th>
<th>Q1 2014/15</th>
<th>Q2 2014/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>16+ 20+ SPADs</td>
<td>21 24 36</td>
<td>18 19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Due to the small numbers involved, there is large variation in the number of 16+ and 20+ SPADs between quarters. Note that the 16+ category also includes 20+ SPADs.

SAS & SOY SPAD numbers

<table>
<thead>
<tr>
<th></th>
<th>Q1 2013/14</th>
<th>Q2 2013/14</th>
<th>Q3 2013/14</th>
<th>Q4 2013/14</th>
<th>Q1 2014/15</th>
<th>Q2 2014/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOY</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>SAS</td>
<td>10</td>
<td>13</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Total SOY</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total SAS</td>
<td>10</td>
<td>13</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Both SOY AND SAS SPADs have remained volatile for the quarters the chart shows. The level of SOY SPADs is low compared to SAS SPADs.

TPWS reset & continue

There were no post SPAD TPWS ‘reset & continue’ incidents during the reporting period. The most recent one occurred at Hitchin on 8 October 2013. The driver stated the signal was displaying a yellow aspect, and assumed the TPWS intervention was due to them being late to cancel AWS. The train passed the first potential conflict point.

On 7 November 2014, the train driver of above mentioned event receives prison sentence for ignoring safety system.

Multi-SPAD signals

Of the 129 multi-SPAD signals, 81 (63%) have TPWS fitted. These signals carry a lower risk, as TPWS is designed to stop the train before it reaches the conflict point.

5% of SPADs in the last five years have been at signals which were multi-SPAD at the time. 19% had at least one SPAD in the preceding five years.

1 Stated values are for year ending Sep-14, and arrows indicate comparisons between this and the year ending Mar-14.
**Context**

### Most recent notable incidents resulting from SPADs

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger train derailment</td>
<td>28 Aug 2010</td>
<td>Guildford</td>
</tr>
<tr>
<td>Passenger train collision</td>
<td>3 Oct 2009</td>
<td>Darlington</td>
</tr>
<tr>
<td>Non-passenger train derailment</td>
<td>15 Jul 2014</td>
<td>Brocklesby Junction</td>
</tr>
<tr>
<td>Non-passenger train collision</td>
<td>16 Oct 2003</td>
<td>Norton Bridge</td>
</tr>
<tr>
<td>TPWS reset and continue</td>
<td>8 Oct 2013</td>
<td>Hitchin</td>
</tr>
</tbody>
</table>

### Last three SPADs resulting in fatalities

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ladbrooke Grove</td>
<td>5 Oct 1999</td>
<td></td>
</tr>
<tr>
<td>Southall</td>
<td>19 Sep 1997</td>
<td></td>
</tr>
<tr>
<td>Watford Junction</td>
<td>8 Aug 1996</td>
<td></td>
</tr>
</tbody>
</table>

- **Ladbrooke Grove**
  - Collision: 31 fatalities (29 passengers and 2 workforce)
- **Southall**
  - Collision: 7 passenger fatalities
- **Watford Junction**
  - Collision: 1 passenger fatality

### Historic performance

- **SPAD numbers (AMT)**
  - 393
  - 300

Since 2004/05 annual SPAD numbers have decreased by approximately 23%. However, there’s a recent increase since early 2014.

- **SPAD risk relative to September 2006 benchmark**
  - Between March 2003 and September 2006 there was a significant reduction in SPAD risk following the installation of TPWS. There has been seen an increase in SPAD risk in the recent year.

- **Seasonality (10-year average)**
  - In the last 10 years, average monthly SPADs numbers have seen peaks in July and October/November.

### Contribution to total accidental system risk (SRM)

- **SPAD**
  - SPAD risk contributes 10.0% of train accident risk. This 10% SPAD risk is 0.6% of total accidental system risk. While this is a relatively small level of risk, SPADs are an important precursor due to their ability to cause a multi-fatality accident.
Recent change in SPADs

The recent monthly SPAD update shows an increase in SPAD numbers. This section is to identify emerging trends and features in terms of this increase.

