1. Purpose of paper

1.1 This paper will provide the Board with an update on current developments in the area of risk to passengers.

2. Key points

- The level of harm to passengers in the first five months of 2011/12 is 16% lower than in the same period last year. Of the 52 fatalities and weighted injuries (FWI) per year (10.4 fatalities) faced by passengers on the railway, around 40 FWI (78%) is due to injuries to individual passengers in stations.

- A significant area of station risk is the platform-train interface (PTI), which was the subject of a special topic report published in June 2011. The OFG subgroup that sponsored the PTI special topic report has now been expanded to cover the totality of passenger risk in stations with the initiation of the Station Safety Improvement Project.

- The trend in passenger risk is consistent with the requirements of the High Level Output Specification (HLOS) target and two of the three passenger risk related Strategic Safety Plan (SSP) trajectories.

- There was an indication of an increase in train accident risk to passengers as measured by the PIM in 2010/11, with no further increases seen in 2011/12.

- Since 2006 RAIB have completed nine investigations into events where passengers have been harmed, with a further two underway.

- There have been developments in the area of winterisation, with an update of the good practice guide and the development of a guidance note.

- The Olympic Delivery Authority (ODA) is preparing a quantified risk assessment for transport in relation to the forthcoming Games in London.

3. Passenger risk in context

3.1 The risk to passengers on Network Rail Managed Infrastructure (NRMI) is 52.0 FWI per year, or 37% of the total FWI risk of 140.9. The passenger fatality risk is 10.4 fatalities per year which is 15% of the total fatality risk of 70.7. Although the level of harm recorded in 2010/11 was the highest since 2006/07, the level between April and August this year has been 16% lower than the same period last year. There has been one fatality in this period\(^1\) compared with three in the same period in 2010/11. More detail on the trends in passenger harm and passenger risk in context can be found in Appendix 1.

\(^1\) There has been further fatality after this period.
3.2 The HLOS target for passenger safety is a 3% reduction in risk during Control Period 4 (CP4). The trend in passenger risk to the end of March 2011 is consistent with the requirement of the HLOS target. The HLOS Passenger Safety Indicator is shown graphically, together with information on performance against SSP trajectories, in Appendix 2.

3.3 The UK has the lowest passenger risk of all of the 25 member states of the EU on the basis of the recently published second set of National Reference Values (NRVs); a chart and table that illustrates this comparison is shown in Appendix 2.

4. Passenger risk from train accidents

4.1 The Precursor Indicator Model (PIM) measures the underlying risk from train accidents by tracking changes in the occurrence of accident precursors. The output from the PIM updated to September 2011 is shown in Chart 1.

4.2 The increases in train accident risk seen in 2010/11 were mainly in the SPAD and irregular working categories. So far in 2011/12 there have been no further increases in risk, and the total risk remains low by historical standards.

4.3 While the total number of SPADs has continued to increase this year, the underlying risk from SPADs has fallen in recent months; this is shown graphically in Appendix 3.

4.4 Mindful of the increase in risk from irregular working, a steering group has been created in order to develop an industry irregular working risk ranking methodology, sponsored by the Operations Focus Group (OFG).

4.5 According to the PIM, the lowest contributor to passenger train accident risk is from level crossings, although when looking at train accident risk as a whole, it is the largest contributor, due to the risk to members of the public. Due to the perceived reputational risk from level crossings, Network Rail has proposed, in the Initial Industry Plan, a fund for Control Period 5 (CP5) to improve safety at level crossings. This is to deliver, amongst other things, a reduction in level crossing risk by a minimum of 50% by the end of CP5.
5. **Station safety**

5.1 Of the 52 FWI per year faced by passengers on the railway, around 40 FWI (78%) is due to injuries to individual passengers in stations. A small amount of the train accident risk to passengers also occurs in stations such as buffer-stop collisions, and other train accidents that cause harm in stations such as at Potters Bar in 2002.

5.2 Slips, trips and falls make up the largest proportion (58%) of risk in stations, with 23.4 FWI per year. Another significant area of station risk is at the PTI, with 10.4 FWI per year (25.7%). PTI risk accounts for the largest proportion of passenger fatality risk, and the second largest proportion of passenger FWI risk. Although most of the PTI FWI risk occurs while boarding or alighting, most of the PTI fatality risk occurs while not boarding or alighting the train.

5.3 There are many factors which affect the occurrence of accidents at the PTI. These factors overlap, making up a complex list of criteria that contribute to the accident rate. This means some of the effect of a particular factor may be hidden by the effects of other factors. The factors include the age and gender of the passenger, whether or not they are intoxicated, their familiarity with rail travel\(^2\), and seasonal changes in the passenger demographic. Other correlated factors are the time of day or week that the journey is taking place. Example charts from the special topic report\(^3\) on passenger risk at the PTI can be found in Appendix 4.

