With an increasing number of people using the railway, modern hectic lifestyles, and the pervading use of technology, we need to act now to respond to existing and emerging risk...
Running Britain’s railway is a technical and complex operation that draws on many organisations within the industry to deliver a service for all of our customers using the GB network. Operating this system introduces many challenges, including managing the interface between the platform and train safely and efficiently.

We had 1.6 billion passenger journeys on our network in 2013/2014 which equates to 3 billion movements across the platform train interface (PTI). The vast majority of these interactions are safe and occur without incident. Travelling on the railway remains among the safest means of travel.

In December 2013, a ‘task and finish’ group was established, by RSSB, to investigate PTI risk and develop a strategy that would support industry in managing this complex interface. Unfortunately, in the last 10 years there have been accidents at the PTI, some resulting in life changing injuries and even fatalities.

With an increasing number of people using the railway, modern hectic lifestyles, and the pervading use of technology, we need to act now to respond to existing and emerging risk, whilst continuing to ensure journeys are as safe and seamless as possible.

To tackle these risks, we have developed an approach which is based on a detailed understanding of the risk that exists; using quantitative and qualitative methodologies to really understand what the data is telling us. We have worked with colleagues from across the industry to identify practical mitigations which can be immediately deployed across the network. We have set out plans and recommendations to benefit both safety risk, performance impact, and capacity. This strategy takes forward the theme of improving safety for everyone using the network, and sets out not only the challenges to managing risk, but also how we introduce consistency of approach. This strategy is supported by a full technical report and examples of good practice, so that everyone in the rail community can introduce effective mitigations quickly.

This strategy marks just the beginning of the industry’s work, it will be updated as further information and knowledge becomes available. The strategy is supported by a realistic deployment plan that provides a framework for what can be achieved in the immediate, short-, medium-, and long-term.

**Neal Lawson**
Chair of PTISG and Director Maintenance and Operations Services, Network Rail
On behalf of the Office of Rail Regulation (ORR) I am delighted to endorse the first industry-wide platform train interface (PTI) strategy. This marks a point in time where the rail industry’s vision and resolve has brought them together to work collaboratively, to optimise the management of the PTI in terms of safety, operational performance, and availability of access. Understanding the issues presented by a continuing growth in demand, we, as an industry, have an opportunity to take a system-wide approach to addressing the challenges of designing and managing the PTI for the future.

There is a considerable amount of work to do as we continue to develop the understanding of the issues around the PTI, through improved data collection and analysis, and an extensive research programme.

I commend the way the whole industry, through the Platform Train Interface Strategy Group (PTISG), has taken on the responsibility of producing this strategy. It is now a live document which can be used to guide shared industry and company delivery plans.

**Ian Prosser**
Chief Inspector of Railways and Director, Rail Safety, Office of Rail Regulation (ORR)
Incidents at the platform train interface (PTI) account for almost half of the total passenger fatality risk on the mainline railway network, and about one-fifth of the overall passenger fatality and weighted injury (FWI) risk.

This first issue of the platform train interface strategy presents a comprehensive overview of the industry’s consolidated approach to identifying causal factors and mitigations that can be implemented. It identifies research that is already planned or underway, that will support those activities. It also proposes timetables for immediate (first year), short-term (CP5), medium-term (CP6 and CP7), and long-term (CP8 and beyond) implementation of activities that reduce safety risk, and optimise operational performance and availability of access, in a manner that promotes the long-term best interests of the mainline railway system.

Like many issues within the whole system railway the PTI affects many areas of design and operation that are not always compatible:

- Platform clearances for passenger, freight, and plant vehicles
- Platform and passenger vehicle floor heights
- Optimal step and gap configurations for passengers with and without mobility issues, and those using wheelchairs
- Passenger train designs, including door configurations, train capacity, provision for luggage; and how these might affect overall performance

The broad range of issues covered in this strategy means that there are areas of overlap; where an issue in one area impinges on another. For ease of approach this document looks at 6 specific areas of activity describing, where relevant, the activity plans for the short- and long-term targets. Those areas of activity are:

- Data and intelligence gathering
- Passenger movements through the station and across the PTI
- Train stopping positions, dispatch, monitoring the dispatch corridor, and stopping once dispatched
- Optimising the step and gap
- Accessibility
- Performance and capacity

The PTI strategy will be a living document. It will be updated as activities are progressed, knowledge gained, lessons learned, and targets refined.
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1.6 billion passengers carried each year

3 billion platform train interface interactions every year

48% of the passenger fatality risk occurs at the PTI
The mainline railway currently carries nearly 1.6 billion passengers each year. In each journey, passengers cross the platform train interface (PTI) at least twice – once while boarding and once while alighting. These 3 billion PTI interactions every year are distributed over 2,500 stations, and about 6,000 platforms, across the mainline railway network. While the number of injuries per PTI interaction is very low, 21% of the overall passenger fatality and weighted injury (FWI) risk and 48% of the passenger fatality risk occurs at the PTI.

The management and operation of the PTI is complex and presents a number of hazards for station users. These are often exacerbated by an individual’s actions and behaviour. Following a number of accidents at the PTI, in particular the accident at James Street, Liverpool in October 2011, there has been considerable focus on improving the operation and management of the PTI.

But it is not just about safety. Effective management and operation of the PTI also requires the consideration of operational performance, capacity, right of access for train operation (including freight services), accessibility, public behaviour, and perception.

We know that the standards relating to platform height and stepping distances into the train need further clarification and understanding, in the context of both existing platforms and new infrastructure projects such as Thameslink, Crossrail, and HS2.

In view of this range of PTI related issues and the need to co-ordinate actions across the industry, in September 2013, the RSSB Board approved the proposal for the development of a PTI strategy for the GB mainline railway and endorsed the creation of a cross-industry Platform Train Interface Strategy Group (PTISG) to support its production.

The core aim of the PTI strategy has been for the industry to work together to reduce safety risk, and optimise operational performance and availability of access.

As optimising the PTI is a significant task for the industry, this document represents only the first edition of the strategy. As such, it does not provide all the answers in relation to the design, operation, and management of the PTI. The strategy provides a starting point to begin to measure PTI risk, a vision for the industry, and recommended next steps. Upon sign-off of the strategy, we will move into the implementation phase.
2 Overview of the strategy

The strategy will:

- Focus on safety, performance, capacity and access issues that impact on the PTI
- Reduce FWI, which includes: fatalities, major injuries, minor injuries and shock and trauma
- Address the issues associated with maintaining continued compatibility of freight vehicles with the routes and platforms on the network
- Give due consideration to the accessibility requirements of the ‘Persons with Reduced Mobility’ (PRM) Technical Specification for Interoperability (TSI)
- Consider the potential for multi-fatality incidents at the PTI resulting from overcrowding
- Consider the impact from the expected increase in passenger numbers and any platform modifications required

2.1 Structure of this strategy

The strategy is divided into the following sections:

1 Data and intelligence gathering.
2 Passenger movement through the station and across the PTI. This includes influencing public behaviour and support station and platform staff.
3 Train stopping positions, dispatch, monitoring the dispatch corridor and emergency stopping once dispatched. This includes door closing arrangements.
4 Optimising the step gap.
5 Accessibility, including how accessibility can be improved without affecting performance and safety.
6 Performance and capacity – how can we improve the operational performance.

While the strategy is structured in these sections, the workstreams are not mutually exclusive. To maximise benefit there will need to be continued coordination across all activities.
The core aim of the PTI strategy is for the industry to work together to reduce safety risk and optimise operational performance, capacity and availability of access...

2.2 Strategy objectives and targets

The core aim of the PTI strategy is for the industry to work together to reduce safety risk and optimise operational performance, capacity and availability of access in a manner that promotes the long-term best interests of the mainline railway system and those who use it. The strategy aims to identify through the short- and long-term targets, deliverables for the mainline railway system as a whole for:

- New railway developments and major renewals
- Existing stations and rolling stock

In delivering the core aim, the strategy:

- Reflects the wide range of operation, performance, engineering and behavioural issues surrounding the PTI
- Accounts for the immediate short-, medium- and long-term needs of the industry
- Defines the research, where appropriate, needed to develop and deliver the strategy
- Seeks industry buy-in for the implementation of the strategy
- Includes proposals for developing and implementing a national campaign to influence public behaviour on stations and at the PTI, including a national media campaign and passenger education programme
At the initial strategy group meeting in December 2013, the decision was taken to develop a risk-based approach, in order to review assumptions held about the causes of PTI accidents. These assumptions were converted into hypotheses and tested using a combination of qualitative and quantitative data. Some of these data sources included:

1. The *PTI Special Topic Report*, first published in 2011, was updated and reissued at the end of 2013. This report provided high-level information which was later supplemented by a SMIS narrative analysis of PTI accidents between 2009 and 2013. The analysis provided more detailed evidence on the size and scale of the issue, alongside causal factors.

2. Operations, engineering and human factors workshops, utilising industry expertise to identify contributing factors to PTI risk.

3. Observations by a human factors supplier, to better understand how passengers interact with the PTI environment and perceive risk; the study included passenger focus groups and a survey.

4. Trial of the Close Call system.

5. Detailed post-incident data collection and analysis.

6. Development of a PTI risk tool to assist in identifying the levels of risk across the station portfolio.

7. Additional work to investigate the optimum step gap, including the consideration of level access.

A similar hypothesis-based approach has been taken to evaluating options for the engineering, operational, and capacity implications of the strategy.

An action plan will be produced to accompany the strategy, with the aim of informing and tracking implementation. Shortly after the strategy is published, a technical report, including the data and methodology used to create the strategy, will be made available to the rail industry.

All proposals for changes, additional work, and research, will be considered against the requirements for reasonable practicability as defined in the RSSB document *Taking Safe Decisions* (see Section 7). Further information on this approach is available within the technical report.

Any proposals for changes to existing standards, or for new standards, around the PTI will be progressed through the normal processes and overseen by the Industry Standards Coordination Committee.
The lines that make up the current GB mainline railway are many decades old and were built at different times, by different private railway companies, to different design standards. Much of the station infrastructure (including platforms) does not conform to current standards. There is no retrospective requirement to bring assets into conformity, and doing so is prohibitively expensive.

As an illustration, only around 30% of the existing platforms conform to current height standards, and around 20% conform for lateral offset. Only 7% conform to modern standards for both height and offset.

Train vehicle footstep heights and positions are similarly variable due to their historical introduction, with earlier rolling stock often tailored to specific routes, whilst more modern stock is specified and designed to ‘go anywhere’, to meet the requirements of today’s railway.

This diversity is a significant part of the challenge of managing the PTI.

Chart 1
Average platform height and offset

The orange segments show the percentage of existing platforms that conform to current height and offset standards.
PTI risk forms a significant proportion of the risk faced by passengers, especially fatality risk. A greater understanding of the causal factors involved in PTI accidents can provide the industry with the knowledge to help prevent some of these accidents, and to mitigate the consequences when they do occur.

In 2011, RSSB published the first edition of a special topic report into the possible factors causing accidents at the PTI. The current report is the second edition and contains data that has been updated to the end of September 2013.

The report focused on a number of factors that have an effect on accidents at the PTI. These included the effects of time (including the time of day, week, or year) and its effect on the people involved, including a consideration of age and gender. Other factors that we investigated included the effect of intoxication on passengers, weather conditions, type of station and its operator, and the type of train and its operator.

PTI accidents are categorised in 2 distinct ways: accidents occurring while boarding or alighting trains; and accidents occurring at the platform edge, but not during boarding or alighting.

**Chart 2**

*Passenger risk by accident type*

<table>
<thead>
<tr>
<th>Passenger FWI risk (58.4 FWI/per year)</th>
<th>Passenger fatality risk (8.3 per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train accidents</td>
<td>Train accidents</td>
</tr>
<tr>
<td>Other passenger accidents</td>
<td>Other passenger accidents</td>
</tr>
<tr>
<td>Platform edge incidents (boarding/alighting)</td>
<td>Platform edge incidents (not boarding/alighting)</td>
</tr>
<tr>
<td>Slips, trips and falls</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Assault and abuse</td>
<td>Assault and abuse</td>
</tr>
<tr>
<td>On-board injuries</td>
<td>On-board injuries</td>
</tr>
</tbody>
</table>

Source: SRM v8.1
The following conclusions were drawn from the reports:

- PTI risk accounts for the largest proportion (48%, or 4.0 fatalities each year) of overall passenger fatality risk (8.3 fatalities each year); this is illustrated in Chart 2. Accidents during boarding or alighting account for 2% (0.2 fatalities each year) of the fatality risk, while other accidents at the platform train interface account for 46% (3.8 fatalities each year); this is biggest single contributor to passenger fatality risk

- PTI risk accounts for 21% (12.1 FWI each year) of the total passenger risk as measured by FWI. Of this, 11% (6.7 FWI) occurs while getting on or off trains, and 9% (5.5 FWI) occurs while not boarding or alighting. The total passenger risk, as estimated by Safety Risk Model version 8.1 (SRM v8.1), is 58.4 FWI

- Risk at the PTI is not limited to passengers. Members of the public, visiting stations for reasons other than travel (shopping, socialising, meeting or seeing off passengers), are also affected by PTI-related risk

- When passengers and public are considered together, the PTI accounts for 12.7 FWI each year and 4.4 fatalities each year, as measured by SRM v8.1

- There has been an increase in amount of harm while boarding or alighting since 2007/08, even when accounting for the generally increasing trend in passenger journeys

- 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

  - There is a gender imbalance in the people involved in accidents at the PTI. This imbalance is different, depending on whether the person is boarding/alighting (where more females are involved, possibly due to footwear or propensity to report the accident), or not boarding/alighting (where more males are involved)

  - Intoxication has a large effect on the occurrence of accidents at the PTI, especially when the person is not boarding or alighting. Males are involved in more alcohol related incidents than females

  - Males appear to have a generally higher level of risk from PTI accidents not due to boarding or alighting, even after taking into account that they are involved in more alcohol-related incidents overall

  - Accident rates are higher during off-peak periods of the day or week. There is also a higher rate of accidents in summer. It is possible that there is an increased proportion of people at these times who are less frequent users of the railway, such as tourists and other leisure users, and who are therefore less familiar with the risks associated with it

  - The weather has some effect on accidents while boarding or alighting, with a higher rate of accidents seen when the weather is wet and icy compared to when it is dry and not icy. The effect is less than is seen with slips, trips, and falls in stations
The problem

- Alighting from the train appears to be more hazardous than boarding. Although the numbers of events are similar, alighting accidents account for around 70% of the harm.