As shown on the chart, the two-year moving total indicates an increase in the number of SPADs since early/mid-2013/14 after a period of low SPAD numbers during late-2012/13. In addition, the red coloured bars show the number of SPADs occurring during March – June period in the analysis’ period. In 2014, there is a peak in SPAD numbers per month during March-June period compared to the same period in the previous years. October is known as a month with high SPAD numbers due to autumn leaf falls as seen in previous Octobers. Although the three-year moving average shows there is a reduction in number of SPAD since 2009/10, the trend has showed an increase during the “cluster” period.

This chart is comparing the monthly SPAD numbers during the period Oct-13 to Sep-14 with the previous 5-year (09-13) monthly average. During Mar-Jun 2014, the recorded number of SPADs are substantially higher than the five-year average. This supports the analysis described for the chart above.
Executive summary

Half-year in detail

Route performance

Data quality

Lessons learned

Since around the middle of 2012/13, the AMA trends in the number of SPADs has been increasing for both passenger companies and freight companies. This is true of both the trend in absolute number, and the trend when normalised by train miles.

The two charts below show SPADs trends for passenger and freight sectors separately. Each chart shows number of SPADs per month, AMA per month and the normalised rate; and the grey line indicates the average number of SPADs per month for the analysis’ period.

Both freight and passenger SPADs have shown increasing trends since 2013/14. This trend in increased freight numbers since Oct-2013 is tested to be statistically significant compared to the average of the previous 4-year and hence, the increase is evident. However, it must be borne in mind that the number of freight SPADs is very much lower and will therefore be subject to more variation.

The chart on the left shows that recent freight SPAD numbers are outside the upper control limit. These upper and lower control limits are calculated based on the 5-year data. The upper and lower control limits are statistical terms and number of SPADs are expected to fall inside the range. It was seen that SPADs number in March 2014 are outside the range where the increase was initially noticed.

2 Control limits are statistical terms, which is calculated by a statistical methodology based on mean and standard deviation of the data selected.
Risk

Modelled risk
Precursor indicator model (PIM)

The PIM measures the underlying risk from potentially higher risk train accidents (PHRTAs) by tracking changes in the occurrence of accident precursors. In April 2010, SPADs contributed 0.71 FWI per year (9.8% of the total risk). September 2014 shows SPADs contributing 0.92 FWI/year (12.7% of the total risk). This is an estimate of the underlying level of the risk from PHRTAs.

SPAD risk

The SPAD risk is modelled using the individual components of SPAD risk ranking scores, based on a rolling 12-month period. It indicates that, at the end of the quarter, the risk from SPADs is 76% of the 2006 benchmark level.

High risk SPADs

There were 10 SPADs with a risk ranking of 20+ during the first half of 2014/15. The details are as follows:

- **SPAD risk ranking 23** – On 20 April a passenger train passed B15 signal at danger on the Down Main line at Dewsbury by approximately 804m, which was the first potential conflict point. The signal at which the SPAD occurred was reported as having no indication when the SPAD occurred. B15 is a signal protecting a plain line and the distance to the conflict point where a collision could have occurred is 804m. The signal is not protected by TPWS, and as the train reached the first potential conflict point the risk ranking overrun probability is 10 (the highest being 10). In terms of the potential consequences, should a head-on or side on collision with a train have occurred, the SPAD risk ranking consequence score was 13 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 44mph and for the conflict train was 0mph (potential collision speed in the calculation - 22 mph), (b) the collision would have involved two multiple unit passenger trains and (c) both trains were peak loaded with passengers.