5.4 As train operating companies are becoming responsible for the station infrastructure, it is important that adequate provision is made in the new franchise model to enable risk to be reduced so far as reasonably practicable with structural changes.

6. **Initiatives and activities in the area of passenger risk**

6.1 Over the past year, passenger risk at the PTI has been one of the key focus areas for OFG. The Group established a PTI subgroup, which commissioned RSSB to produce a special topic report, as mentioned above. This report was published in June 2011, and formed the basis of PTI workshop that took place at ATOC in the same month. The OFG subgroup has now been expanded to cover the totality of passenger risk in stations with support from ATOC, and a Station Safety Project Manager has been appointed on a one-year secondment (from East Coast) to manage the project. The Station Safety Improvement Project has the following working remit:

- Establishing the current situation for all Station Operators, and reviewing any improvement initiatives that exist.
- Conducting analysis of relevant safety data.
- Developing toolkits and guidance for Station Operators.
- Reviewing technological solutions to existing safety issues and good practice that exists outside of the rail sector (for example at airports, shopping centres and sporting venues).

\(^2\) A commuter who is a more experienced rail user may be able to deal with hazards unique to rail travel better than a tourist who has little experience.

\(^3\) Downloadable from: [http://www.rssb.co.uk/SPR/REPORTS/Pages/default.aspx](http://www.rssb.co.uk/SPR/REPORTS/Pages/default.aspx)
• Educating staff and members of the public upon the safety risks that exist in railway stations and creating a resource centre of materials on Opsweb.
• Exploring and influencing the investment opportunities that exist within CP5.
• Promoting the work of the group within the station operator community.

6.2 Since 2006, RAIB have completed nine investigations into events where passengers have been harmed, with a further two underway. Nine of these events were train accidents resulting in on-board injuries. Two involved injuries to passengers on station platforms, including an accident at Romford where three passengers were hit by ballast that fell from a wagon, and an injury to a passenger while boarding a train at Brentwood. Further information on RAIB investigations can be found in Appendix 5.

6.3 A further RAIB investigation is underway into an incident near St Pancras Station where a train failed and passengers detrained in the two hours it took for another train to arrive. The investigation will focus on the design and operation of the trains, the management of the incident and the information available to the passengers and staff who were involved. The problem of passengers detraining themselves is not unique to the UK; in the Paris area it has been noted that it can occur after a delay of as little as 20 minutes. ATOC and Network Rail are producing guidance on the issue of stranded trains.

6.4 A detailed breakdown of risk to the passenger and ‘snapshot view’ of some of the ways in which sources of passenger risk are being tackled is shown in Appendix 6.

7. Winter preparations for managing passenger risk
7.1 The good practice guide (ATOC/GPG019 Winter Arrangements for Stations4) for winter preparations published by ATOC last year has been updated, in particular a section on safe methods of working.

7.2 A guidance note is in development, which will include guidance on: Preparation for winter (eg weather forecasting); planning for winter (eg route strategy and timetables); infrastructure preparation (eg maintenance); rolling stock winterisation; train operation; air and brake systems; and coupler reliability.

8. Preparations for the London 2012 Olympics
8.1 The Olympic Delivery Authority (ODA) is the statutory body responsible for ensuring delivery of venues, infrastructure and legacy for the 2012 Summer Olympic and Paralympic Games in London. The ODA are preparing a quantified risk assessment for transport in relation to the Games.

8.2 The risk assessment needs to be carried out in order to: Establish the risk profile associated with transport operations, Identify high risk areas, Assess hazards exacerbated during the Olympics, Provide input to the Games Ready Safety Case, and Enable comparison with safety targets.

9. Recommendations
9.1 The Board is invited to CONSIDER and DISCUSS the key points identified in this paper.

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4 Available from www.rgsonline.co.uk
Appendices

Appendix 1. Passenger risk profile and trends

The risk to passengers on NRMI is 52.0 FWI per year or 37% of the total FWI risk of 140.9. The rest consists of members of the public (44%) and workforce (19%). The passenger fatality risk is 10.4 fatalities per year of the total fatality risk of 70.7 with members of the public at 79% and workforce at 6%.

The top three contributors to passenger risk are slips, trips and falls, incidents at the PTI, and assault and abuse.
Chart 3 shows that the level of harm recorded for 2010/11 was the highest level since 2006/07 and an increase of around 10% on the previous year. Much of the rise in FWI was due to an increase in fatalities, which at eight, was the highest recorded since 2006/07.