- The severity of a passenger injury at the PTI is heavily influenced by whether or not the accident involves a train and, if so, whether the train is stationary or moving. Moving trains have accounted for almost half of the harm and more than three-quarters of PTI fatalities over the past 10 years, with through trains being particularly highlighted in the data.

Chart 3
PTI harm 2004/05 to 2013/14

<table>
<thead>
<tr>
<th>Injuries per year</th>
<th>Harm per year</th>
<th>Fatalities per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1,245.6)</td>
<td>(9.9 FWI)</td>
<td>(3.2)</td>
</tr>
</tbody>
</table>

- Arriving trains: 95%
- Departing trains: 4%
- Through trains: 1%
- Stationary trains: 1%
- No train involved: 1%

1 Between 2004/05 and 2013/14 there were 71 PTI accidents where the type of train movement was not known. These accounted for 3.27 FWI (2 fatalities) and have been apportioned to each train movement category according to the proportion of injuries where the type of train movement is known.
Targets

All work streams have had the opportunity to undertake workshop reviews and develop suggested PTI mitigations. These have been based on industry expertise, experience, and knowledge about what currently exists, both in rail and other passenger transport areas, and what could exist in the future, based on current research and understanding of PTI issues. These mitigations were linked back to the factors we understood to be present in PTI events, to build a better picture of which mitigations could have the greatest impact and where.

The mitigations were initially ranked, based on the number and severity of the incidents that could be controlled by them, the confidence the workshops had given to these mitigations, and how high a priority the workshops felt the mitigations were.

It was decided that, to set meaningful targets, a reduction in the normalised FWI should be identified. The normalised FWI for PTI incidents is, however, notably different between different incident types and train interactions. Therefore, the targets have been set to FWI incidents fitting into 5 broad incident types, based on the precursor field in SMIS, the main source of PTI event data. These 5 categories are:

- Alighting: all events where a person is attempting to alight a train
- Boarding: all events where a person is attempting to board a train. Boarding and alighting have been separated as alighting events have been shown to have a higher normalised FWI than boarding events
- No train present: all non-boarding or alighting events with no train present at the time, in the area of the event
- Train present – stationary: all non-boarding or alighting events where a stationary train was present
- Train present – moving: all non-boarding or alighting events where a train was moving – either approaching or leaving a station, or a non-stopping train

Each factor, which had previously been linked to possible mitigations, was linked back further to the event precursors, to allow for a granular view of what type of events featured which type of factors, and what mitigations were considered to be effective for them.

As the event factors had been split up by precursor, the initial mitigations work was reviewed by the work stream leads, to allow for additional insight into the potential timescales and costs involved for each mitigation. The suggested effectiveness of mitigations was adjusted for how well a mitigation may work in a particular context. For example, a mitigation that is effective for boarding and alighting events featuring rushing may not work as well for rushing incidents with no train present.

The mitigations were given a suggested impact, cost, and timescale. These, along with the adjusted confidence and priority for each, influenced the potential reduction in FWI for that particular factor and mitigation. The potential percentage reduction has been averaged across all mitigations, to account for where mitigations may be very effective, but only for a small number of events. These suggested reductions are also based on the principle that all mitigations implemented work as intended.
Progress against the targets can be continually measured by monitoring the trends of the precursors that make up each of the 5 incident types. By doing this, it will be possible to predict if a target may not be met. Analysis of each precursor trend against its individual target would be needed to understand which mitigations are having the most effect. The way the percentage reductions are built allow for adjustments where our understanding of a mitigation’s effectiveness changes. For short-, medium-, and long-term mitigations, the outcomes rely on taking action now, and that they are in place within the timescales defined.

A number of mitigations rely on staffing, and thus are only appropriate in stations with full- or part-time staff. As such, the mitigation targets shown in the table below are only appropriate in 64% of events, and a further 30% of events may only be prevented by mitigations at certain times. The mitigations shown do not include those that rely on the presence of station staff. These factors have been accounted for in deriving the targets.

For implementation to be successful, the strategy needs continued support from the highest levels in the industry. This must include: subject matter experts joining the programme group, senior members of the industry taking ownership of the action plan and, where justified, the finance provided to support the development and implementation of the strategy.

<table>
<thead>
<tr>
<th>Incident type</th>
<th>In the immediate term, we can potentially decrease the normalised FWI of PTI events by</th>
<th>With mitigations achievable in the short term, we can potentially decrease the normalised FWI by</th>
<th>With mitigations achievable in the medium term, we can potentially decrease normalised FWI by</th>
<th>With mitigations achievable in the long term, we can potentially decrease the normalised FWI by</th>
<th>With all mitigations in place and working as intended, we could cumulatively reduce the normalised FWI by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alighting events</td>
<td>2%</td>
<td>24%</td>
<td>6%</td>
<td>6%</td>
<td>38%</td>
</tr>
<tr>
<td>Boarding events</td>
<td>2%</td>
<td>27%</td>
<td>4%</td>
<td>*</td>
<td>33%</td>
</tr>
<tr>
<td>No train present</td>
<td>14%</td>
<td>1%</td>
<td>*</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Train present – moving</td>
<td>20%</td>
<td>2%</td>
<td>*</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Train present – stationary</td>
<td>11%</td>
<td>1%</td>
<td>*</td>
<td>12%</td>
<td></td>
</tr>
</tbody>
</table>

* No long term risk measures identified at this stage, these will be determined as the strategy develops.
All proposed deliverables described in this strategy (short- to long-term) will be developed, piloted and, where applicable, implemented in line with the guidance set out in *Taking Safe Decisions*, using the Common Safety Method for Monitoring and the Common Safety Method on Risk Evaluation and Assessment (CSM RA).

Deliverables will be subject to a standardised management of change process to provide consistent implementation and monitoring of change. The results of this monitoring will be reviewed and used to inform any further management of change processes and help eliminate the possibility of changes having unintended negative impacts in other areas.

This approach will mean all decisions and changes to achieve the objectives and targets in this strategy are based on ensuring safety, operational performance, and availability of access, so far as is reasonably practicable (SFAIRP).

In addition, new projects and renewals should give consideration to whether an additional marginal spend, or combining projects, would result in a justifiable benefit to the affected PTI environment. Any business case concerning increase in scope or combination of projects would need to include measurable benefits in improvements to safety, performance, accessibility, and capacity, SFAIRP.

...all decisions and changes to achieve the objectives and targets in this strategy are based on ensuring safety, operational performance, and availability of access...
The events and factors that are captured within, or omitted from, the scope of the PTI strategy are:

**Events in scope**
- Person trapped in train doors
- Slip, trip, or fall across the platform train interface
- Contact with train exterior while on platform
- Person falling between train and platform
- Fall from platform onto track

**Events not in scope**
- Trespass
- Indirect contact with the electricity supply: individuals who may be carrying objects or engaging in behaviour that bring them indirectly into contact with electricity supply

**Factors to be considered**
- Injured party factors – the injured party’s actions, or personal characteristics
- Third party factors – the actions of a third party, but not the actions of train or station staff
- Station design – the design of the station, including the platforms, in normal operating conditions
- Station operation – the operation of the station, including the actions of platform staff, and the impact of events such as delays on station operation
- Train design – the design of the train, including doors, handrails, and alarms
- Train operation – the operation of the train, including the actions of on-board staff, and dispatch procedures
9 Governance

9.1 Development

The PTISG was established in December 2013 and has met for 1 year; chaired by Neal Lawson, Director Maintenance and Operations Services, Network Rail. It has cross-industry representation, including: TOCs, ATOC, ROSCOs, DfT, ORR, and LU (TfL). Cross-industry representation is also reflected across the programme team and technical work stream leads.

The freight industry is engaged through the National Freight Safety Group (NFSG); and freight technical experts were contacted to review and feed into the drafting of the strategy.

9.2 Support from the rail industry

The development of the strategy has been widely supported and influenced by industry. Engagement and input was sought from a wide range of industry colleagues, including:

- Industry specialist workshops which covered operations, engineering, and human factors
- Using the existing Station Safety Champion Network, of which a representative from each TOC and Network Rail are members
- Between June and October 2014, progress and themes of the strategy were shared with wider industry. This included presenting and receiving feedback at executive safety meetings, through to station visits and meeting front line colleagues. This feedback has subsequently been incorporated into the strategy

9.3 Ownership and implementation

The PTISG was a ‘task and finish’ group that reported directly to the RSSB Board. To maintain a high profile and industry buy-in, the PTISG will continue to meet during the initial implementation phase. To reflect progress, the PTISG, will be renamed: PTI Strategy Implementation Group (PTISIG). The cross-industry technical workstream leads will continue to support the implementation of the strategy. Any subsequent standards changes will be progressed through the normal Industry Standards Coordination Committee process.

9.4 Funding

Many of the immediate and short-term recommendations in the strategy involve the utilisation of existing resources in a more effective way, the creation of more consistency across the network, sharing of good practice, or initiating research.

The medium- and long-term recommendations are aimed more at engineering. To be successful this requires a step change in the industry’s approach to projects, and in particular funding. A new approach will need wide industry ownership and the creation of a senior level industry policy group to review current structures; particularly the funding of maintenance, renewals, and enhancement projects. In parallel, the industry group will be required to review the prioritisation and combining of projects, to obtain the greatest benefit for the industry and passengers, SFAIRP. A system approach will be used to ensure that future PTI related projects are not delivered in isolation.
The GB railway still has many historic infrastructure assets such as stations, bridges, and viaducts in daily use and these severely constrain the options, compared to a new-build railway system. The line of route is generally fixed and the location of stations and platforms cannot easily be moved. The GB mainline is, for most of its length, a mixed traffic railway with long-distance, suburban, regional, and freight traffic sharing the same tracks. This limits the options for tailoring platforms to specific operations, as requirements for clearance to high-speed passing traffic or freight vehicles may conflict with the desire for small platform train gaps for stopping services.

Overcoming these constraints was a key part of this PTI strategy, made more difficult as there is, at present, no clear industry strategy for which types of traffic are expected to need access to which route sections in future. In the absence of such a strategy it is assumed that current access will continue largely unchanged but it is recognised that this may not be the optimum solution. There is some ‘bottom up’ view on future freight flows for high cube containers but no clear ‘top down’ strategy, and there is no corresponding strategy for passenger vehicles.

All operators need to recognise that a mixed traffic railway will inevitably need compromises, and any changes to the network will need to be in the long-term best interests of the whole railway system. The majority of freight traffic growth on the GB rail network over the period of this strategy is expected to be intermodal (container or swapbody) and clearance for these types of vehicles is therefore essential for rail to develop as part of the national transport system. Where alternative routes can be identified or developed, reduced clearances, and hence stepping distances, may be possible.

The current and projected increase in passenger numbers are driving a number of initiatives, including longer trains, and hence longer platforms. Longer trains may introduce new challenges for safe and efficient train dispatch, whilst extensions to existing platforms often have to be built in locations where it is difficult to meet all aspirations. These factors are taken into account in this strategy.

...a mixed traffic railway will inevitably need compromises, and any changes to the network will need to be in the long-term best interests of the whole railway system.
11 Interoperability and standards requirements

The GB mainline railway operates within the framework of the EU Interoperability Directive, the supporting Technical Specifications for Interoperability (TSI), and the suite of Railway Group Standards (RGS) for compatibility. Within this framework there are requirements related to the PTI which need to be taken into account in this strategy, and challenged if appropriate.

The Persons with Reduced Mobility (PRM) TSI deals with accessibility issues for the PTI, and specifies a maximum gap for ‘unassisted boarding’ of wheelchairs and other mobility impaired users of 75mm horizontal and ±50mm vertical. This maximum gap is only if ‘unassisted boarding’ is required and boarding ramps and other aids including staff assistance are fully compliant with the TSI.

The standard TSI platform heights are low (550mm or 760mm above rail level) and GB has a specific case for our platform height (and offset). The revised TSIs refer to National Technical Rules (such as RGS GI/RT7016) which contain the GB requirement of 915mm height. The corresponding offset is also defined in RGS, depends on platform curvature, and has exceptions for a few vehicle types.

There are no requirements in TSIs or RGS for vehicle floor height, but step positions are given relative to the target platform. TSI requirements for step position relative to the platform are slightly different from the RGS, but there is a significant overlap, and a GB Specific Case in the revised TSI permits the full combined area to be used.
11.1 Current and recent projects

Various train operators in GB have required platforms with heights which differ from the 915mm RGS requirement for new build. These have generally been higher platforms, which are much more restrictive for freight and other passing traffic. A number of these platforms conflict with the loading gauge for track maintenance machines (as well as freight traffic), restricting their passage, or only allowing passage at very low speed under observation. In these locations mechanised track maintenance (or even rail delivery of materials) may not be possible.

