



# Risk associated with train dispatch

Summary of risk analysis and consolidation of current knowledge

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## Summary

Based on recent GB industry-standard evidence, safety levels are as good for passengers who board and alight from trains without a guard being present as they are for those using other services.

This review of available data looked at the risk to passengers as they enter and leave train carriages and as the train departs from a platform when no guard is present and the driver controls the opening and closing of doors (known as driver controlled operation (DCO), and sometimes also referred to as driver only operation or (DOO)).

The report concludes that levels of risk across all forms of dispatch are low.

## Background

Every year approximately 1.7 billion passenger journeys [3] are made and just under 80 million passenger trains are dispatched [7] on the mainline rail network in Great Britain. The train dispatch process varies at different locations with different members of staff involved. When dispatch arrangements are changed the procedures to manage the risk must be fit for the circumstances in which they will be applied.

## Purpose and Methodology

The purpose of this report is to provide an assessment of the relative safety of different methods of boarding and alighting train passengers, notably between trains with guards and without, and between stations with and without platform staff.

The report's methodology estimates the risk associated with train dispatch under the different arrangements, reflecting incidents that have occurred recently on the network.

This is an update of the risk analysis carried out in the research project T743 [1]. This report also outlines work carried out by RSSB to consolidate existing knowledge of risk relating to train dispatch.

This will inform the update of the Rail Industry Standard for Passenger Train Dispatch and Platform Safety (RIS-3703) [4] and has the potential to be developed in partnership with industry to support risk assessment for changes to train dispatch.

## Scope

The analysis in this report covers:

- Personal accidents to passengers and members of the public associated with train dispatch. This includes:
  - Any injury to passengers or public while they are boarding or alighting a train.
  - Incidents of passengers or public coming into contact with a train while on the platform, or falling between a stationary or departing train and the platform.
- Risk of collision following signals passed at danger (SPADs) when starting against signal (SAS) at platforms which can be related to train dispatch.

Personal accidents to workforce, ERTMS operations, freight operations, SPADs when starting on yellow (SOY) and suicides were outside the scope of the analysis.

## Train dispatch risk

### Train dispatch risk in context

The Safety Risk Model (SRM) [5] estimates that the overall risk from mainline railway operations in Great Britain is 132 fatalities and weighted injuries (FWI)<sup>1</sup> / year (excluding suicides).

Of this the residual risk relating to train dispatch<sup>2</sup> (from personal accidents to passengers and public and from SAS SPADs) is estimated to be 1.8 FWI / year.

Figure 1 shows the risk related to train dispatch accounts for just over 10% of the risk to passengers and public at the platform train interface (PTI).

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<sup>1</sup> FWI is a composite measure where 1 fatality is given an equal weighting to 10 major injuries, 200 Class 1 minor or shock / trauma injuries, or 1000 Class 2 minor or shock / trauma injuries. Class depends on the seriousness of the event resulting in and minor or shock / trauma injury.

<sup>2</sup> Risk related to train dispatch is the risk that arises from any step in the dispatch procedure, passenger behaviour resulting from the impending dispatch of a train, or departure of the train from the platform. This includes incidents such as, becoming trapped in train doors closing for departure and slipping while running for a train that is about to depart.

Figure 1: Train dispatch risk in context

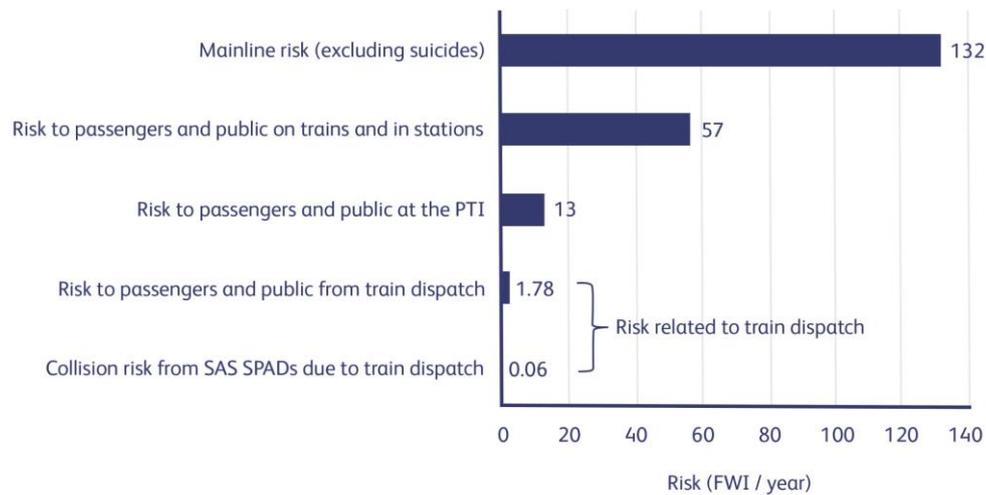


Figure 1 also shows that the risk related to train dispatch is dominated by risk from personal accidents to passengers and public and includes a smaller contribution from SAS SPADs.