- **SPAD risk ranking 22** – On 12 June 2014 a passenger train passed WH354 signal at danger on the Up Slow line at Bedford South Junction by approximately 127m. The driver stated the SPAD was due to them cleaning the window at the time of the incident. WH354 is a signal protecting a plain line and the distance to the conflict point where a collision could have occurred is 225m. The signal is not protected by TPWS, and the risk ranking overrun probability is 9 (the highest being 10). In terms of the potential consequences, should a rear-end collision with a train have occurred, the SPAD risk ranking consequence score was 13 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 90mph and for the potential conflict train was 90mph (potential collision speed in the calculated – 45mph), (b) the collision would have involved two multiple unit passenger trains and (c) the SPAD train was 26-50% loaded with passengers, and the potential conflict train was ECS.
• **SPAD risk ranking 21** – On 26 June 2014 an ECS train passed SY240 signal at danger on the Down Main line at Salisbury by approximately 389m. The driver stated that he was temporarily distracted by events in the run up to the shunt move and was not focused at the time. SY240 is a position light signal protecting a junction and the distance to the conflict where a collision could have occurred is 138m. The signal is not protected by TPWS, and as the train reached the first potential conflict point the risk ranking overrun probability is 10 (the highest is 10). In terms of the potential consequences, should a head-on or side-on collision with a train have occurred, the SPAD risk ranking consequence score was 11 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 15mph and for the conflict train was 30mph (potential collision speed in the calculation – 22.5mph), (b) the collision would have involved two multiple unit passenger trains and (c) the SPAD train was ECS, and the potential conflict train was 11-25% loaded.

• **SPAD risk ranking 20** – On 1 July a passenger train passed B8 signal at danger on the Up Main line at Dewsbury by approximately 16m. The driver stated that they had failed to react to the signal. B8 is a signal protecting a plain line and the distance to the conflict point where a collision could have occurred is 984m. The signal is not protected by TPWS, and the risk ranking overrun probability is 6 (the highest being 10). In terms of the potential consequences, should a rear-end collision have occurred, the SPAD risk ranking consequences was 14 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 75mph and for the conflict train was 0mph (potential collision speed in the calculation – 37.5mph), (b) the collision would have involved two multiple unit passenger trains and (c) the SPAD train was 51-100% loaded, and the potential conflict train was 51-100% loaded.

• **SPAD risk ranking 23** – On 7 July 2014 a passenger train passed CEJ1/2 signal at danger on the Down Perth line at Carmuirs West Junction by approximately 419m. The driver stated misreading the previous signal. CEJ1/2 is a signal protecting a plain line and the distance to the conflict point where a collision could have occurred is 1086m. The signal is not protected by TPWS, and the risk ranking overrun probability is 9 (the highest being 10). In terms of the potential consequences, should a rear-end collision have occurred, the SPAD risk ranking consequences was 14 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 70mph and for the conflict train was 0mph (potential collision speed in the calculation – 35mph), (b) the collision would have involved two multiple unit passenger trains and (c) the SPAD train was 5-10% loaded, and the potential conflict train was 51-100% loaded.

• **SPAD risk ranking 21** – On 9 July 2014 a passenger train passed K629 signal at danger on the Down Main line at Woolmer Green Junction by approximately 40m. The driver stated that they had become distracted. K629 is a signal protecting a junction and the distance to the conflict point where a collision could have occurred is 262m. The signal is not protected by TPWS, and the risk ranking overrun probability is 7 (the highest being 9). In terms of the potential consequences, should a rear-end or side-on collision have occurred, the SPAD risk ranking consequence was 14 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 70mph and for the conflict train was 75mph (potential collision speed in the calculation – 36.25mph), (b) the collision would have involved two multiple unit passenger trains and (c) both trains were peak loaded.

• **SPAD risk ranking 21** – On 22 July 2014 a passenger train passed L91 signal at danger on the Down Suburban line at Bethnal Green by approximately 80m. The driver stated that they had started against the signal having failed to check the signal aspect. L91 is a signal protecting a junction and the distance to the first potential conflict point where a collision could have occurred is 428m. The signal is fitted with TPWS, but as it was a platform starter this was not involved, the risk ranking overrun probability is 9 (the highest being 10). In terms of the potential
consequences, should a rear-end or side-on collision have occurred, the SPAD risk ranking consequence was 12 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 30mph and for the conflict train was 40mph (potential collision speed in the calculation – 17.5mph), (b) the collision would have involved two multiple unit passenger trains and (c) both trains were peak loaded.