In many cases the heights have been selected to be within the 75mm±50mm from the current vehicle floor or step height, to enable ‘unassisted boarding’, with the expectation that this will reduce dwell times. In practice, whilst the step and gap at these platforms may be within the 75mm±50mm, they are not truly level and the resulting trip hazards can cause problems for other passengers. There is emerging evidence that this may not be the optimum or lowest risk solution for the general passenger population.

Most of these projects are away from the GB ‘mainline’ railway network and therefore not within the scope of RGS. Some either pre-date or are excluded from the scope of TSIs. Projects within scope of TSIs and/or RGS would need deviations to use non-standard platform positions.

Known projects with ‘high’ platforms include Heathrow Express, London Overground (TfL section only), and the design for the Crossrail central section. Some other projects are considering the introduction of higher platforms, and these include some Thameslink core stations for raised platform sections.

11.2 HS2

HS2 is considering a ‘high’ platform and has started discussions on a possible revision to the TSI, as the GB Specific Case would probably not be appropriate for new high-speed lines; and use of the TSI standard 550mm or 760mm heights would not support level access from platform to seat for any credible HS2 train designs. HS2 is committed to providing a PTI that is safe, enhances passenger experience and allows people to travel independently with confidence and dignity. The introduction of a new higher platform will increase the diversity of the GB system. However, the HS2 project team recognises the challenges associated with tackling this difficult problem, and have indicated their intention to work with the PTISIG to develop consistent approaches, where possible, to manage the PTI.
12 Data and intelligence gathering

12.1 Aims

Preventing PTI events relies on the industry’s ability to understand what causes them. This work stream is focused on better understanding of what data is currently held, improvements to the way data on PTI events is collected, and better utilisation of the data. The aims of this work stream are to:

1. Improve industry understanding of currently collected data.
2. Improve the accuracy, consistency, and detail of PTI event reporting.
3. Develop a broader understanding of PTI events and factors, by pursuing different data collection avenues.
4. Generate tools and outputs that allow for better understanding of PTI risks and mitigations.

12.2 Benefits

The key benefits to improving the quality of PTI event data, and better utilising currently held data, are:

1. A clear, and continuously developing, understanding of what factors are involved in PTI events; leading to a better understanding of what mitigations are needed to prevent events.
2. A clear understanding of what mitigations are effective, and under what circumstances; enabling station and platform owners and maintainers to focus their efforts on proven mitigations.
3. The ability to track, with confidence, the impact mitigations have on the number and seriousness of PTI events.

12.3 Current understanding

To provide more information on the factors involved in PTI incidents, a detailed search of SMIS narratives was conducted. The factors for this search were decided with input from the work stream leads for human factors, engineering, and operations; generating a list of 40+ broad factors, fitting into 6 overarching themes, consistent with the scope.

- Injured party behaviours/factors
- Station design
- Train design
- Station operation
- Train operation
- Third party factors

Each incident was given tags for any factors brought up in the narrative. An incident could have any number of tags, and these were recorded in a matrix to make further analysis feasible. Incidents between calendar years 2009 and 2013 were chosen as a representative sample, and while workforce incidents are currently not being used for the reporting output, they have all been tagged for future use.
The narrative search demonstrated some of the limits in current PTI incident reporting data. For example, 60% of incidents did not feature a reported age range, 30% had no reported gender, and 13% featured neither. This paucity of information was often reflected in the nature of the narratives themselves. A large number of incidents featured no greater incident detail than that the injured party had had a slip, trip, or fall; which by itself is not particularly conclusive in determining what factors influence incidents.

Additionally, factors under the Injured Party theme were over represented. While it was simple to find incidents where an injured party had, for instance, been under the influence of alcohol or rushed to board a train, it was more difficult to identify incidents where train dwell times or platform staffing levels were an attributable factor.

A sub-group under the governance of System Safety Risk Group (SSRG), the Data and Risk Strategy Group (DRSG), has responsibility for considering and meeting the industry’s needs for future safety-related information.

However, the data sample size was considered sufficient enough to be able to draw sound conclusions on the factors most in need of addressing:

- Slips/trips/falls and the related subcategory Misjudged Footing (where the Injured Party declares they had missed their footing or misjudged their step) was the biggest incident factor by number of incidents. While a slip/trip/fall is a very broad descriptive factor, it is useful for further comparison. 62% of all incidents involving passengers and public included mention of a slip/trip/fall in the narrative. The average FWI per incident for this factor was 0.009

- Encumbrances – that is, where the injured party was encumbered by suitcases, pushchairs, bikes, or other baggage, was the next biggest factor by number of incidents. This factor was included in 15% of all narratives, and had an average FWI per incident of 0.004

- Rushing – where an injured party ran or rushed on a platform or train leading to an accident, was the third most used factor, appearing in 10% of all narratives. The average FWI per incident was 0.011

- Intoxication was the fourth biggest incident factor by number of incidents. This was a feature of 9% of all incidents and had an average FWI of 0.028 per incident.

62% of all incidents included mention of a slip/trip/fall

15% of all incidents involved passengers carrying suitcases, pushchairs, bikes, or other baggage

10% of all incidents involved running or rushing on a platform or train

9% of all incidents involved intoxication
• Hazard on platform – where broken coping stones, cracked pavement, ice, or other hazards were present on the platform, was the fifth biggest factor from number of incidents. This was a feature of 8% of all narratives, and had an average FWI per incident of 0.006. This is also the only factor of the top 5 that is not under the Injured Party theme.

Alongside examining the total number of incidents, the average FWI scores per incident factor were collated. Some incident factors were used in a small number of incidents, which meant any single incident with very high FWI or a fatality associated with it skewed the average. The incident factors with the highest average FWI score, with anomalous scores accounted for, were:

• Horseplay and risky behaviour, had the highest average FWI per incident, with a score of 0.091, almost equivalent to 1 major injury per incident. There were a total of 29 incidents associated with this factor.

• Too near the edge, the factor covering where an injured party is standing, running, or sitting too near the edge of the platform, had the second highest average FWI, with a score of 0.052. There were a total of 218 incidents featuring this factor in the narrative.

• Dropped items, where the injured party dropped an item on the platform or track and was involved in an incident as a result, had an average FWI of 0.032 per incident. This was a factor in 10 incidents.

The results garnered from this exercise sit well with the findings of the PTI Special Topic Report, while providing some additional data on incident factors not reported through SMIS precursor headings.

12.4
Approach

The following activities are due to be completed, or become part of business as usual processes, during 2015.

12.4.1
PTI information forms

After initial analysis of PTI data in SMIS, it was recognised that if more information about each event could be captured, more accurate conclusions could be drawn from the data. For example, if further information on the exact whereabouts of the event (which platform and where on the platform) could be captured, then it would be possible to calculate the stepping distance at the point of the event. This would enable a better understanding of how the stepping distance affects the occurrence of accidents at the PTI.

During the creation of the strategy, a form was devised to capture as much information as possible about PTI events, including the exact location of the event, possible causal factors (that were not consistently being picked up in the SMIS narrative), and any other relevant factors relating to the event or the station in which it occurred. As part of a preliminary study, this form was sent out to station staff when a PTI event occurred, and the information captured was collated. From this information, it is possible to gain an understanding of what data can realistically be collected on an ongoing basis. This work will feed into the future development of the SMIS project and could result in new fields in SMIS that could capture this information.
12.4.2  
Close Call

The Network Rail led Close Call System, which is managed by RSSB, was rolled out to 10 trial stations across the GB network between May and October 2014.

A close call is defined as ‘an event that had the potential to cause injury or damage’. Studies have shown that for every major accident or fatality there are many hundreds of events of a far less serious nature. In different circumstances, these ‘close calls’ could have ended up being more serious accidents.

The main outputs from the trial included production of a working definition of what constitutes a close call at the PTI, supplementary information on precursor events which could lead to a PTI incident, and trialling of the reporting system across different TOC and Network Rail managed stations.

The findings from this trial will feed into any future roll out of Close Call across the network.

12.4.3  
PTI risk tool

As part of the RSSB-managed R&D programme a PTI risk tool is being developed within project T1029, Designing a tool to support duty holders in the assessment of platform train interface risk.

The tool will enable assessment of individual platforms, to identify key risk information that should be incorporated into local instructions for the platform and also aspirations for improving arrangements at the PTI. The content of the tool is consistent with the RIS-3703-TOM Rail Industry Standard for Passenger Train Dispatch and Platform Safety Measures. This web-based toolkit will allow station staff to identify and assess by platform:

- The types of hazardous events that commonly occur
- Risk control measures in place, relating to, for example, platform, station, and train design; train arrival and dispatch procedures; crowd management; way finding; and passenger information, assistance, and support
- Approaches to enhance risk controls, drawing on good practice approaches and examples provided by the toolkit

The tool is to be compatible with mobile technology. A single database will sit behind the tool that will capture the data for all platforms, once an initial assessment has been completed. Information generated from the toolkit will be collated nationally and used to inform the short-, medium-, and long-term approaches to operational arrangements as well as platform, train, and station design. In addition, the data will help SFAIRP decisions to be made, so these short-, to long-term approaches are targeted and prioritised according to risk.

The tool will be available in summer 2015 and further developed following the optimum step and gap research, and better defined relationship between gaps and injuries.
13 Passenger movement through the station and across the PTI

13.1 Aims

The aim of this work stream is to reduce incidents at the PTI through the safe, efficient, and effective movement of passengers throughout stations and across the PTI. This work stream also aims to minimise the desire for passengers to rush, support them in decision making, and facilitate the provision of a service to meet customer needs and expectations. It will consider the projected increase in demand for that service. This will be achieved through:

- Better and consistent communication
- Improved station and train design
- Improved presentation and location of station and on-board travel information
- Enhanced way-finding signage
- Increased support provided by station staff

13.2 Benefits

The potential benefits of enhancing the efficient and effective movement of passengers throughout stations and across the PTI will be a reduction in:

- Slip, trip, and fall incidents around stations and on platforms
- Incidents involving passengers falling between the train and the platform
- Incidents involving passengers falling from the platform
- Incidents involving passengers being struck and/or trapped and dragged by a train
- Delays associated with these incidents
- The financial impact resulting from these incidents

Enhancing the efficient and effective movement of passengers throughout stations and across the PTI will provide a safer environment for rail users, as well as:

- Potentially improving performance due to prompt departure and reduced dwell times
- Enhancing the customer experience by providing better information and communications

13.3 Current understanding

Incidents at the PTI continue to increase despite current control and mitigation measures in place. There are a number of passenger behaviours related to the occurrence of such incidents. These include:

- Passenger intoxication. This has been identified by the Office of Rail Regulation as a factor in 21 of the 32 deaths at the PTI in the past 10 years. Intoxication is associated with the potential for passengers to fall from the platform, be struck by a train while on the platform, fall between the platform and the train or slip, trip, or fall across the platform train interface
- Passengers walking, standing, or waiting too near the platform edge. This is associated with the potential for passengers to fall from the platform, be struck by a train while on the platform, or fall between the platform and the train
- Passenger awareness of the distraction caused by technology such as mobile phones, and tablets
- Passenger and public awareness and perception of the potential risks associated with the PTI
Passengers rushing through stations and at the PTI

A number of options have been identified with the potential to help tackle these behaviours. These include:

- Standardised and systematic implementation of guidance, upskilling staff, and closer collaboration with British Transport Police (BTP) to manage intoxicated passengers
- Creating, communicating, and enforcing zones at the PTI to stop passengers waiting, walking, or standing too close to the edge of the platform
- Targeted safety communications, announcements, and interventions by staff to help raise passenger awareness of, for example, distraction caused by technology, PTI risks, and actions passengers can take to keep themselves safe at the PTI. These will make use of technologies such as CCTV for monitoring, through to intelligent systems, proactively alerting staff of passenger behaviours associated with PTI risks

Whilst passenger behaviours are a significant contributory factor in incidents at the PTI, a number of factors associated with station design and train operations can be enhanced to influence these behaviours.

For example, sub-optimal platform signage and announcements can lead to passenger confusion and cause them to rush for trains. Passenger flow modelling is currently used during station design and re-design projects to identify optimum way finding signage and station furniture positioning. It is also used to identify areas of potential congestion such as queues at retail outlets and crowding around CIS screens.

Through the influence of passenger behaviours, using behavioural change interventions, staff interaction, station design, and train operations, incidents in and around the station would be reduced, in addition to reducing incidents at the PTI.

13.4 Gaps in the evidence

There are a number of gaps in the current understanding of behaviours, factors, and solutions relating to the efficient and effective movement of passengers throughout stations and across the PTI. These include understanding:

- The most effective ways of motivating and influencing different passenger groups; and the messages, methods, and approaches that can be targeted to each group to change behaviour at the PTI
- The most suitable method for designating and enforcing zones at the PTI, to keep passengers away from the platform edge
- The most suitable methods for supporting passenger decision making

In addition, there may not be industry-wide methods or approaches, either to modelling passenger flows at the PTI, or assessing crowding issues. These can happen during day to day operations or be caused by situations such as train delays, engineering works, special events, and emergency situations. Such modelling needs to consider a range of issues and scenarios such as: how people move around the platform, board, and alight a train; how they distribute themselves on the platform prior to boarding and once they have entered or alighted a carriage; and the effects these can have on safety, capacity, and performance.
...we will develop and implement sustainable solutions, where applicable, and so far as is reasonably practicable, achieve efficient and effective movement of passengers throughout stations and across the PTI.

This work stream will address these gaps, build on the options and issues discussed above, and consider best practice from other countries and industries. From that we will develop and implement sustainable solutions, where applicable, and SFAIRP, achieve efficient and effective movement of passengers throughout stations and across the PTI.