## Comparing different methods of train dispatch

The risk associated with different methods of train dispatch was analysed using data from the industry's Safety Management Information System (SMIS) for the six-year period 2010-2015. The analysis grouped dispatch arrangements into four main methods:

- Driver only from an unstaffed platform
- Driver and guard from an unstaffed platform
- Driver only from a staffed platform
- Driver and guard from a staffed platform

The following sections show the breakdown of train dispatch risk from personal accidents to passengers and public, and SAS SPADs by dispatch method.

### Personal accidents to passengers and members of the public

Figure 2 shows the estimated breakdown of passenger and public risk from train dispatch by dispatch method. The risk is normalised by the number of boarding and alighting movements made by passengers (derived from passenger footfall at stations [2]) apportioned across the four dispatch methods.

The error bounds on Figure 2 show the uncertainty that arises from incidents where the dispatch method could not be identified.

**Figure 2: Estimated risk to passengers and public per billion passengers boarding or alighting by dispatch method**

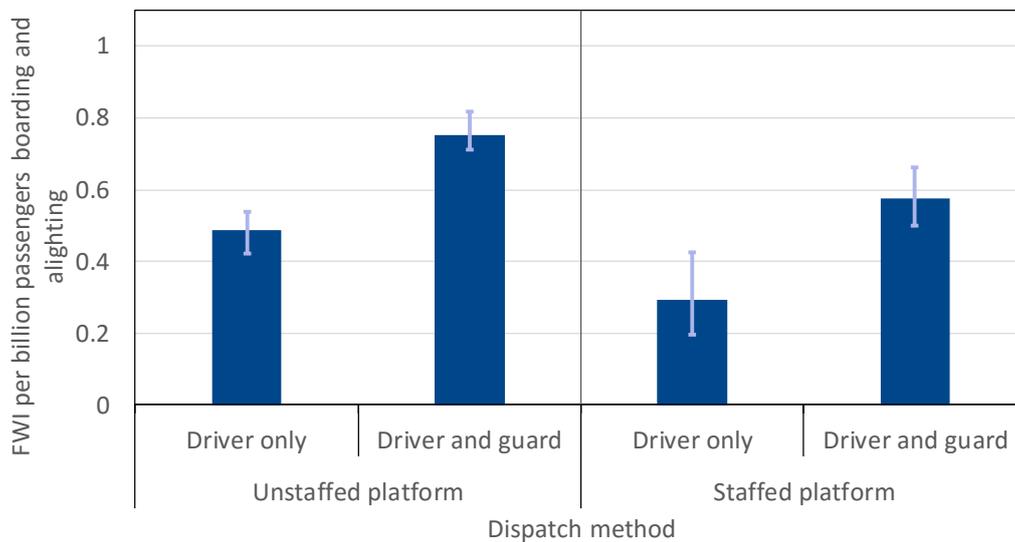


Figure 2 shows that based on incidents reported in SMIS:

- The level of normalised risk associated with dispatching a driver only train is lower at staffed platforms than unstaffed platforms. Similarly, the normalised risk associated with dispatching a driver and guard train is lower at platforms that are staffed.
- The level of normalised risk associated with dispatching a driver only operated train is lower than a driver and guard train, whether the platform is staffed or not.

Figure 2 does not account for possible variation in reporting levels of incidents across dispatch methods.

Figure 3 shows the number of incidents involving fatal and major injuries per passenger boarding or alighting. The reporting and recording of these more serious incidents is likely to be consistent across the dispatch methods. The error bounds on the chart show the uncertainty that arises from incidents where the dispatch method could not be identified.

**Figure 3: Number of fatal and major incidents involving passengers and public per billion passengers boarding or alighting**