So far in the year 2011/12, the level of harm has been 16% lower than for the same period in 2010/11. There was one fatality in this period compared to three in the same period last year. The fatality involved a male passenger who fell between the train and the platform at Clapham Junction station on 3 August.

A further fatality occurred on 22 October, when a 16-year old girl fell between the train and the platform while running after a train.
Appendix 2. SSP trajectories, HLOS Target and European benchmarking

1. SSP trajectories

The 2009-2014 SSP defines three trajectories that are related to passenger risk from individual accidents. Trajectories have, as their starting point, the level of risk as of April 2009, as estimated by SRMv6.5, and SRMv7 has been used to assess the change in risk occurring at the end of 2010/11. The progress against the trajectory for related to slips, trips and falls in stations satisfies the trajectory range, although the risk at the end of 2010/11 is higher than at the start of CP4. Progress satisfies the SSP trajectory for boarding & alighting accidents, but does not satisfy the trajectory for other platform-edge accidents.

2. Passenger HLOS Target in the context of SSP Trajectories

The High Level Output Specification (HLOS) target for passenger safety is a 3% reduction in risk during Control Period 4.

Because the target covers a wide range of risks in one measure, there is value in examining the contribution from various risk areas – see Chart 4. It can be seen from the chart that the trend in passenger risk to the end of March 2011 is consistent with the requirement of the HLOS target. Progress in train accidents is assessed in the interim measure by examining the PIM. For the other risk contributors, the risk is categorised according to the trajectories set out in the 2009-14 Strategic Safety Plan.
3. European Benchmarking

Countries across Europe have been submitting their Common Safety Indicators (CSIs) to the European Railway Agency (ERA) since 2007. In 2011, the ERA unveiled the second set of NRVs that will be used to monitor safety performance across member states.


- Passenger and workforce fatality rates in the UK were well below the EU average over the six-year period 2004-2009. (This is the same period as the one used by ERA to set the second set of NRVs.)

- The countries with similar rates to the UK include Germany, the Netherlands and Scandinavian countries.

- In general, countries in northern and western parts of Europe have safer railways than those further south and east. Slovenia (with no passenger fatalities in the period) is an exception.

- A single multiple fatality accident can have a significant effect on the accident rate, especially for smaller countries.

- The UK ranks highly among the 25 EU countries across all NRVs, and has the lowest passenger risk as indicated by the Passengers NRV.

<table>
<thead>
<tr>
<th>UK NRV rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRV Category</td>
</tr>
<tr>
<td>Passengers</td>
</tr>
<tr>
<td>Employees</td>
</tr>
<tr>
<td>Level crossing users</td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td>Unauthorised persons on railway premises</td>
</tr>
<tr>
<td>Whole society (consists of all person types listed above)</td>
</tr>
</tbody>
</table>
Appendix 3. SPAD risk

RSSB uses results from the SPAD risk ranking (SSR) process to assess trends in SPAD risk. In July 2010, the industry adopted a revised method for estimating SPAD risk, based on the SSR to give a more stable estimate of the risk than the previous method. At the same time, the baseline date was reset to September 2006, after the introduction of TPWS and the removal of Mark I rolling stock.

Despite the number of SPADS continuing to increase, the corresponding increase in risk over the period from January 2010 to June 2011 has more recently seen a notable reduction. There are two main causes of this reduction: One is a recent shift in the risk profile with fewer SPADs risk ranked 15-19 and more ranked 11-14; another cause is a reduction in SPADs where the train reached the conflict point (the point where the train could come into contact with another train).
Appendix 4. Passenger risk at the PTI

Below are some example charts from the special topic report into passenger risk at the PTI, the full report can be found on the RSSB website

- More females than males are involved in PTI accidents while boarding or alighting (PTI (BA)). Footwear could be one reason for this difference.

- Far more males than females are involved in PTI accidents not due to boarding or alighting (PTI (not BA)); intoxication accounts for a much larger proportion of this type of injury.

- Passenger age groups under the age of 16 and over the age of 51 are involved in a much higher number of accidents than would be expected when considering their representation in the passenger profile. These age groups include the elderly and the very young, who may be less steady on their feet.

- The number of PTI (BA) accidents increases during the week, coinciding with a rise of accidents due to intoxication. When normalised by trips in progress, the rate of accidents is higher during the weekend.