- **SPAD risk ranking 20** – On 31 July 2014 an ECS train passed VS685 signal at danger on the Up Catford Loop at Bellingham by approximately 60m. The driver stated loss of concentration. VS685 is a position light signal protecting a junction and the distance to the first potential conflict point where a collision could have occurred is 340m. The signal is not fitted with TPWS, and the risk ranking overrun probability is 8 (the highest being 10). In terms of the potential consequences, should a head-on or side-on collision have occurred, the SPAD risk ranking consequence was 12 (the highest being 18). The score arises because (a) the permitted speed of the SPAD train was 15mph and for the conflict train was 60mph (potential collision speed in the calculation – 37.5mph), (b) the collision would have involved two multiple unit passenger trains and (c) the SPAD train was ECS, and the potential conflict train was 11-25% loaded.

- **SPAD risk ranking 20** – On 6 August a passenger train passed WH1023 signal at danger on the Up Moorgate line at London St. Pancras by approximately 11m. The driver stated the signal had reverted to Yellow as the train passed, although this was not supported by the data logger. WH1023 is a signal protecting a plain line and the distance to the conflict point where a collision could have occurred is 218m. The signals is not protected by TPWS, and the risk ranking overrun probability is 8 (the highest being 10). In terms of the potential consequences, should a rear end collision have occurred, the SPAD risk ranking consequence score was 12 (the highest being 18). This score arises because (a) the permitted speed of the SPAD train was 15mph and for the conflict train was 0mph (potential collision speed in the calculation – 15mph), (b) the collision would have involved two multiple unit passenger trains. And (c) the passenger trains were both peak loaded.

- **SPAD risk ranking 20** – On 8 August an ECS train passed CA721 signal at danger on the Down Direction Goods line at Cambridge by approximately 3m. The driver stated that the signal had cleared and reverted to danger. CA721 is a signal protecting a bi-directional plain line and the distance to the conflict point where a collision could have occurred is 665m. The signal is not fitted with TPWS, and the risk ranking overrun probability is 6 (the highest being 10). In terms of the potential consequences, should a head-on collision have occurred, the SPAD risk ranking consequence score was 14 (the highest being 18). This score arises because (a) the permitted speed of the SPAD train was 5 mph and for the conflict train was 70mph (potential collision speed in the calculation – 37.5mph), (b) the collision would have involved an ECS multiple unit and a multiple unit passenger train and (c) the passenger train was peak loaded with passengers.

There was also one non-passenger train derailment as the result of a SPAD – On 15 July a freight train passed signal B163 signal at danger on the Down Immingham line between Ulceby Junction and Brocklesby Junction and subsequently became derailed. The driver stated that the brakes had failed to work when applied on the approach to B163 signal (group 5 cause).
SPAD risk in detail

In the last 12 months, the majority (56%) of SPADs involved the potential for a passenger train collision. 26% had the potential for other outcomes, such as derailments or overrunning level crossings, and in 18% of cases there was no potential conflict before the next signal.

SPAD risk closely tracks the overrun probability for SPADs where there is the potential for a collision involving a passenger train, with the number of trains reaching the conflict point in such scenarios having a strong impact on the shape of the SPAD risk graph. In the last 12 months, 8 trains reached the conflict point, where there was the potential for a passenger train collision and there were 2 train reached the conflict point during the first half of 2014/15.

SRM and SORAT

The SRR methodology is designed to provide an immediate indication of changes in SPAD risk, which relies upon certain assumptions which prevent it being used as a tool to look at the risk of individual SPADs or certain categories of SPAD. Once SORAT has been more fully rolled out, it will allow a better understanding of the risk from SPADs at individual signals.