The following section provides more details on how this will be achieved.

13.5 Approach

An operational workshop in March 2014, asked industry experts to consider a number of pre-determined hypotheses in relation to how they might impact on performance, and for their potential to increase risk.

Three areas of operations were considered; the management of passengers, station design and train dispatch. Each group was firstly asked to identify the top 5 in order of their positive impacts, 1 having the most impact and 5 the least.

In the second session they were asked to consider the same hypotheses for their potential to increase risks, 1 being the highest risk and 5 the least.

A passenger behaviour workshop was also conducted using the same methodology, with subject matter experts. The findings from this workshop were triangulated with outputs from a literature review and analysis of SMIS data.

The prioritised list of solutions, identified by this work as providing the most significant benefits in terms of improving performance and reducing risk, SFAIRP, has been used to develop the following immediate, short-, medium-, and long-term initiatives. It has also contributed to all initiatives described in the work stream ‘Train stopping positions, dispatch, monitoring the dispatch corridor and stopping once dispatched’.

Many of the changes proposed, in both work streams, will require relevant assessments to determine at how many locations such changes would need to be made, and the likely effectiveness of each initiative. Consideration will also be given to retrospective changes to platforms or station equipment where it can be identified that there would be a significant benefit in terms of reducing risks and improving performance.

All changes implemented will be subject to a management of change process to eliminate the possibility of the changes having unintended negative impacts in other areas. Additionally, the process will provide consistent implementation and monitoring of any changes. The results of this monitoring will be reviewed and used to inform any further management of change processes.
13.6 Immediate

Over the next 12 months this work stream will aim to:

- Help empower and raise passenger awareness of PTI risks through a national safety communications campaign
- Create communication materials to help station and platform staff understand the range of PTI risks faced by passengers, to spot vulnerable or high risk groups at the PTI, and provide relevant assistance
- Improve the management of intoxicated people through the promotion of good practice
- Facilitate industry sharing of best practice in managing PTI risks, through creating, and directing staff to, a facility on OPSWEB

Details on how these aims will be achieved are provided below.

13.6.1 National safety communications campaign

A national safety communications campaign will be designed and piloted across the network using consistent, simple, positive messaging through a range of channels, such as social media.

This campaign will provide targeted safety communications, to help empower (rather than ‘scare’) passengers and raise passenger awareness of PTI risks and the potential consequences of, for example, standing too close to the edge, rushing, intoxication, and distraction. Simple actions passengers can take to keep themselves safe at the PTI will also be communicated. The campaign will embody good practice in safety communications and will focus on initially raising awareness, before concentrating on high risk groups and key issues.

Communication materials will also be developed to help station and platform staff understand the range of PTI risks faced by passengers, to spot vulnerable or high risk groups at the PTI and provide relevant assistance. These materials will also direct staff to the practices showcased in the OPSWEB facility.

The campaign and communication materials will draw on work completed by the Transport Research Laboratory (TRL) Qualitative Study of Passenger Behaviour, which provides a segmentation analysis of passengers’ behaviour at the PTI; good practice from current rail safety communications campaigns at the PTI (such as Tyne and Wear Metro, and Thameslink, previously First Capital Connect); as well as proven campaigns in other areas of public safety, such as road, fire, water safety, smoking, and healthy eating.

13.6.2 Good Practice Guide for managing intoxicated passengers

A Good Practice Guide Managing alcohol risks to personal security on the railway was developed by RSSB for industry as part of research project T704. Work will be undertaken by RSSB to further promote systematic application of this Good Practice Guide across the railway, so that all railway companies are implementing the guidance as best they can. Network Rail has created a paper ‘Tackling Intoxication on the Railway’; this has been shared within Network Rail and ATOC, and outlines the most opportune ways to implement the RSSB Good Practice Guide.

The work will also consider the development of additional good practice, the requirements for additional industry support, such as staff training, and enhancement of station facilities; and how these can be best developed to advance the management of intoxicated passengers across the short-, medium-, and long-term.
A national safety communications campaign will be designed and piloted across the network using consistent, simple, positive messaging...
Passenger movement through the station and across the PTI

13.6.3
OPSWEB

A facility on OPSWEB to share, store, and promote good industry practice for the management of the PTI will be created. This will, over time, provide an interactive and more innovative method of sharing good practice across the industry.

13.7
Short term

Over the short term (during CP5) this work stream will build on the achievements of the first 12 months and initiate new programmes of work to advance the efficient and effective movement of passengers throughout stations and across the PTI. Specifically the work stream will aim to:

- Prioritise, based on risk, stations where platform furniture presents a significant PTI risk
- Determine the optimal design of way finding signs, and content for passenger travel communications
- Create a decision framework to inform the position of platform markings to designate zones where passengers should not wait, walk, or stand too close to the edge of the platform
- Implement additional good practice in the management of intoxicated passengers and determine how station design and improved co-ordination between station staff, train staff, Network Rail, and the BTP can advance the management of intoxicated passengers
- Determine and implement a common approach to modelling crowding at the PTI
- Determine new ways to reduce crowding and safely manage the projected increase in passenger numbers
- Facilitate behaviour change by continuing to raise passenger awareness of PTI risks and behaviours related to the occurrence of incidents, such as distraction (including distraction caused by technology), rushing, and standing too close to the platform edge
- Provide staff with the skills, time, and equipment to support relevant PTI initiatives

13.7.1
Risk based prioritisation and removal of hazards and design features on station platforms that may affect the free flow of passengers

A survey of station platforms will ascertain locations where the level of platform furniture obstructs the free movement of passengers. Research project T1029 will provide a station risk tool which can assist with the identification of priority stations where platform furniture presents a significant risk.

13.7.2
Research options for design of way finding signs, and standardised key messages, to assist passengers in finding the correct platforms and trains

The effective management of passengers around stations is achieved via a number of means including: way finding signs, information displays, assistance staff, and announcements.
Research will be done to find the optimal design of way finding signs and the most appropriate content for passenger announcements, including the times they should be made. This will include on-board information and assistance, removal of train information from CIS screens prior to train departure, and better methods for communicating and managing service disruption and last minute platform changes. The Network Rail pedestrian flow and passenger modelling at stations tools could be used as part of this research. Consideration should also be given to signage and messages where platform sharing occurs, as well as exploring the benefits of standardising the time at which train information is removed from CIS screens, and door closing times prior to train departure.

RSSB research project T1026 currently being undertaken will inform this work.

13.7.3 Creating, communicating, and enforcing zones at the PTI

Based on existing research, and informed by RSSB research project T1026, a decision framework will be developed to inform the position of platform markings to designate zones where passengers should not wait, walk, or stand too close to the edge of the platform. The framework will be applicable to the variety of station environments and configurations across the network. Once completed, the framework will be proposed for incorporation into relevant Railway Group Standards and Rail Industry Standards. To support the implementation of the framework, staff will be provided with relevant training, equipment, and support to raise passenger awareness and understanding of identified zones.

Research will be considered to determine if any relevant operational procedures (for example, train dispatch procedures) need to be revised to support the implementation of these zones.

The development of the decision framework will also incorporate GI/RT7016 ‘Interface between station platforms, track and trains’, to ensure all decisions on platform markings consider the aerodynamic ‘pull’ on station platforms from passing trains, and buffeting from passing freight trains.

13.7.4 Advancing the management of intoxicated passengers

To support the management of intoxicated passengers, the feasibility and effectiveness of enhancing station facilities (informed by good practice) will be assessed, along with the potential to advance co-ordinated support between station staff, train staff, Network Rail, and the BTP, to improve implementation of existing legislation and promote ‘responsible drinking’ on the railway.

Based on the work achieved in the immediate term, consideration will be given to the development of additional good practice on the management of intoxicated passengers, which will include guidance to staff on how to apply it.

13.7.5 Crowd management

Research will be initiated that will:

1 Identify and implement, SFAIRP, an industry-wide methodology for modelling passenger flow and crowding at the PTI.

2 Use this methodology to create a real time picture of crowding across GB rail.

3 Explore ways to reduce crowding and safely manage projected increase in passenger numbers.
To achieve this consideration will be given to:

- Review of current approaches used to model passenger flow and crowding at the PTI
- Station and train design
- Train planning and timetabling
- Management of passenger flows and movements within the station and at the PTI
- Better communications, including live train loading information
- Coordination of resources between relevant parties
- Proactive crowd control to manage day to day crowding and situations that can cause crowding such as train delays, engineering works, special events, and emergency situations

Crowd management plans for special events will be implemented more regularly at stations. Plans may include staffing levels, staff training, triggers for when the plan would be invoked, and 3rd party support. Additionally the plan would identify how to manage flows of passengers through the station, and on and off platforms, and will be informed by the crowd management research.

13.7.6 Passenger education programme

Passengers are often unaware of the dangers they face on the railway particularly as a result of their own behaviour, for example distraction caused by technology, rushing, or standing too close to the platform edge. The design of an education programme for passengers will incorporate information on what they will find on arrival at a station, how they can use signs to navigate around the station and on to platforms, train door markings, and the risks to themselves and others within the station environment.

The education programme will include targeted communications, announcements, and interventions, at stations and on board trains, to re-enforce the messages. The programme will support the continued national safety communications campaign. It will be informed by behavioural change theories, and techniques such as nudge theory and theory of planned behaviour, and will empower (rather than ‘scare’) passengers.

Station staff will be provided with relevant training, equipment, and support to achieve this. Existing school railway safety education programmes will be updated to include hazards at the PTI, and relevant safety messages for efficient and effective movement of passengers throughout stations and across the PTI.

The feasibility and potential effectiveness of new approaches for communications and behavioural change will also be considered. For example:

- Targeted communications at stations in response to a PTI incident (similar to the UK Fire Service ‘Hot Strikes’, where fire safety community activity is targeted within an area that has recently had a dwelling fire)
- Targeted communications at point of sale such as: at ticket offices, displayed on tickets and the on-line purchase of tickets
- Use of travel champions to intervene and communicate key messages
• Using technology (smart phones, tablets) to provide, for example:
  – Warnings such as targeted staff announcements heard through passengers’ personal devices or displayed on smart phones or tablets
  – Incentives for desirable behaviour, for example, a smart phone app that can log arrival at the station in good time and build up loyalty points; or an active sensor in the yellow line that communicates with your ticket and awards points or credit for waiting behind the line
  – Holograms at the PTI to deliver safety communications, potentially in response to passenger behaviour
  – Intelligent monitoring capability and automated passenger warnings and messages, to help communicate and enforce the zones in real time, reducing impact on staff resource
  – Resources to support school railway safety education programmes and safe travel with children. This could include children education packs, big windows, child friendly offers and promotions, and specific guidance for travelling with children

13.7.7
Staff training

Staff training (station and train crew) to support the initiatives described above will be developed, accompanied by recommended updates to relevant staff competence standards and assessments, for implementation by industry. This will build on the communication materials developed in the immediate term and be informed by the non-technical skills training RSSB research project T1064. This programme will also look at how staff can be given the necessary time and resource to support the initiatives described above to ensure they do not become overloaded.

13.8
Medium term

Over the medium term (CP6 and CP7) this work stream will focus primarily on the piloting and implementation of mitigations identified in the research and studies in CP5.

This will include:
• Risk based prioritisation and removal of station platform furniture and hazards that present a significant risk to the free flow of passengers
• Implementing and subsequently monitoring effectiveness of changes to way finding signs and announcements on passenger behaviour
• Continued investigation into technological advances which could improve passenger information and way finding within stations
• Implementation of platform markings, based on the decision framework
• Implementing station facilities and formalised arrangements between station staff, train staff, Network Rail, and the BTP to enhance the management of intoxicated passengers
• Implementing options to advance crowd control and meet projected increase in passenger numbers
• Monitoring effectiveness of staff training (including non-technical skills) and passenger education, including updates based on risk-based information
13.8.1 Removal of hazards and design of features

The short-term outputs will identify a programme of risk-based prioritisation and removal of platform hazards and design features that may affect the free flow of passengers. This will be based on the platform risk assessments and surveys.

13.8.2 Passenger information and way finding within stations

Global technological advances and innovative solutions in the provision of passenger safety, travel, and way finding information will be monitored and reviewed to inform further changes at stations and on trains, where they are considered to be a better solution.

13.8.3 Platform lines and markings

All GB station platforms implementing, SFAIRP, consistent platform markings, in line with the decision framework developed and implemented in CP5.

13.8.4 Intoxication

A range of resources to support the safe management of intoxicated passengers will be piloted at all staffed stations and, where successful, will be implemented, SFAIRP. Work will also be undertaken to incorporate requirements for such resources into the design standards for new stations.

The exploration of potential advancements in co-ordinated support between station staff, train staff, Network Rail, and the BTP carried out in CP5, will be turned into formalised agreements of roles, responsibilities, and processes for managing intoxicated passengers. This formalised agreement will be supported by investigation into additional legislation and policy that could be used to support the management of intoxicated passengers, for example banning the sale and consumption of alcohol on trains (similar to TfL).

13.8.5 Crowding

Initiating implementation of options for managing and reducing crowding identified in CP5 across the network, where relevant and SFAIRP. Piloting and implementation will be initially focused on crowding hotspots, identified by the real time picture of crowding across GB Rail developed in CP5.

13.8.6 Monitoring effectiveness of staff training and passenger education

Monitoring will include the review of information gathered from multiple sources, such as the PTI risk tool, SMIS, monitoring the effectiveness of staff training, passenger education, and the arrangements in place to ensure staff do not become overloaded. In addition the railway school education programme, updated in CP5, will be monitored to help determined the feasibility and benefit of incorporation into the National Curriculum.
13.9 Long term

The solutions and options piloted and implemented in CP6 and CP7, will help to achieve the aims of this work stream and SFAIRP enable efficient and effective movement of passengers throughout stations and across the PTI.