- It is possible that the higher rate of accidents on weekends is due to increase in leisure travellers at these times, who may be less frequent passengers and therefore less familiar with the railway network.
### Appendix 5. RAIB investigations involving harm to passengers

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Accident description</th>
<th>Harm to passengers</th>
<th>Focus of investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/01/2006</td>
<td>Sudbury Station</td>
<td>A passenger train ran into the buffer stops</td>
<td>1 major injury</td>
<td>The operation of the train.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 minor injuries</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 shock/trauma</td>
<td></td>
</tr>
<tr>
<td>05/02/2007</td>
<td>Aylesford</td>
<td>A bridge inspection unit working on the M20 was deployed over a railway bridge. The gantry on the inspection unit was struck by a scheduled passenger train.</td>
<td>1 minor injury</td>
<td>Safety briefing processes for the contractors.</td>
</tr>
<tr>
<td>23/02/2007</td>
<td>Grayrigg</td>
<td>An express passenger train derailed at a set of facing points.</td>
<td>1 fatality</td>
<td>The operation, maintenance and design of the points, specifically shortcomings in safety management arrangements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>28 major injuries</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>58 minor injuries</td>
<td></td>
</tr>
<tr>
<td>01/02/2008</td>
<td>Barrow upon Soar</td>
<td>A passenger train collided with debris from a footbridge that had been knocked down by the raised body of a tipper lorry. The train subsequently derailed.</td>
<td>1 minor injury</td>
<td>The effectiveness of the lorry alarm system and the process to assess and manage the risks from road vehicle transit operations to and from worksites on their property.</td>
</tr>
<tr>
<td>04/01/2010</td>
<td>Exeter St Davids</td>
<td>A passenger train from Barnstaple arriving at the station collided with the rear of another passenger train which was stationary in the platform.</td>
<td>2 major injuries</td>
<td>Low adhesion and the lack of sanding equipment on the class 142 unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 minor injuries</td>
<td></td>
</tr>
<tr>
<td>04/02/2010</td>
<td>Romford Station</td>
<td>A quantity of stone ballast fell from the bottom doors of a wagon in a freight train, as it passed through the station. Stones bounced onto the station platform, and struck three passengers.</td>
<td>2 minor injuries</td>
<td>Wagon design and staff training for the use of this particular wagon.</td>
</tr>
<tr>
<td>06/06/2010</td>
<td>Falls of Cruachan</td>
<td>A passenger train struck a boulder that had fallen down a cutting slope onto the railway</td>
<td>8 minor injuries</td>
<td>The earthworks management system.</td>
</tr>
<tr>
<td>17/08/2010</td>
<td>Sewage Works Lane user worked crossing</td>
<td>A passenger train collided with a loaded 44 tonne articulated road tanker and subsequently derailed.</td>
<td>4 major injuries</td>
<td>The processes relating to misuse at user worked crossings and the procedures for responding to misuse and near miss incidents on user worked crossings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 minor injuries</td>
<td></td>
</tr>
<tr>
<td>05/11/2010</td>
<td>Oxshott</td>
<td>A lorry fell from a road bridge onto the railway and struck the roof of a passing train.</td>
<td>2 major injuries</td>
<td>Guidance and inspections for highway safety and structural examinations at bridges carrying roads over railways.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2 minor injuries</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1 shock/trauma</td>
<td></td>
</tr>
</tbody>
</table>