The SRM allows us to look at the risk from some of the main SPAD sub categories, in FWI per year:

<table>
<thead>
<tr>
<th>Subcategory</th>
<th>Risk (FWI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction</td>
<td>0.412</td>
</tr>
<tr>
<td>Plain line</td>
<td>0.237</td>
</tr>
<tr>
<td>Shunt</td>
<td>0.060</td>
</tr>
<tr>
<td>Other</td>
<td>0.112</td>
</tr>
</tbody>
</table>
Half-year in detail

Monthly SPAD numbers
The below two charts respectively show the number of SPADs and 16+ SPADs for each month during the first half of 2014/15. The band shows an expected range for SPADs based on the data since 2006.

SPAD numbers are relatively volatile throughout the year. The SPAD numbers for each month of the first half of 2014/15 fall in the expected range based on previous years, apart from April, which is slightly outside the expected range.

There is a large variation in 16+ SPADs between months, due to their low numbers. In the last three years about 30% of SPADs have been risk ranked 16+.

SPADs by sub-category
SPAD numbers by sub category are shown below

A1 category SPADs
A2 category SPADs
A3 category SPADs

A4 category SPADs
A1 SPADs are attributable to driver error, A2 that the signal is imperfectly displayed or partly obscured, A3 that an incorrect authority had been given and A4 that the train experienced compromised braking performance. Full descriptions are given in Appendix 2.

Of those which have this field completed in SMIS, approximately 87.9% are A1, 6.1% are A2, 4.5% A3 and 1.5% A4. Incidents for which a sub-category has not been entered have been categorised as A1 SPADs.
**TPWS at SPADs**

<table>
<thead>
<tr>
<th>Percentage of SPADs with a TPWS brake demand</th>
<th>Percentage of TPWS brake demands which are interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

The proportions of SPADs involving a TPWS brake demand varied around the average of the 6 quarters, at 57%, during the period shown. There is an increase in the number of SPADs at TPWS fitted signals, with the number at non-TPWS fitted signals staying relatively constant. Hence, there is a reduction in the TPWS brake demand per SPAD.

**Reset and continue**

Since the installation of TPWS was completed in early 2004, there have been 29 ‘reset & continue’ incidents. None of these has resulted in either a collision or a derailment, although in one instance the SPAD train did damage some points by running through them.

**Last three reset and continue incidents**

<table>
<thead>
<tr>
<th>Hitchin</th>
<th>Arkleston East</th>
<th>Shoeburyness</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Oct 2013</td>
<td>8 Aug 2013</td>
<td>9 Jun 2013</td>
</tr>
</tbody>
</table>
TPWS approaching SPADs

TPWS brake demands approaching signals at danger (with no SPAD)

|       | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 
|-------|----|----|----|----|----|----
| 2013/14 | 304 | 324 | 297 | 253 | 297 | 253 | 2014/15 |

There does not appear to be any correlation between the number of TPWS brake demands approaching signals at danger (which do not result in a SPAD) and the number of SPADs.

Seasonality of TPWS brake demands approaching signals at danger (with no SPAD)

One possible reason for the seasonal variation during Oct-Dec is that drivers alter their braking technique when approaching signals at danger according to the prevailing conditions, and that slowing down earlier reduces the numbers of overspeed trips approaching signals at danger.

TPWS at permanent and temporary speed restrictions (PSRs and TSRs)

Brake demands at PSRs and TSRs

|       | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 
|-------|----|----|----|----|----|----
| 2013/14 | 112 | 103 | 92  | 96  | 106 | 100 | 2014/15 |

Prior to 2012, all TPWS brake demand data was collected from control logs, the data is now collected directly from SMIS resulting in a more complete data set.

Seasonality of brake demands at PSRs and TSRs

There is currently insufficient historical data on brake demands at TSRs and PSRs to draw any conclusions about their seasonality. There is currently no evidence to suggest a correlation with SPADs.