Over the long term (CP8 and beyond) this work stream will focus on sustaining this success.

This will include:

- School railway education programmes incorporated into the National Curriculum
- Advanced systems for monitoring passenger behaviour and supporting passenger decision making through stations and on platforms, using intelligent automated systems. These systems will support continued understanding and modelling of passenger flows and crowd management issues at the PTI; deliver tailored customer information, warnings, and assistance in real time; incentivising desirable behaviour, and providing a tailored individual experience for rail
- All new stations and rolling stock designed incorporating new technologies and design features to minimise, for example, crowding, distraction (including distraction caused by technology), the desire to rush, and to support passenger decision making. This will also include a range of station facilities to support the safe management of intoxicated passengers

13.10 Critical success factors

Where relevant and SFAIRP, solutions developed within this work stream will incorporate accessibility issues identified and addressed in the ‘improving accessibility at the PTI’ work stream.

This work stream will co-ordinate closely with the ‘Train stopping positions, dispatch, monitoring the dispatch corridor, and stopping once dispatched’ and ‘Optimising step and gap’ work to ensure solutions support the efficient and effective movement of passengers through stations and across the PTI.
14 Train stopping positions, dispatch, monitoring the dispatch corridor and stopping once dispatched

14.1 Aims

The aim of this work stream is to reduce incidents at the PTI by standardising and enhancing the processes supporting the arrival, departure and dispatch of trains from platforms. This includes doors and management of doors.

14.2 Benefits

The potential benefits of this work stream will be a reduction in:

- Slip, trip, and fall incidents when boarding and alighting
- Incidents involving passengers falling between the train and the platform
- Incidents involving passengers falling from the platform and train
- Incidents involving passengers being struck and/or trapped and dragged by a train
- Incidents of passengers becoming trapped in train doors
- Delays associated with these incidents
- The financial impact resulting from these incidents

The introduction of Driver Only Operation (DOO) across the GB network may result in small savings to journey times that can be made through reduced dwell times as a result of fewer human interactions involved in opening and closing the doors. There is also a small performance benefit assumed from a reduction in the number of delays and/or cancellations arising from waiting for safety critical members of staff.

Moreover, RSSB research project T743 indicated that enhancements to dispatch methods, based on assessment of the specific situation at individual stations, on a case-by-case basis, could lead to the achievement of small localised safety benefits.

14.3 Current understanding

Processes for train arrival, departure, and dispatch can affect passenger behaviour and the occurrence of PTI incidents. For example, the non-provision or sub-optimal positioning of train stop car marks can result in non-standard stopping positions on platforms. This in turn means it is difficult to give passengers advice about the best position to stand on the platform and may result in them rushing to get to the train or, as with those with seat reservations, to the correct coach.

Processes for train arrival, departure, and dispatch offer opportunities for helping to control PTI incidents and/or reducing the severity of such incidents. For example, technological solutions to stop trains before they arrive at platforms, can help reduce the risk of a passenger being struck by a train if they fall from the platform. Enhancing methods for monitoring the dispatch corridor can help reduce the risk of a passenger getting trapped in the door and being dragged by the train.

RSSB research project T743 suggests that advancements in train dispatch methods may be best achieved through localised, station-specific improvements ‘through assessment of the specific situation at individual stations, on a case-by-case basis’, as opposed to ‘wholesale change in dispatch method from one type of dispatch to another’. The report indicates this is because ‘the risk related to dispatch is considered equally distributed across the methods of dispatch with
no single method(s) having a disproportionately high relative risk. This suggests that on average the current dispatch procedures in place at most stations are appropriate to the circumstances. Therefore there is limited safety benefit to be achieved through wholesale change in dispatch method from one type of dispatch to another.’

With this in mind, a number of options have been identified. These include:

- Development of technological solutions designed to stop a train in an emergency once it has started
- Advancements, where possible, in train dispatch methods and train monitoring approaches, to provide a safe environment at the PTI and support efficient and timely dispatch of the train
- Advancements and standardisation, where possible, of stop car marks, train door position markings, and signage

There are different combinations of technology which can be used to support DOO, and the selection of these to date has been on a bespoke basis, according to suitability and cost at any specific location. This raises incompatibilities when rolling stock is required to run on alternative routes. RSSB research project T1035 will review current DOO practices in conjunction with available and emerging technologies and propose the most cost effective way in which DOO could be implemented. The research will aim to capture the system requirement(s) independent of the technology, and subsequently evaluate the relevant technologies against such requirements.

14.4 Gaps in the evidence

There are a number of gaps in the current understanding, such as:

- The types of technologies and their advantages and disadvantages, for supporting safe and efficient train dispatch, and stopping trains in an emergency where there is a PTI risk
- How car marks and train stopping positions can be standardised, and what standardised positions may look like
- The type of technology and process required to further improve the safety and efficiency of train dispatch under DOO
- The potential for standardised door positions to allow for door position markings on platforms
- How closing train doors prior to departure may influence passenger behaviour
- How ‘Hustle Alarms’ affect passenger behaviour, the optimal door close arrangements, and the standardisation of design to promote passenger understanding and reduce access and egress incidents. For example, the Hustle Alarm on LU trains sound as the doors are closing, whereas with London Overground trains it sounds to warn people that they are about to close

This work stream will address these gaps and build on the options and issues discussed above, as well as consider best practice from other countries and industries to develop and implement sustainable solutions, where applicable, and SFAIRP.
14.5 Immediate

This work stream is built on a set of studies that will begin during 2015 and will be finished by the end of CP5. These are described in the next section.

14.6 Short term

Over the short term (CP5) this work stream will aim to:

- Determine system requirement(s) and associated technologies associated with trains arriving and departing platforms to support reduction in PTI incidents
- Build an evidence base to facilitate the making of an informed decision on the further use of DOO
- Consider different technological solutions for stopping trains when there is a PTI incident
- Trial GSM-R solutions to enable station staff to make high priority calls to a driver and signaler when there is an incident at the PTI
- Determine the feasibility of standardising train stop car mark positioning on platforms, through optimal positioning, use of train stop boards, train door positions and markings, and train design
- Identify optimal door close arrangements, including consistency in closing doors prior to departure, and determine the feasibility of standardising the use of Hustle Alarms to support consistent dispatch procedures, promote passenger understanding, and reduce access and egress incidents

14.6.1 Train arrival and dispatch

A research programme will be initiated to explore how technologies and approaches associated with trains arriving and departing platforms can be used to support a reduction in PTI incidents. Areas of research are likely to include assessing:

- Feasibility of extending the scope of RIS 3703-TOM to include the duties of drivers, guards, other train crew, and managers with regards to train dispatch
- Feasibility and effectiveness of using platform-mounted cameras, body-side cameras, and in-cab CCTV monitors as the preferred option for train dispatch
- Effectiveness of train monitoring processes during trains dispatch to determine whether the whole train can be monitored as it leaves the platform
- Technological solutions to train monitoring which enable the PTI to be observed without interruption for as long as possible, ideally until the train has left the platform

The programme will aim to capture the system requirement(s) independent of the technology, and subsequently evaluate the relevant technologies against such requirements.
A research programme will be initiated to explore how technologies and approaches associated with trains arriving and departing platforms can be used to support a reduction in PTI incidents.
14.6.2 DOO

RSSB research projects T1035 and T1059 will be reviewed to provide an insight into the benefits and shortcomings of the possible introduction of further DOO across the network. This will include assessment of which technologies would deliver the most cost-effective solutions including, for example, Intelligent Vision or non-visual band sensing technologies for driver support. The research will aim to capture the system requirement(s) independent of the technology, and subsequently evaluate the relevant technologies against such requirements. This will facilitate the making of an informed decision on which method will optimise the value of its investment, both by managing cost and addressing whole system compatibility.

14.6.3 Stopping trains in an emergency on arrival or departure

Work will be undertaken to identify technological solutions for stopping trains when there is a PTI incident, including the feasibility of each solution. This may include stop indications, use of GSM-R handsets on platforms and platform track detection systems.

As part of this work, Network Rail has reviewed options for a GSM-R solution to enable station staff to make high priority calls to a driver and signaller when there is an incident at the PTI. A concept of operations has been developed and draft operational requirements and success criteria produced. The concept was approved by the PTISG and will be taken forward as one of the work streams of a sub-group to the Operations Enhancement Group. Handsets will need to be obtained, upgraded, and trialled. Trial locations have been selected and need to be formalised to make sure the solution can be adequately tested.

14.6.4 Stop boards

A feasibility study will be carried out (informed by RSSB research project T1026) to look at the optimal positioning and use of train stop car marks across the network to standardise train positioning on platforms where possible, taking account of exits and other features. This will include a survey initiated to determine the best position of stop car marks at platforms where they are not currently provided, and to establish whether current positions are optimal where there is shared platform usage. Consideration will also be given to the relationship between the movement of stop boards, existing station design and furniture, and passenger behaviours. For example, moving stop car marks on platforms to areas that have no cover or canopies may also need to consider repositioning waiting shelters to avoid passengers rushing for a train in the rain or crowding in the area of the platform where the cover or canopy is located.

14.6.5 Train door position markings and signage

A feasibility study will look at the provision of train door position markings and signage on platforms and research options for design of train door position markings and signs.
This has been used successfully on other networks, generally where only one type of train uses the platform. Where trains of varying lengths, or with varying door positions, use a particular platform there is a need to consider the complexity of such markings and the likely confusion that may result from numerous door position markings. As such the research will also explore how train design, for example, train length, door positions, and other train design dimensions can support the provision of train door position markings and signage, providing recommended options for future train design.

In addition, it is unlikely passengers will readily differentiate between rolling stock types, so consideration needs to be given to the design of markings to aid passenger understanding.

Finally, consideration should be given to the provision and location of passenger shelters and covered areas, to encourage passengers’ use of the zones in all weathers, as this will assist in the reduction of passengers running along the platform to specific doors once the train has arrived at the platform.

RSSB research project T1026 will inform this feasibility study.

14.6.6 Optimal door closing arrangements

Research will be carried out to identify optimal door close arrangements and support consistent dispatch procedures, promote passenger understanding, and reduce access and egress incidents, such as passengers getting trapped in train doors. This will consist of:

- A study into the effectiveness of the different methods of using Hustle alarms to determine an optimal approach to promote passenger understanding and reduce access and egress incidents. This work will also consider the feasibility of standardised arrangements
- Research exploring how the timing(s) of closing doors prior to departure affects passenger behaviour, and what options should be considered to promote passenger understanding and help reduce the risk from PTI incidents. This work will look at how a consistent approach to timing(s) of closing doors prior to departure could be implemented and communicated to passengers, including the development of a framework for determining timings, advertising a different departure time to passengers, or the possibility of standardising approaches and timings

Work will also be undertaken to explore how train door design can be enhanced to help reduce the occurrence of door trapping incidents. This will include:

- Investigating the feasibility and effectiveness of future obstacle detection technologies such as proximity detection systems and enhanced sensitive door edges and interlock arrangements. As part of this, relevant system requirements will be captured to inform door design processes and standards
- Review and, where relevant, provide recommendations to enhance the train door design process, including potential enhancements to relevant standards and policies. This may include review and refinement of obstruction test requirements and greater consideration and assessment of door trapping hazards and passenger behaviour within the train door design and subsequent modification process
14.7
Medium term

Over the medium term (up to CP7) this work stream will focus primarily on the piloting and implementation of mitigations identified in the research and studies in CP5.

This will include:

- Technologies and approaches associated with trains arriving at and departing platforms, including incorporating requirements in standards for train and station design as well as relevant Railway Group Standards and Rail Industry Standards
- Technologies for stopping trains in an emergency on arrival or departure, such as GSM-R technologies to enable station staff to make high priority calls to a driver and signaler when there is an incident at the PTI
- Standardise, SFAIRP, train dispatch procedures at stations
- Standardised, SFAIRP, stop boards, train door position markings, supported by options for train and station design
- Consistent door close procedures and timings, so far as is reasonably practicable
- Train door technologies and design arrangements to help reduce the occurrence of door trapping incidents
- Using the evidence base created in CP5 to build a business case to facilitate further decisions on DOO

14.7.1
Train arrival and dispatch

Piloting and implementation of the technologies and approaches associated with trains arriving at and departing platforms, including platform sharing, to support reduction in PTI incidents, as identified from the research programme initiated in CP5. Where successful and relevant, work will also be undertaken to incorporate requirements for such technologies into the design standards for new stations and trains.

Relevant changes to Railway Group Standards and Rail Industry Standards such as RIS-3703-TOM will be proposed to provide additional requirements and guidance on train monitoring during dispatch and the duties of drivers, guards, and train managers with regards to train dispatch.

14.7.2
DOO

Using the outputs of T1035 Evaluating technological solutions to support DOO train dispatch and T1059 Evaluating the use of on-train DOO (passenger) monitors during station departures to develop a business case to support the further introduction of DOO. This will include advanced technologies for stations and rolling stock on those parts of the network where the introduction of DOO will provide value for the investment. It will also consider the benefits that introducing DOO could bring in supporting the management of PTI risks and delivering improved performance.

14.7.3
Stopping trains in an emergency on arrival or departure

Implement GSM-R handsets or other technologies assessed in CP5 for use by station staff, on a location-specific basis to begin with, and make more available if they prove to be effective.
14.7.4
Stop boards
Based on the outputs of the short-term activities, implement systematic installation of platform stop car marks, and changes to station design, and monitor their effectiveness.