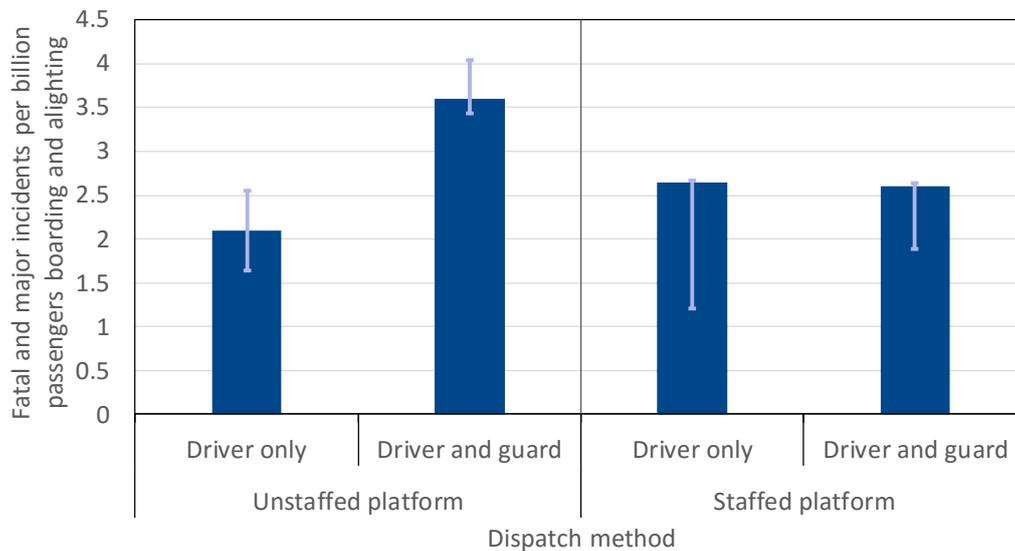


Figure 3 shows that based on incidents reported in SMIS the highest rate of more serious incidents occurred when dispatching a driver and guard train from an unstaffed platform.

Within the six-year data set three incidents involving fatal injuries were considered dispatch related. Two of these events occurred at unstaffed platforms, one involved a driver only operated train and the other involved a driver and guard train. The third incident involved a driver and guard train at a staffed platform. A summary of these incidents is provided in Table 1.

**Table 1: Train dispatch related incidents involving a fatal injury**

Date	Location	Dispatch method	Description
22/10/11	Liverpool James Street station	Driver and guard from an unstaffed platform	Fall between departing train and platform
25/04/15	Bodmin Parkway station	Driver and guard from a staffed.	Struck by departing train due to being too close to the platform edge
05/12/15	Battersea Park station	Driver only from an unstaffed platform	Fall between departing train and platform

## SAS SPADs

SAS SPAD risk from train dispatch accounts for a very small amount (3%) of the total train dispatch risk that is considered in this report. The scope of this section includes the risk of a collision following a SPAD from a platform starting signal.

This risk is managed at a national level by the train protection and warning system (TPWS) that is installed at most signals. This is a safety system that automatically applies the brakes on a train which passes a signal at danger. However, the SPAD risk has been included in this report to ensure complete picture of train dispatch risk.

Figure 4 shows the breakdown of SAS SPAD risk by dispatch method normalised by the number of trains dispatched by each method. Again, the error bounds are an indication of the uncertainty that arises from incidents where the dispatch method could not be identified.

**Figure 4: Estimated risk from SAS SPADs per billion trains dispatched by dispatch method**

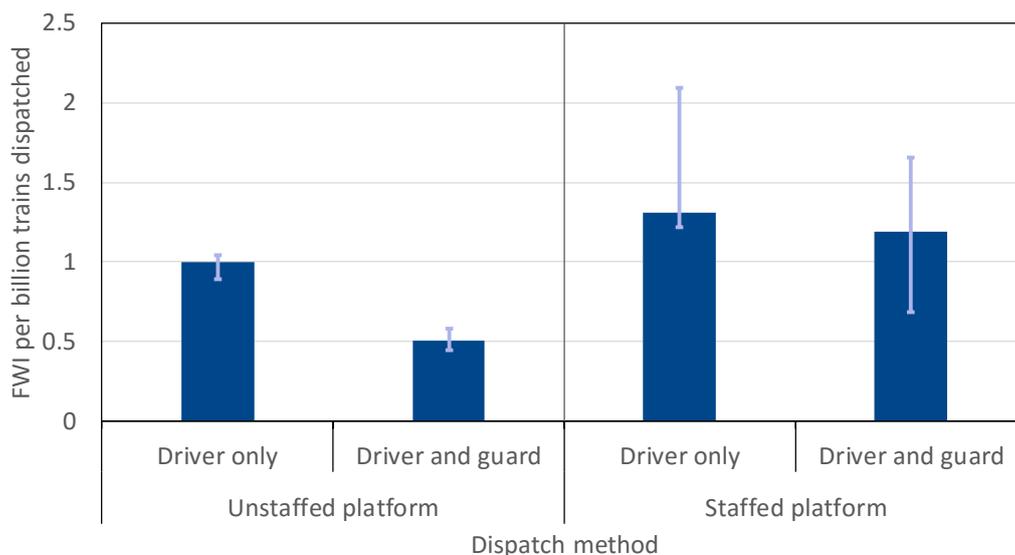


Figure 4 shows that based on the SPADs that occurred in 2010-2015:

- The normalised risk is higher at staffed platforms, regardless of train operation type.
- At unstaffed platforms, the normalised risk is higher for driver only dispatch than dispatch involving a guard.