In all cases TPWS performance is based on the data since 2012 as there’s a change in data reporting in 2012.
**Route performance**

### Anglia

**All SPADs AMT**

- **33 ↓**
  - Year ending Mar-14: 44
  - Year ending Sep-13: 34

**Multi-SPAD signals**

- **20 ↑**
  - Year ending Mar-14: 19
  - Last year: 22

**Proportion of total SPADs AMT**

![Pie chart showing proportion of total SPADs AMT]

**16+ (incl. 20+) SPADs AMT**

- **17 ↑**
  - Year ending Mar-14: 15
  - Last year: 8

**Train miles AMT (millions)**

- **33 =**
  - Year ending Mar-14: 33
  - Last year: 33

**SPADs per million train miles**

- **1.01 ↓**
  - Year ending Mar-14: 1.34
  - Last year: 1.02

**SPADs per MTM from average**

### Kent

**All SPADs AMT**

- **28 ↑**
  - Year ending Mar-14: 24
  - Year ending Sep-13: 23

**Multi-SPAD signals**

- **12 =**
  - Year ending Mar-14: 12
  - Year ending Sep-13: 14

**Proportion of total SPADs AMT**

![Pie chart showing proportion of total SPADs AMT]

**16+ (incl. 20+) SPADs AMT**

- **7 ↑**
  - Year ending Mar-14: 2
  - Year ending Sep-13: 5

**Train miles AMT (millions)**

- **23 =**
  - Year ending Mar-14: 23
  - Year ending Sep-13: 23

**SPADs per million train miles**

- **1.22 ↑**
  - Year ending Mar-14: 1.04
  - Year ending Sep-13: 0.98

**SPADs per MTM from average**

![Bar chart and pie chart showing SPAD performance by quarter]

**Notes:**

1. Data quality
2. Route performance
3. Lessons learned

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**Data quality**

- Context & Risk
- Executive summary
- Half-year in detail
- Route performance
- Lessons learned

**SPAD/TPWS Report, H1-2014/15**
Lessons learned

Data quality

Route performance

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Scotland

All SPADs AMT

22 ↑
Year ending Mar-14: 21
Year ending Sep-13: 20

Multi-SPAD signals

7 ↓
Year ending Mar-14: 8
Year ending Sep-13: 8

Proportion of total SPADs AMT

Train miles AMT (millions)

37 ↑
Year ending Mar-14: 36
Year ending Sep-13: 36

SPADs per million train miles

0.60 ↑
Year ending Mar-14: 0.50
Year ending Sep-13: 0.55

Sussex

All SPADs AMT

18 =
Year ending Mar-14: 18
Year ending Sep-13: 22

Multi-SPAD signals

8 =
Year ending Mar-14: 8
Year ending Sep-13: 10

Proportion of total SPADs AMT

Train miles AMT (millions)