14.7.5
Train door position markings and signage
Based on the results of the feasibility study carried out in CP5, implement train door position markings and signs on platforms, and relevant methods for communicating these to passengers, where possible and SFAIRP. Potential train design options to support this provision will also be piloted with recommendations for long-term implementation.

14.7.6
Optimal door closing arrangements
Based on the research carried out in CP5, pilot and implement:

- Optimal use of Hustle Alarms for door close arrangements as per the findings of the study carried out in the short term
- Preferred option for a consistent approach to timing(s) of closing doors prior to departure including determining, advertising, and communicating these timings
- Train door technologies and design arrangements to help reduce the occurrence of door trapping incidents

14.8
Long term
The solutions and options piloted and implemented in CP6 and CP7, will SFAIRP, reduce incidents at the PTI by standardising and enhancing the processes supporting the arrival, departure, and dispatch of trains from platforms.

Over the long term (CP8 and beyond) this work stream will focus on sustaining this success.

This will include:

- Introduce DOO on those parts of the network identified in CP6 and CP7. This will be supported by advanced technologies for station and rolling stock to assist in the operation and arrangements for deploying existing staff in a capacity to support the management of PTI risks, and delivery of improved performance
- All new stations and rolling stock designed to support advanced technologies; and approaches associated with trains arriving at and departing platforms to support reduction in PTI incidents
- All new rolling stock designed using advanced train door technologies and design arrangements, with specified train lengths and door positions. This will also support the optimisation, SFAIRP and where applicable, of mitigations such as platform screen doors and barriers

14.9
Critical success factors
This work stream will co-ordinate closely with the ‘passenger movement through stations and across the PTI’ and ‘optimising the step gap’ work streams.
15 Optimising the step and gap

15.1 Aims

The aim of this work stream is to improve understanding and reduce the risk from slips, trips, and falls between the train and the platform while boarding and alighting, at all stations, throughout GB and:

- Provide a safe environment for any passenger boarding, alighting, waiting for, or locating a train
- Give confidence to all passengers, including the visually or mobility impaired, that they will be able to board and alight their selected train without issues
- Provide clear processes for optimising the platform train gap at individual locations, taking into account the different traffic types, operations, and geographical constraints
- Develop clear targets for the integrated specification and design of platforms, track, and rolling stock

Work packages required to deliver this include:

- Definition by human factors of the optimal step position and arrangement
- Standardisation of train floor and step heights, and consideration of the need for more than one ‘standard’ platform height
- Standardisation of platform/track design

15.2 Benefits

This work stream addresses the hazardous event of falls between the train and platform while boarding and alighting; and influences slips, trips, and falls at the platform while boarding and alighting. Slips, trips, and falls may be minor in consequence but high in frequency. Falls between train and platform tend to be smaller in frequency but higher in consequence.

Optimising the step and gap delivers benefits in addition to safety. Standardisation of the step and gap at the PTI will reduce dwell times and help optimise capacity. This improved experience will improve passenger satisfaction by reducing anxiety and will increase accessibility, encouraging the use of the railway by a broad range of passengers.

15.3 Current understanding

15.3.1 Key influencing factors and potential solutions

There are a number of key factors which need to be understood for optimisation of the step and gap at the PTI. These include the wide range of current platform heights and offsets, and the influence of these on specifications for new vehicles where there is a trend for footsteps on new vehicles to be specified and designed to be compatible with 100% of existing platforms, regardless of the intended operation. The consequence of this is an increase in stepping distances to the actual platforms served by such vehicles. This is in contrast to older rolling stock which was more often route specific and designed to provide small stepping to the actual platforms served. Data from the T866 and T1037 projects is already informing this work.

A key gap in the current management of the step and gap is a sound understanding of the optimum step and gap for different passenger groups. There is emerging evidence that the ±50mm vertical step used as a limit for unassisted boarding by mobility impaired passengers is actually a trip hazard for other passenger groups and that a slightly larger (perhaps 100 to 150mm) vertical step may be a lower risk solution. Work is being initiated to improve knowledge in this area.
The current target platform position is considered too low by some industry practitioners, particularly in relation to the prevailing floor and footstep heights of modern vehicles. For an illustration of current rolling stock footsteps plotted against the target platform position, see Chart 4. However the constraints of a mixed traffic railway must be considered, and due consideration given to the intended future use of different route sections of the network (types of traffic, speeds, and other factors). This strategy will develop a robust, well developed set of target platform positions (possibly dependent on route usage) and these can then feed in to future platform design and to standardisation of train floor and step heights and door positions for future rolling stock. A whole system approach will be taken to this work, where the option of lowering future train floors and footsteps will be considered alongside the options for different platform heights.

The construction of platforms adjacent to curved track is not desirable due to increased stepping and sighting issues, therefore existing RGS requirements in this area should be retained. Industry consideration of deviation applications against the existing RGS requirements should take into account lessons learned through the PTI strategy.

Chart 4
Footsteps and target platforms
A relatively small number of existing ‘high and tight’ platforms appear to be constraining the footstep positions on modern rolling stock. A categorisation process will be developed to assess each of these so that plans, and cost benefits, can be made for their elimination. Such ‘high and tight’ platforms, and platforms on sharp curves, also constrain vehicle body width, leading to increasing gaps between the vehicle and platform away from the footsteps. Such gaps are a factor in the higher consequence falls from the platform (often not boarding or alighting).

15.3.2 Earlier work and current knowledge

Earlier work which has been used to inform this strategy includes:

- The DfT study ‘Significant Steps’ provided some information on the effect on passenger confidence of different step and gap arrangements
- T610 An assessment of the cost and benefits of adopting a standard uniform platform height of 1115mm (no overall benefit identified, lateral offset would increase by around 150mm)
- Laser Rail study ‘Platform stepping distances/platform height/kinematic clearance’ for Railtrack S&SD in 1998. For a platform height of 945mm 100% adequate clearance for the then current rolling stock was only achieved at 860mm offset
- T866 Investigation of platform edge positions on the GB network provided a snapshot of current position (height and offset) of all existing platforms on the network
- T1037 which collated information on the footstep positions of all current rolling stock and is investigating distribution of stepping distances for range of routes and rolling stock

15.4 Gaps in the evidence

There are a number of gaps in the current understanding and research projects are already underway or planned to address some of these. Further work is needed on others. A particularly key area is standardisation of the platform height and offset such that a balance is achieved between accessibility for passengers, minimising the risk of PTI incidents, and the capacity and flexibility of the network to accommodate mixed traffic.

Network Rail is analysing the gauging implications of possible target platform heights and the associated offset that would be required to accommodate different traffic types. Initial results indicate that, where access is required for freight trains or track maintenance machines (likely to be the vast majority of the current network), any increase in platform height above the current target position is likely to lead to an increase in lateral offset of at least the same magnitude. Thus a reduction in vertical stepping distance would lead to an increase in horizontal gap. This would apply equally to localised increases in platform height (humps) as gauge clearance for passing traffic, and for arriving and departing trains, would be required.

When the initial analysis is complete, further work will look at the implications on actual stepping distances from current and future rolling stock.

Platform gap fillers are also being considered as an option at suitable locations to reduce horizontal gaps and minimise the potential consequences where trips do occur. Trials are currently underway by Heathrow Express at Terminal 5 and, if this is successful, the installation may be extended to other platforms at Heathrow.
This solution is only likely to be applicable where platforms are straight, the range of rolling stock is restricted, and platform entry and exit speeds are controlled. However, within these constraints it could be an effective control. The T1054 study of gap fillers and other mitigations in use worldwide may identify other such opportunities.

Standardisation of train floor and footstep heights, and of train door positions, will facilitate a number of potential platform controls and mitigations, but the conflicting requirements of different train types are likely to make this very difficult. Long-distance (inter-city) trains generally have doors and vestibules towards the ends of the vehicles to maximise the seating area and control the passenger environment. Commuter vehicles on the other hand generally have side doors at one-third and two-third positions to speed boarding and alighting, and minimise dwell times.

15.5 Further work required

15.5.1 Standardisation of train floor and step heights

Whilst standardisation of train floor and footstep heights would, over the long term, assist in providing consistent stepping arrangements, there are a number of constraints to consider in developing the strategy. Existing vehicles have a long remaining life and, whilst it may be practical to modify footsteps, this is not a minor change and it is certainly not practical to modify floor heights. A transition plan will therefore be needed once the future target system is agreed.

Some current vehicle designs have small ‘ stubby ’ external steps with widths of only around 150mm which, whilst potentially useful for boarding, probably constitute a hazard when alighting. These steps also create a false impression of the stepping distance as the gap is measured from the edge of the step whilst the real distance is larger.

Initial enquiries suggest that lower floor heights, more similar to the current target platform height, are practical for electrical multiple unit vehicles.

For diesel multiple units this would be more challenging as more space is required for under-floor traction equipment.

As discussed above, standardised door positions and vehicle lengths for all future rolling stock would have advantages for platform markings and might, in the long term, enable the use of platform screen doors or lower fences; but these would have to take into account the different types of passenger operation.

Further work is needed on the specification for sensitive door close edges to minimise potential for trapping incidents without impacting on timekeeping, capacity, and performance. Vehicle vestibule design, door widths, handrails, and other items can all have an influence on both the safety and the time taken for boarding or alighting. Good practice guidance and specifications will be developed.

Although the costs of early vehicle replacement are likely to be high, the risk register of platform train interface incidents should be used to consider if any particularly problematic rolling stock could justifiably be withdrawn.
15.5.2
Standardisation of platform/track design

Assumptions are currently being used regarding the future access required on different routes of the network, but better information in this area would assist in developing the strategy for platform and track design. As a particular example it is not clear whether ‘Eurostar’ clearance is really still needed away from the HighSpeed network. Similarly, further study of freight flows and freight gauge requirements may help to optimise the balance between vertical clearance under bridges, including for electrification, where a low vehicle deck height is advantageous and width at platform positions which is generally worse with a low deck height.

To optimise the gauge clearance through different platforms a number of work steams are proposed, these include: the possible development of a bespoke ‘Plant gauge’ for track maintenance machines separate from W6a freight gauge, a review of optimal track cant and cant deficiency in station areas, and consideration of effective track fixity in platform areas to potentially reduce the required clearance. Development of differential gauge clearance requirements may improve the platform options on mixed traffic sections.

Following incidents with wheelchairs and buggies, a review of platform gradient and crossfall is underway. As with platform height, standards are already in place for new or substantially altered platforms but there is currently no requirement to modify older locations. If the risk is found to be substantial then funding may need to be found to correct the worst existing platforms or mitigate the risk in some other way.

The use of localised platform ‘humps’ to provide easier access at selected doors is being considered in a number of areas. Whilst this may appear an attractive solution, there are a number of potential dis-benefits that need to be properly considered. These include the gauge clearance requirements, which are no different for short lengths than for the full platform, the potential for changes in height to introduce new hazards, and the possibility of higher platform sections infringing required clearances to overhead wires, especially in locations which already have low wire height.

Research work (T1062) is currently looking at the optimum arrangement for the under-platform recess, and the results will be incorporated when available.

As noted above, passive gap fillers are probably only of use on straight platforms. For curved platforms some form of active moveable gap filler may be possible, but this would have to be carefully considered to minimise adverse effects on dwell times and capacity, and avoid the potential for trapping incidents. An initial investigation is already underway in the Thameslink project.

15.6
Approach

Three primary packages of work are considered necessary to deliver improvements through this work stream:

- Human factors to define optimal step position and arrangement. This should include the consideration of ‘stubby steps’, which may actually increase the risk, particularly when alighting.
• Design of train to improve the stepping arrangement
• Design of platform and track to improve stepping arrangement

Achieving optimised stepping arrangements will need consistent designs of both rolling stock and infrastructure.

The optimisation of the train and PTI should include cost-benefit analysis to determine the most effective approach. Existing platform and train stock should be carefully considered to determine where targeted works or withdrawal may garner significant benefits.

15.7 Immediate

Due to the significant amount of research required to optimise the interface, and the potential to unintentionally increase risk, it is considered that no obvious quick wins are available beyond normal good practice such as:

• On-going rolling stock maintenance. Ensuring responsibility for safety critical maintenance and basic maintenance checks (doors and vestibule area items such as hand rails, door edge sensors, closing forces, and trip hazards at the step) are clear and explicitly undertaken
• Elimination of temporary hazards on rolling stock, SFAIRP
• Promotion and use of the RSSB Rail Vehicle Maintenance Toolkit, for example, and a continued programme of maintenance improvements based on risk assessment outcomes
• Removal of excess platform furniture which may create a hazard
• Good housekeeping and normal maintenance checks for platforms
• Investigate lower cost ways of raising platforms, such as lowering track
• Definition of ‘worst’ platform, and identification of ‘worst’ platforms and rolling stock

The work described below will be initiated and any emerging findings will be implemented as appropriate.

15.8 Short term

15.8.1 Research the optimal step and gap

This new piece of systematic research will answer the question ‘What is the optimum design of the PTI to minimise slips, trips, and falls during boarding and alighting?’ The work will incorporate a complete assessment of the usability of small ‘stubby’ steps (particularly when alighting) and ensure results are incorporated in future rolling stock procurement. This research will guide future work on platform and train design toward achieving an optimised interface.

15.8.2 Research the implications of varying platform positions

Complete analysis of the gauging implications of different potential platform heights and implications for the PTI step and gap, and confirm or update the target platform position in RGS. The research will indicate the likely impact on a mixed traffic railway of varying the platform height to deliver a different step and gap without varying rolling stock.
15.8.3  
Research the implications of varying train floor positions

Initiate research to define standard train floor heights and the implications for train construction and the PTI step and gap. This work will build upon the research undertaken in 15.8.1 and correlate with 15.8.2. RGS, current working practices and methods should then be amended as appropriate.