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6 Full investigation reports and press releases relating to investigations in progress can be downloaded from [www.raib.gov.uk](http://www.raib.gov.uk)
<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
<th>Injuries</th>
<th>Investigation Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/01/11</td>
<td>Brentwood A passenger</td>
<td>A passenger was injured when she fell between the train and the platform while</td>
<td>1 minor</td>
<td>This investigation is ongoing. The RAIB’s preliminary examination has identified that</td>
</tr>
<tr>
<td></td>
<td>was injured while</td>
<td>alighting from the rear set of doors of the rear coach of the eight-coach train.</td>
<td>injury</td>
<td>the train was being operated by the driver alone (as are many of the passenger trains</td>
</tr>
<tr>
<td></td>
<td>alighting from</td>
<td>The person who fell was held by another passenger until the back of the train had</td>
<td></td>
<td>on this route) and that the station was unstaffed at the time of the incident. At</td>
</tr>
<tr>
<td></td>
<td>the rear coach of the</td>
<td>passed clear and then assisted back onto the platform after it had departed.</td>
<td></td>
<td>this station, train drivers are provided with a television monitor, mounted on the</td>
</tr>
<tr>
<td></td>
<td>eight-coach train.</td>
<td></td>
<td></td>
<td>platform adjacent to their cab, to enable them to see the back of the train. The</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>investigation will review the way the train was operated and the train dispatch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>arrangements at Brentwood.</td>
</tr>
<tr>
<td>10/04/11</td>
<td>Durham station A final</td>
<td>A final drive cardan shaft dropped onto the track from an empty passenger train.</td>
<td>1 minor</td>
<td>This investigation is ongoing. It will examine the sequence of events leading up to</td>
</tr>
<tr>
<td></td>
<td>drive cardan shaft</td>
<td>During the incident, a passenger sustained a minor injury from a piece of ballast</td>
<td>injury</td>
<td>the incidents, the design, maintenance and overhaul of the cardan shaft and final</td>
</tr>
<tr>
<td></td>
<td>dropped onto the track</td>
<td>thrown up onto the platform.</td>
<td></td>
<td>drive, the design of the cardan shaft restraining straps and other factors which may</td>
</tr>
<tr>
<td></td>
<td>from an empty passenger</td>
<td></td>
<td></td>
<td>have affected the incidents.</td>
</tr>
<tr>
<td></td>
<td>train.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26/05/11</td>
<td>London St Pancras</td>
<td>A passenger train, stopped close to the northern portal of Kings Cross Tunnel due</td>
<td>No injuries</td>
<td>This investigation is ongoing. It will identify the sequence of events that led to</td>
</tr>
<tr>
<td></td>
<td>International London St</td>
<td>to an electrical problem. Two hours later a train arrived to assist the failed train.</td>
<td></td>
<td>the movement of the failed train with open doors. Factors for consideration will</td>
</tr>
<tr>
<td></td>
<td>St Pancras International</td>
<td>By that time, some passengers had used the emergency release handles to open the</td>
<td></td>
<td>include the design and operation of the trains, the management of the incident and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>train doors in an attempt to improve ventilation (the air conditioning and lighting</td>
<td></td>
<td>the information available to the passengers and staff who were involved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>systems were no longer functioning). The train began to move but this movement was</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>immediately stopped because passengers were getting out onto the railway from the</td>
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<tr>
<td></td>
<td></td>
<td>carriages within the tunnel.</td>
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</tbody>
</table>
Appendix 6. Detailed breakdown of risk to the passenger and ‘snapshot view’ of some of the ways in which sources of passenger risk are being tackled

AGENDA ITEM: 01

Programme of stalks marking, increased use of the slip, trip and toll kit, passenger safety awareness campaigns. Improved emergency preparedness training of staff, improved winter preparedness, increased CCTV coverage, improved passenger communications.

Passenger safety awareness campaigns, further installation of CCTV – improved emergency preparedness training of staff, enhanced luggage storage space, review of internal door operation, maintaining secure station accreditation and review of processes for ensuring passenger welfare during service disruption.

LED 157 (published) on slips etc. being updated by new project LED 829 (published) on platform/train interface.

Operations Focus Group recognised during 2010 the increasing significance of individual passenger accidents at railway stations. In response to this a working group of Network Rail, SAC, and a number of new products development such as RED 28 – Risk at the Platform Train Interface, RIS3703 – Rail Industry Standard for Passenger Train Dispatch and Platform Safety Measures; and a Special Topic Report on Passenger Risk at the Platform Train Interface.

Rail Industry Standard for Passenger Train Dispatch and Platform Safety Measures (RIS-3703) has been approved and issued. This standard provides information on the factors that should be considered when conducting train dispatch risk assessments and methods by which positive safety behaviours can be engendered in both staff and members of public.

Network Rail has appointed a Head of Level Crossings, and produced a policy on management of level crossings to reduce train and accident risk by 25%, by the end of Control Period 4 (2014). It continues to operate the Don’t Run The Risk campaign and to use the Don’t Run The Risk campaign.

Increased use of driving simulators, improved rostering to reduce fatigue, unobtrusive monitoring of driver performance, development of a competency standard for on board hospitality staff, personal development plans for drivers and review of SPADs to ensure all lessons learnt.

T096, T173, T347, T1463 (published) – Weather, climate change, T112, T544 (published) - scour/flood

Sustainable Development Steering Group is looking at effects of environment on passengers.

Network Rail.

TPWS initiatives related to fitment of TPWS at PSRs and in-cab modifications are being considered by the TPWS Strategy Group set up in 2009 by the RSSB Board to determine the way forward for TPWS as part of a long term Train Protection Strategy. The latest outputs are a draft handbook on the use of AWS and TPWS and an update to the TPWS Strategy Group’s action plan.

Proposals to change GO/RT3119 and to propose a review of the Standard.

Network Rail.

Network Rail.

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Proposals to change GO/RT3119 and to propose a review of the Standard.

Network Rail.

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