22 =
Year ending Mar-14: 22
Year ending Sep-13: 22

SPADs per million train miles

0.81 ↓
Year ending Mar-14: 0.94
Year ending Sep-13: 0.98
Lessons learned

Data quality

Route performance

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Context & Risk

Half-year in detail

Wessex

All SPADs AMT

26 ↓
Year ending Mar-14: 30
Year ending Sep-13: 29

Multi-SPAD signals

14 ↑
Year ending Mar-14: 12
Year ending Sep-13: 9

Proportion of total SPADs AMT

Western

All SPADs AMT

27 ↓
Year ending Mar-14: 30
Year ending Sep-13: 28

Multi-SPAD signals

13 ↓
Year ending Mar-14: 14
Year ending Sep-13: 14

Proportion of total SPADs AMT
**Wales**

**All SPADs AMT**
- Year ending Mar-14: 18
- Year ending Sep-13: 18

**Multi-SPAD signals**
- Year ending Mar-14: 4
- Year ending Sep-13: 2

**Proportion of total SPADs AMT**

**16+ (incl. 20+) SPADs AMT**
- Year ending Mar-14: 5
- Year ending Sep-13: 4

**20+ SPADs AMT**
- Year ending Mar-14: 0
- Year ending Sep-13: 0

**Train miles AMT (millions)**
- Year ending Mar-14: 17
- Year ending Sep-13: 17

**SPADs per million train miles**
- Year ending Mar-14: 1.05
- Year ending Sep-13: 1.05

**SPADs per MTM from average**

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3 Stated values are for year ending Sep-14, and arrows indicate comparisons between this and the year ending Mar-14.
Data quality

**Reporting**

We are confident there is no underreporting of SPADs, as SMIS has a direct link to CCIL, which we check to make sure all the SPAD events are entered.

**SPADs with a completed investigation**

The SPAD investigation is important, as it is the final stage of the process, after which SMIS is updated to reflect any additional information or corrections which have come to light.

It is also often used to help establish cause, where this is otherwise not clear, which is used in the safety risk model and furthering our understanding of SPAD risk.

It is expected that more recent SPADs may not have a completed investigation, while older SPADs should have a completed investigation that has been added to SMIS.

TOCs and Network Rail are being asked to ensure old SPADs with completed investigations are up to date in SMIS.

**Days taken to enter SPAD events into SMIS**

Over the last five years, the vast majority (98%) of SPADs have been entered into SMIS within five days of the event occurring. The majority of those which have been entered into SMIS after five days have been events which were not originally thought to have been a SPAD.
Lessons learned

SPADs – an international perspective

Greg Morse, Operational Feedback Specialist

At around 00:18 (local time) on 11 January 2013, a Quebec North Shore & Labrador (QNS&L) freight struck the rear end of iron ore train near Mai, having passed a signal at danger. The leading locomotive on the freight was completely destroyed and the second locomotive derailed. Eight wagons on the iron ore train also derailed. The freight crew sustained minor injuries. Approximately 40 feet of track was damaged.

The three-locomotive, 55-wagon, 3950-ton freight was being driven by a trainee, in the presence of a driver with over 20 years’ experience. Both were familiar with the territory and met fitness and rest standards.

The trainee was undergoing practical training and had not yet received any formal training on the Canadian Railway Operating Rules (CROR).

Throughout the evening, the freight was following the iron ore train, which had departed about 30 minutes before the former. The latter had stopped at a signal while its crew cleared snow that prevented the remote operation of points connected to a siding.

In its investigation report, the Transportation Safety Board of Canada (TSBC) noted that more robust cab sheeting, along with the presence of collision posts, corner posts and anti-climbers, would have minimized damage to the cab and afforded more protection for the crew. It added that the absence of regulations requiring improvements in crashworthiness for locomotives built before 1997 increases the risk of injury for crew members and the risk of damage being sustained by such locomotives during an accident.

The TSBC also confirmed that the freight, having passed the signal (1239) at 40 mph, was unable to stop before colliding with the stationary iron ore train, despite an emergency brake application.

In addition, it listed the following causal and contributory factors:

- Given the conversation with the signaller a little less than one hour before the collision, and despite receiving an alarm, the crew continued to believe that the iron ore train would be in the siding at Mai and that signal 1239 would not be at danger.
- Because the driver did not expect 1239 to be at danger, and because he trusted the trainee, he did not intervene to control the speed on approaching the signal.
- The trainee had not yet received Canadian Railway Operating Rules (CROR) training; he therefore had limited signal experience and did not have a complete grasp of the measures required for the situation in which he found himself.

Issues raised by this report:

- Locomotive crashworthiness
- Trainee supervision and experience
- Driver expectation
- Signal sighting
- Safety Management Systems
• Given that the proximity detection device (PDD)\(^4\) screen in the signal box does not show the actual separation distance between two trains moving in the same direction, the signaller did not fully appreciate that a collision was imminent.