15.8.4  
Review of existing industry assets

Work will be undertaken to identify existing ‘high and tight’ platforms on the network that are constraining footstep positions and plan for their modification, including assessment of the supporting business case. This work would indicate the cost and potential timescale for achieving a sustainable platform position.

Existing rolling stock will be reviewed to identify where footstep modification or early withdrawal from service could lead to step and gap improvements and investigate business case for options. The output from this work could quickly deliver improvements in the step and gap for passengers using the rolling stock.

Clarification of the route access strategy for different types of rolling stock may deliver opportunities to further optimise the step and gap. The output of this work would be a clear understanding of the future access requirements, particularly for some clearance hungry legacy rolling stock.

15.8.5  
Knowledge gathering

Engineering options need to be identified for reducing the step and gap from changes to either the train or the platform. Further work streams are likely to then be identified for these options to be developed and assessed:

- Enhanced involvement and collation of information from passengers and train operating companies should be developed regarding PTI incidents and precursor events. This data should then inform the future design of stations and rolling stock

- Upon completion of the T1062 Platform recess – review of requirements any new learning should be incorporated into revised Railway Group Standards

- A Plant gauge should be developed which may allow some separation of plant and freight to occur, potentially allowing reduced gaps between platform and train where appropriate. The Plant gauge developed should be published in RGS and compatibility considered by Network Rail for Sectional Appendix publication

- Research into crossfall requirements should be completed in line with RAIB recommendations. The research output should be built into the PTI risk model and signage installed at the highest risk sites

- The T1054 study into train and platform gap fillers will provide valuable knowledge into management of the ‘gap’. The use of gap fillers should be considered as a potential mitigation and included in risk management tools in the light of the research
• An accurate risk profile for platforms should be developed. This profile would include the consideration of the T1037 output which researched stepping, to confirm rolling stock that actually use the platform and identification of the stopping position of rolling stock at platforms.

• The RSSB T1026 study into station signage should be completed. The findings of the research should be considered in revised Railway Group Standards and when implemented across the network deliver a safer experience for people using our stations.

15.9
Medium term

15.9.1
Signage for the PTI

• Programme works to install signage and other mitigations at all sites where crossfalls exceed values identified by research. Amend Railway Group Standards if appropriate.

• Consistent signage and platform markings (tailored to different types of operation and usage).

• Revision of signage and other markings to be implemented at highest risk platforms.

15.9.2
Industry change

• Put in place the necessary legislative, standards, and organisational changes, and funding, to facilitate changes to the PTI.

• Impact assessment of rolling stock cascade.

• Develop, pilot, and implement improvements across the network.

• Explore innovative ways to monitor assets in real time, using the data to identify potential hazards ‘pre-failure’, and complete preventive maintenance.

• Review proposed mitigations and work streams to deliver an approach which reduces overall harm, with reference to lessons learned from the implementation of Network Rail Suicide Prevention Best Practice.

15.9.3
Risk-based approach to the PTI

• Consider amendment of the recess provided at the highest risk locations.

• Consider withdrawing freight gauge capability at highest risk locations to allow tighter ‘X’ dimensions and reduced gap (subject to availability of suitable alternative freight routes).

• Programme works to achieve optimal gap sizes at highest risk stations where rolling stock fleet allows.

• Installation of gap fillers to be considered at the highest risk platforms and installed if appropriate.

• Continued programme of improvements based on the platform risk profile.
15.10
Long term

15.10.1
Optimisation

• Optimised physical PTI (footstep, horizontal and vertical stepping distance) for the minimisation of slips, trips, and falls while boarding and alighting

• Consistent platform position and stepping arrangements (tailored to different types of operation and usage)

• Deliver all new platforms and platform works where practicable with crossfalls less than the values identified by research

• Deliver all new platforms and platform works where practicable to achieve the optimal stepping arrangements and recess requirements

• Gap fillers to be considered at all new platform installation and platform works where practicable

• New signage requirements to be achieved at all new platform installation and platform works where practicable

• On-board technology to provide ‘real time’ maintenance diagnostics and targeted preventive maintenance then: resulting in reactive maintenance being no longer needed

15.10.2
Promote best practice in Europe

• Review the requirements of EN 14752 in light of lessons learned from the implementation of the PTI Strategy

15.11
Critical success factors

Success of this work stream is dependent upon:

• Human factors research to define the optimal step position and stepping arrangement for different groups of passengers

• Consistency of platform markings and of platform and train announcements (tailored to local situations)

• Improved understanding of the aspirations for route clearance of different traffic types

• Industry willingness to work across functional lines for the long term benefit of the industry as a whole

• Willingness to fund works to stations or vehicles and to purchase rolling stock to deliver the desired interface

The potential cost of infrastructure works and vehicle modification outside of routine replacement and renewal of assets is extremely high. In determining a set of industry risk tools the strength and whole life industry cost must be included.
16 Accessibility

16.1 Aims

The aim of this work stream is to improve accessibility of the PTI on the GB network:

1. Provide an inclusive environment that is accessible for all types of passenger.
2. Support and empower Persons with Reduced Mobility (PRM) and encumbered passengers to make safe journeys.
3. Facilitate the provision of a safe and efficient service to meet customer needs, expectations and cater for an increased future demand.

16.2 Benefits

The hazardous events associated with accessibility factors include:

- Passenger falling from the platform which commonly leads to a fatality
- Passenger falling between the train and platform, which typically lead to major injuries
- Passenger slipping, tripping and/or falling while boarding or alighting the train, which commonly leads to minor injuries

Improving the accessibility of the PTI has a number of benefits, including:

- Reducing the number of hazardous events associated with accessibility factors and providing a safer environment for passengers, staff and other members of the public
- Reducing service delays and disruptions caused by accessibility factors such as assisting wheelchair passengers with boarding. This is associated with an estimated 47,000 minutes of delay to trains and £1.5m in financial penalties annually, according to T759 research on Improving the methods used to provide access to and from trains for wheelchair users
- Improving boarding and alighting speeds of encumbered passengers and PRM offers potential dwell time improvements
- Enhancing the customer experience, for example, by advancing the management of PRM, providing better information and communications to support passenger decision making
- Improving the use of available capacity in stations and on trains and responding to the increase in encumbered travel and assisted travel
- Reducing the number of injuries to staff involved in assisting boarding and alighting wheelchair passengers

16.3 Current understanding

Accessibility in rail means providing equal access to stations and trains for all. This means removing the barriers that make it challenging for particular passenger groups to board/alight trains and navigate stations (e.g., providing ramps, lifts and tactile paving).
Accessibility in rail means providing equal access to stations and trains for all. This means removing the barriers that make it challenging for particular passenger groups...
16.3.1 Passenger behaviours, factors and potential solutions

There are a number of factors and behaviours, related to accessibility, which are associated with the occurrence of the hazardous events described in section 16.2. These are:

1. Visually impaired passengers have been identified from the data analysis as a particularly at risk group and are associated with the potential to fall from the platform, fall between the platform and the train or slips, trips and falls across the PTI.

2. Luggage is a common factor in falls between the platform and the train or slips, trips and falls across the PTI.

3. Wheelchair passengers are associated with slips, trips and falls across the PTI.

4. A small number of recent incidents have involved pushchairs and wheelchairs rolling off the platform.

A number of options have also been identified that have the potential to help tackle these behaviours and factors. These are:

- Supporting station staff to aid PRM (in particular encumbered travellers, wheelchair passengers and visually impaired passengers)
- Design of train doorway to enhance accessibility for Persons with Reduced Mobility
- Design of train internal layout to improve provision for wheelchair passengers and also for the provision for storage of luggage

A design that is safe and high performing will usually also be accessible. Similarly improving accessibility often has performance benefits. However, focusing on any one of these in isolation has the potential to negatively impact one of the other two eg a wheelchair lift from the platform to the train may have dwell time implications, or by removing the step up to a train to assist wheelchair boarding has potential to increase slips trips and falls. They must therefore be considered together.

16.4 Gaps in evidence

As such there are a number of gaps in the current understanding of factors and solutions relating to the accessibility of the PTI. These include identifying:

- The risk from different step and gap arrangements for encumbered passengers and PRM (eg wheelchair users or the visually impaired). This will form part of the Optimising the step and gap work stream and build on the Significant Steps research where appropriate
- Methods for optimising boarding/alighting for wheelchair users including identifying alternatives options to a manual boarding ramp
- Good practice for highlighting hazards to specific at risk groups eg highlighting the platform edge for visually impaired passengers or highlighting the hazard of a slope/gradient to passengers in wheelchairs or with pushchairs
- Methods for providing passengers with real time information and assistance
16.5
Approach

This work stream will address the questions that currently need answering, build on the benefits set out in section 16.2 to develop and implement sustainable solutions, where applicable, and SFAIRP, to improve accessibility at the PTI.

16.6
Immediate

Over the next 12 months the focus will be on supporting the needs of particular groups to help them undertake safe journeys. This work stream will focus on achieving the following quick wins:

1. Supporting station staff to assist PRM.
2. Ensuring existing good practice in managing wheelchair passengers is implemented by all rail companies, SFAIRP.
3. The development of a more consistent, evidence based approach to the management of mobility scooter use on the GB network.

16.6.1
Supporting station staff to aid Persons with Reduced Mobility

Work will be undertaken to support station staff to aid PRM by promoting a consistent approach to informing passengers of what facilities and level of staffing are available at stations. The work will also look to identify requirements for staff training in relation to the needs of specific passenger groups that are known to have issues with accessibility such as encumbered passengers, wheelchair passengers and those with sensory impairment, also considering the use of staff to proactively advise and inform at risk passengers.

16.6.2
Good practice for boarding and alighting wheelchair passengers

An RSSB Good Practice guide T759 Improving the methods used to provide access to and from trains for wheelchair users was developed for industry. The purpose of the guide is to improve the assistance service that is provided to wheelchair users when boarding and alighting from trains, using a folding manual boarding ramp.

Work will be undertaken to further promote systematic application of this guide, across the railway, so that all railway companies are implementing the guidance as best they can. The work will also look to determine additional good practice, industry support requirements, such as staff training, enhancement of assisted travel booking etc to support wheelchair passengers across the short- to long-term.

16.6.3
Safety and accessibility of mobility scooters

The research project T1055 Improving accessibility and safety for mobility scooter users travelling by rail will help to inform the development of a more consistent, evidence based approach to the management of mobility scooter use on the GB network.

The research will draw together current research from rail and other sectors (including buses and trams) to summarise the technical and practical knowledge that could be used to support train operators in the development of evidence based policies and practices for passengers using mobility scooters to access rail services and the staff facilitating the service. The project will use literature searches, incident analyses and end user consultations to determine the issues and existing good practice to arrive at guidance for passengers, rail staff and managers on the safe use of scooters at stations and on board trains.
The research outputs will help to ensure that the safety of scooter users, other passengers and staff are maximised.

16.7
Short term

Over the short term (CP5) this work stream will aim to consolidate and promote existing good practice, identify methods for highlighting hazards to at risk groups and determine the feasibility of future options where identified eg a national policy for luggage or modifications to rolling stock design.

16.7.1
Support passengers with a sensory impairment

- Work with relevant organisations such as RNIB and advocate groups to determine suitable practices that station staff can use to effectively support passengers with sensory impairment
- Explore and consolidate best practice approaches for highlighting hazards to specific at risk groups eg highlighting the platform edge for visually impaired passengers. Drawing on existing research such as T881 Evaluating wayfinding systems for blind and partially sighted customers at stations, where relevant to the PTI
- Develop guidance for the use of tactile paving across the network. To build on research project T158 The Use of Tactile Surfaces at Rail Stations. Taking into account different scenarios (eg when there is aerodynamic risk, standard platform no aerodynamic risk, narrow platform no aerodynamic risk) and considering tactile paving in relation to other platform markings ie white line and yellow line

16.7.2
Management of encumbered passengers

- Where platforms are staffed or monitored, staff respond proactively in real time to support encumbered travellers and provide guidance for safe boarding and alighting
- The findings of the research project T1057 Investigating the risks posed by luggage to passengers and staff on trains and stations will be used to make recommendations for staff training and future train and station design
- Investigate options such as a national policy on the amount of luggage accepted on the railway, including ‘approved’/‘recommended’ products for rail travel (similar to airlines), certain size/design luggage, buggies, mobility scooters etc
- Consolidate best practice for pushchairs on GB rail and investigate options for highlighting the hazard of a slope/gradient to passengers with pushchairs (eg signs, platform markings or media campaign)
- Research options for designing rolling stock to help reduce the risk associated with encumbered travel, for example, design of train step, better storage of luggage, increasing size of vestibules and specific carriages for encumbered travel

16.7.3
Enable wheelchairs and mobility scooters to board and alight trains

- Improve passenger communication about accessibility at different stations
- Promote both T759 The Good Practice Guide for staff and wheelchair passengers and T1055 The Good Practice Guide for mobility scooters (to be completed in CP5)
- Explore and consolidate best practice on the design of manual boarding ramps
16.8 Medium term

Over the medium term the strategy will implement modifications to trains and stations informed by the research undertaken in CP5 and continue to empower passengers to make informed choices through the availability of information about accessibility and facilities available.

16.8.1 Support passengers with a sensory impairment

- Implement modifications where practicable to highlight the hazard of the platform edge and step and gap to passengers with a sensory impairment. Informed by the research in CP5.
- New platforms to comply with the guidance SFAIRP.
- Passenger communication about accessibility at stations. Continue to promote and monitor keeping information up to date and available to empower passengers. Also promote good practice methods of providing information to passengers identified in CP5.