An alternative normaliser, which may give a better comparison of the SAS SPAD risk by dispatch method, is the number of platform signals encountered at red for each dispatch method. A higher number of red signals are expected on commuter routes, which is where more trains are dispatched as driver only from staffed and unstaffed platforms. This is an area that could be investigated further by using the Red Aspect

Approaches To Signals (RAATS) tool recently developed by RSSB and University of Huddersfield.

### Approach and assumptions

The data used in the analysis was extracted from SMIS by filtering for relevant hazardous events from the Safety Risk Model (SRM) [5]. A further manual filter was applied to remove incidents unrelated to the dispatch process. Only a sample<sup>3</sup> of the passenger and public incidents were analysed due to a large data set.

The method of dispatch is not consistently recorded in SMIS so a survey was sent to all passenger train operating companies (TOCs) [6] to determine the method of dispatching their services at each station they call at. This information was mapped to the incident sample taken from SMIS to identify the dispatch method in use. If a TOC indicated that they use more than one dispatch method at a station, then unless the method could be identified from the incident narrative, the incident was apportioned between the dispatch methods in use.

The estimated number of injuries of each type associated with each dispatch method, and the size of the data sample on which these estimates were based, is shown in Table 2.

Table 2: Sample sizes of data sets

Dispatch method		Injury degree			
		Fatal	Major	Minor	Shock trauma
Estimated number of incidents related to dispatch over 6 years (rounded)					
Unstaffed platform	Driver only	1	11	471	16
	Driver and guard	1	17	647	76
Staffed platform	Driver only	0	7	288	8
	Driver and guard	1	11	667	10
Total		3	46	2073	109
Number of incidents related to dispatch in sample					
Total		3	46	281	14

<sup>3</sup> One-in-eight incident records were sampled from each hazardous event type, unless the dataset contained fewer than 20 incidents in which case all incidents were included. In addition to this, all incidents involving a fatal or major injury were included in the sample.

## Conclusion

The analysis did not seek to account for how other risk factors, such as passenger characteristics, vary between dispatch methods, stations and geographical locations, and any uncertainties inherent in the statistical data.

Taking into account these caveats, the analysis implies that there is no additional risk for passengers boarding and alighting DCO/DOO trains, and indeed that trains without a guard actually appear to lower overall dispatch related safety risk to passengers.

The analysis also shows that the risk to passengers and public from train dispatch is low in the context of other risks on the mainline network. It is well established that rail travel in GB is safe compared to both other modes of transport and other European railways.

## Consolidating knowledge of train dispatch

Further work was carried out to consolidate the current knowledge of risks associated with different methods of train dispatch. A review was undertaken of existing RSSB research, shared industry standards, Rail Accident Investigation Branch (RAIB) investigations, and other industry sources.

This review identified the hazardous events that could occur during or as a result of dispatch, 116 possible causes of these hazardous events and 121 controls that can be used to manage the risks. The findings were arranged into a schematic to represent the hazardous events, causes and controls.

The schematic covers risks associated with each method of train dispatch and the different ways to manage these risks. Many controls are common and some of these are set out in the standards that apply to operations, rolling stock and infrastructure. However, some controls differ depending on the dispatch method or characteristics of the train or platform. These are implemented based on local risk assessments and can sometimes reflect historical decisions.

The hazardous events, causes and controls identified will be used to inform the development of the Railway Industry Standard (RIS) for passenger train dispatch and platform safety [4].

The outputs can also be used by train operating companies at a local level to assist in carrying out a detailed risk assessment to support a change in train dispatch arrangements. This would validate and enhance the outputs providing further benefit to the industry. A further application that could be explored is the use of the outputs to assist with accident investigations.

## References

- [1] Basacik, D. et al., 2008. T743 A review of passenger train dispatch from stations, London: RSSB.
- [2] ORR, 2016. Estimates of station usage. [Online]  
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- [5] RSSB, 2014. Safety Risk Model: Risk Profile Bulletin, version 8.1, London: RSSB.
- [6] RSSB, 2016. TOC survey on dispatch methods used at stations<sup>4</sup>.
- [7] Network Rail, 2016. Planned timetable [Online]  
[Accessed 20 January 2017].

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<sup>4</sup> Sources: Abellio Greater Anglia, Arriva Trains Wales, c2c, Caledonian Sleeper, Chiltern Railway, CrossCountry, East Midlands, First Great Western, Grand Central, GTR Gatwick Express, GTR Great Northern, GTR Southern, GTR Thameslink, Heathrow Connect, Heathrow Express, Hull Trains, London Midland, London Overground, Merseyrail, Northern, Scotrail, South West Trains, Southeastern, TfL Rail Crossrail, TransPennine, Virgin Trains, Virgin Trains East Coast