• Since the trainee acknowledged without reading the data concerning the iron ore train, he maintained a high speed and was therefore unable to stop the train in time.

The TSBC also added the following findings as to risk:

• In the absence of additional physical fail-safe train controls in signalled territory, the existing defences proved inadequate to prevent the collision.

• Considering the sightline distance to signal 1239, it would be impossible for a train, travelling at the permitted speed, to follow the signal indication once it became visible, thereby increasing the risk from collision.

• In the absence of adequate CROR training and overlearned procedures, driver trainees lack sufficient means to operate trains safely, which increases the risk from accident.

• Without an instructor training program, it is difficult to ensure that knowledge and good practices are properly transferred to driver trainees so they can operate trains safely.

• The absence of any regular re-evaluation of drivers’ skills means that unsafe engineer practices that may increase the risk of accident cannot be identified.

• The absence of regulations requiring improvements in crashworthiness for locomotives built before 1997 increases the risk of injury for crew members and the risk of damage being sustained by such locomotives during an accident.

Action taken

On 16 January 2013, the TSBC issued a Rail Safety Advisory Letter to Transport Canada (TC) regarding the importance of comprehensive training for safe train operations. The TSBC suggested that TC review the training provided to driver trainees at QNS&L given the determination that the trainee who operated the incident train had not received formal CROR training and had not completed his practical training phase.

On 22 February 2013, TC issued a Notice of Danger to QNS&L, citing the risk from operating a locomotive without CROR qualification. On the same date, TC issued a Notice of Danger to QNS&L, citing the risk from having a driver trainee operate a locomotive alone.

In response to a TSBC Rail Safety Advisory Letter, TC indicated on 5 March 2013 that its Quebec Regional Office had also started an in-depth review of the training and supervision of QNS&L employees.

Within the scope of its risk-based business planning process for 2013-14, TC has increased supervision of QNS&L operations. Also, in the summer of 2013, TC audited QNS&L’s safety management system (SMS) with a focus on the training programmes for drivers and instructors, supervision of drivers, supervision of driver trainees, and the corrective actions implemented in the wake of this accident.

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\(^4\) The PDD warns the driver about the presence of any other rail vehicle within a specified distance. It is equipped with a GPS that can determine the position, direction and speed of any other tail vehicle fitted with the device.
Appendices

Report scope
The information in this report covers SPADs which occurred on or affecting Network Rail managed infrastructure (NRMI) during the first half of 2014/15, comparing it with previous half-year and years.

Note: Following the recent reissue of Railway Group Standard GO/RT3119, the term ‘SPAD’ now refers to those events which were previously labelled as a ‘category A SPAD’.

Definitions
Various definitions can be found in appendix 1 and 2 of this report can be found as a separate file on the website, alongside this report.

Details of all SPADs on the network
Details of all SPADs that have occurred on the network since 1998 can be found on the SPAD and TPWS page of Opsweb, http://opsweb.co.uk/spad-and-tpws-reports-data. This file is updated every month to include the latest available data.

It is possible to filter on the risk ranking column to identify potentially significant (risk ranked 16+) and potentially severe (risk ranked 20+) SPADs.

Multi-SPADs
A multi-SPAD signal is defined as one which has had two or more SPADs in the preceding five years. A current list of multi-SPAD signals may be found on the SPAD and TPWS page of Opsweb, http://opsweb.co.uk/spad-and-tpws-reports-data. This is updated every Monday.

It is possible to filter on the events in current 5 years column on the Multi-SPADed list tab to identify signals that have had three or more SPADs in the period. It is also possible to see any signals which were cited in the two post-Ladbroke Grove Improvement Notices, by filtering for T22 and IN in the multi-tag column.

SPADs per million train miles
SPAD rates per million train miles by company can be found on the SPAD and TPWS page of Opsweb, http://opsweb.co.uk/spad-and-tpws-reports-data in the OPSRAM data for Network Rail Routes file. This file is updated every month to include the latest available data.
## SPAD numbers

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