16.8.2 Management of encumbered passengers

- Implement modifications to trains doorways where practicable to enhance accessibility for encumbered passengers and PRM. Implement modifications to train vestibules/internal layout where practicable to improve provision for the storage of luggage. Informed by the outputs of T1057 and as appropriate.
- Promote passenger communication and best practice for pushchairs identified in CP5.

16.8.3 Enable wheelchairs and mobility scooters to board and alight trains

Develop guidance for the design of manual boarding ramps for wheelchairs/mobility scooters informed by CP5 research and existing guidance where appropriate such as T834 Reducing accidents through inclusive design: steps, stairs and ramps.

- Investigate alternatives to manual boarding ramps eg deployable ramps for safe and efficient boarding of wheelchairs/mobility scooters.
- Investigate methods for providing users of wheelchairs and mobility scooters with real-time information and assistance.

16.9 Long term

The solutions and options identified and informed by research in CP6 and CP7, will SFAIRP, reduce incidents at the PTI by standardising and enhancing the accessibility of the PTI.

Over the long term (CP8 and beyond) this work stream will focus on sustaining this success.

This will include:

16.9.1 Support passengers with a sensory impairment

- Continue to implement consistent modifications to highlight the hazard of the platform edge and step and gap to passengers with a sensory impairment. Informed by the research in CP5 and any lessons learnt in CP6-7.
- New platforms designed to comply with the guidance, SFAIRP.
16.9.2 
Management of encumbered passengers
- New stations designed to enhance accessibility for encumbered passengers and PRM
- New rolling stock designed to comply with new standard
- Luggage policies implemented where appropriate and clearly and consistently communicated to passengers

16.9.3 
Enable wheelchairs and mobility scooters to board and alight trains
- A consistent approach across the network for managing PRM, SFAIRP
- Use of real time passenger data to provide individual tailored experience eg through real time timetables, personalised wayfinding and advice

16.10 
Critical success factors
Success of this workstream is dependent upon:
- The guidance for wheelchair passengers should take into account any outputs of the work to determine when a slope towards the railway could become a significant hazard, and ways of mitigating the risk (following the recent RAIB recommendation)
- The work to determine the standard tactile distances and guidance for blind/visually impaired passengers should be developed in conjunction with the development of the standards and guidance for yellow lines and platform markings as part of the safe management of passengers work stream
- The needs of wheelchair passengers and encumbered passengers should be considered in relation to the work on reducing the step and gap as a hazard to boarding and alighting passengers
- The optimal stop boards work should take account of the needs of PRM and encumbered passengers
17 Performance and capacity

17.1 Aims
The aim of this work stream is to improve performance delivery and capacity provision, through optimising the design, operation, and management of the PTI.

17.2 Benefits
The workstream will develop, pilot, and implement options for improving performance and capacity where applicable and SFAIRP, ensuring that this strategy strikes the right balance between safety, accessibility, performance, and capacity.

This will help to create a PTI that is safe, accessible and able to meet current and future performance and capacity demands.

17.3 Current understanding
It is recognised that a safety incident at the PTI will inherently impact on performance and therefore mitigations and initiatives aimed at reducing or eliminating these incidents have the potential to positively affect performance. For example, this strategy aims to reduce the number of hazardous events occurring at the PTI, which in turn will reduce the associated service delays and disruptions.

Moreover, PTI mitigations and initiatives have the potential to positively affect capacity. For example, to meet the projected increase in passenger demand, the number of trains on the GB main line network will increase. More frequent trains can mean fewer passengers needing to board any one train, which will result in shorter dwell times. Optimising the design of the PTI, as well as train doorways and vestibules, has the potential to help improve the overall flow rate of boarding and alighting passengers. This, in turn, can have a positive impact on dwell time and, in turn, may contribute to the achievement of capacity improvements.

Change can also have potential negative effects on performance and capacity. For example, design of the train doorway and vestibule (including standbacks) can result in a reduction in the number of seats; while the positioning of entrances, weather protection, and display screens may not encourage the effective use of extended platforms. This can have a negative impact on the time it takes passengers to board or alight.

Optimising the design, operation, and management of the PTI can offer opportunities for improving performance and capacity, as well as safety and accessibility. However, at present, the range of options for achieving this is unclear, as is the potential scale of performance and capacity improvement that can be achieved.

As such, this workstream will:
• Conduct performance and capacity assessments to help identify where the biggest improvements in performance and capacity can be achieved
• Identify and develop options for improving performance and capacity
• Pilot, assess and where applicable, implement options SFAIRP
17.4 Immediate

Over the next 12 months a performance impact assessment will be carried out that will quantify the impacts on performance from PTI related incidents. As the assessment progresses, the data collection and analysis method will be refined and further developed to enable an assessment of capacity impact to be undertaken.

The findings from this analysis will help to identify where the biggest improvements in performance and capacity could be achieved and inform the development of suitable options. The following methodology will be applied.

1 Identifying data

Stations will be identified where incidents have taken place and relevant details collected, for example date, time, location and impact, using existing data sources such as TRUST and NCC logs.

As part of this, gaps in existing data sources will be exposed and identified (incidents incurring 3+ minutes delay will be recorded). A variety of data collection methods will be deployed to overcome these gaps and provide, SFAIRP, a comprehensive data set to analyse.

Applying a variety of data collection methods will also help to identify a core set of methods that can be refined and applied across the short, medium, and long term to support on-going performance and capacity impact assessment.

2 Quantifying the impact

Using the identified data, quantified performance impacts of PTI incidents will be generated; for example, the average of the delays incurred against the number of incidents each year.

Analysis is currently underway to identify data and quantify impacts.

3 Comparing impacts

A comparison between stations and trains affected by PTI incidents and against those not affected by PTI incidents will be conducted. This will help to:

- Further determine the magnitude of performance impacts, by applying an quasi-experimental design to the analysis: comparing stations and trains affected by PTI incidents (experimental group) with stations and trains not affected (control group).

- Identify the factors that can affect the magnitude of performance impacts, by comparing stations and trains affected by PTI incidents. Factors might include operational factors (for example, staffed vs. not staffed), station factors (for example, footfall and frequency of trains), train factors (for example train design, and length of train).

To support this analysis specific examples for specific locations will be used where availability of data allows.
17.5 Short term

A research programme will be initiated to identify options for improving performance and capacity, with consideration given to station, platform, and train design; operations, and passenger behaviour. The programme will examine the options already described in this strategy, as well as additional ones, and identify those that have the greatest potential to improve performance and capacity.

The examination of options will utilise the findings from the performance and capacity impact assessment described and include any additional assessments as needed. Such assessments may include, if possible, pre and post assessments at agreed trial sites for options that have been sufficiently developed to enable piloting. Options not sufficiently developed, will be piloted in the medium term.

As part of the examination, the trade-off between safety, accessibility, performance and capacity will be considered. For example, one option may provide considerable performance benefits and less safety benefit, while another may provide increased safety benefits and a reduction in performance. Such trade-offs need to be considered and thoroughly assessed to ensure balanced SFAIRP decisions are made.

17.6 Medium to long term

Options piloted in the short term and considered suitable will be implemented, SFAIRP.

Options that were not sufficiently developed, will be finalised, piloted and, where relevant, implemented, SFAIRP.

In addition, performance and capacity assessments will be regularly updated, refined, and enhanced utilising a range of different data sources. This will provide a clear, and continuously developing understanding of how performance and capacity can be improved, allow new options to be generated, and existing options to be regularly evaluated.

17.7 Critical success factors

This work stream will co-ordinate closely with the all other work streams described in this strategy.
Glossary of abbreviations and acronyms

BTP  British Transport Police
CCTV  Closed circuit television
CP4,5,6,7  Control period
DfT  Department for Transport
DOO  Driver only operation
EU  European Union
FWI  Fatalities and weighted injuries
GSM-R  Global systems for mobile communication – railway
HS2  High Speed 2
ISCC  Industry Standards Coordination Committee
LU  London Underground
ORR  The Office of Rail Regulation
PPM  Public performance measure
PRM  Persons with reduced mobility
PTI  Platform train interface
PTISG  Platform Train Interface Strategy Group
PTISIG  Platform Train Interface Strategy Implementation Group
R&D  Research & development
RGS  Railway group standard
RIS  Rail industry standard
ROSCO  Rolling stock leasing company
RSSB  Rail Safety and Standards Board
SFAIRP  So far as is reasonably practicable
SMIS  Safety management information system
SRM  Safety risk model
SSRG  System Safety Risk Group
TfL  Transport for London
TOC  Train operating company
TRL  Transport Research Laboratory

Glossary of terms

Cant
The dimension by which the outer rail on a curve is raised above the inner rail.

Cant deficiency
For a train travelling faster than the equilibrium speed on a curve, the theoretical dimension by which the outer rail would need to be raised to reinstate equilibrium.

Crossfall
The slant, slope or gradient of a surface allowing surface water to run in the direction of the fall.

Derogation
A formal written acceptance in response to an application from a Railway Group member, of a permanent non-compliance with a requirement of an RGS.

Deviation
Is a permission to comply with a specific alternative provision to a requirement in an RGS, where it would be unreasonable to comply with the requirement. Note: it is not a permission not to comply with a requirement in an RGS.

Dispatch
The integration of systems, equipment, procedures and instructions to ensure the safe departure of a train from a platform.

GB specific case
Areas or parameters where Great Britain requires a specific case to preserve current domestic practice, with an explanation of why convergence with Europe is impracticable or uneconomic.

Guard
Senior Conductor, Conductor or Train Manager.
High cube containers
In contrast to standard containers, which have a maximum height of 2591 mm (8' 6"), high-cube containers are 2896 mm, or 9' 6"0, tall.

Hotspots
A location which has been identified as having a higher than average frequency of PTI incidents.

Intoxicated
An individual under the influence of alcohol or drugs.

Loading gauge
The dimensions of height and width that must not be exceeded by a rail vehicle or its load, so as not to foul lineside fixtures or structures.

National technical rules (NTRs)
NTRs supplement Technical Specifications for Interoperability (TSIs) where the TSIs are not sufficient.

OPSWEB
RSSB-managed website for rail companies to share operational safety learning and briefing information, sponsored by SSRG.

Performance shaping factors
Those influences that enhance or degrade human performance.

Plant gauge
A specific vehicle gauge that describes the maximum envelope that a vehicle with rail wheels capable of running on railway track, limited to running within a possession only, is permitted to occupy in travelling mode.

Plant vehicles
Items of mechanical and electrical equipment, including portable/transportable infrastructure plant and work equipment.

Platform offset
The distance between the upper surface of the platform edge and the running edge of the nearest rail on the track adjacent to the platform, measured parallel to the plane of the rails.

Step and gap
The ‘Step’ is the vertical distance between the platform surface and the train stepping surface and the ‘Gap’ is the horizontal distance between the edge of the platform and the edge of the train stepping surface.

Person with reduced mobility (PRM)
This refers to any person who has a permanent or temporary physical, mental, intellectual or sensory impairment which, in interaction with various barriers, may hinder their full and effective use of transport on an equal basis with other passengers or whose mobility when using transport is reduced due to age.

Rolling stock
Passenger and freight vehicles, ie trains.
The electronic version of this strategy, available on the RSSB website, contains hyperlinks to all the documents referenced below.

**Railway Group Standards**
The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from www.rgsonline.co.uk

GI/RT7016 – Interface between Station Platforms, Track and Trains

**Railway Industry Standards**
RIS-3703-TOM – Rail Industry Standard for Passenger Train Dispatch and Platform Safety Measures, issue 2

**RSSB documents**
Special Topic Report, Risk at the platform-train interface, 2013

Taking Safe Decisions, version 2.0

RSSB research project T1029 – Designing a tool to support duty holders in the assessment of platform/train interface risk

RSSB research project T704 – The contribution of alcohol to personal safety and security risk on the railways

RSSB research project T1026 – Evaluation of platform information, and guidance on its design, testing, validation, installation, and maintenance

RSSB research project T1064 – Mapping NTS and creating case studies for other roles

RSSB research project T1080 – Optimising platform step and gap research

RSSB research project T743 – A review of passenger train dispatch from stations

RSSB research project T1035 – Evaluating technological solutions to support driver only operation train dispatch

RSSB research project T1059 – Evaluating the use of on-train driver only operation (passenger) monitors during station departures

RSSB research project T866 – Investigation of platform edge positions on the GB network

RSSB research project T1037 – Investigation of passenger vehicle footstep positions to reduce stepping distances and gauging constraints

RSSB research project T610 – An assessment of the cost and benefits of adopting a standard uniform platform height of 1115 mm

RSSB research project T1054 – Evaluating platform gap fillers to reduce risk at the train/platform interface

RSSB research project T1062 – Platform recess – review of requirements

RSSB research project T759 – Improving the methods used to provide access to and from trains for wheelchair users

RSSB research project T1055 – Improving accessibility and safety for mobility scooter users

RSSB research project T881 – Evaluating wayfinding systems for blind and partially sighted customers at stations

RSSB research project T158 – The use of tactile surfaces at rail stations

RSSB research project T1057 – Investigating the risks posed by luggage to passengers and staff on trains and stations

RSSB research project T834 – Reducing accidents through inclusive design: steps, stairs and ramps

**Other references**
Persons with Reduced Mobility (PRM) Technical Specification for Interoperability (TSI), version 2

Rail vehicle accessible research: significant steps, Department for Transport

EN 14752:2005 Railway applications – Bodyside Entrance Systems for rolling stock
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