A REVIEW OF HUMAN FACTORS IDENTIFIED IN INVESTIGATIONS BY THE RAIL ACCIDENT INVESTIGATION BRANCH (RAIB)

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SUMMARY

This paper draws upon the experience that the Rail Accident Investigation Branch (RAIB) has gained since it became operational in October 2005. It firstly shows how human factors have featured in the causation of accidents where specific railway-related activities such as train driving or track maintenance are taking place. It then focuses on the problem of fatigue and shows how it can affect many railway activities and be implicated in the occurrence of accidents. The overall message from this paper is that railway accident investigations provide a useful source of data on human factors issues and their impact on railway safety. For this reason the RAIB plans to extend and refine the preliminary analysis presented in this paper in order to prepare a database of the human factors identified and associated mitigation measures.

INTRODUCTION

The RAIB is the independent railway accident investigation organisation for the UK[1]. The purpose of an RAIB investigation is to improve the safety of railways, and to prevent further accidents from occurring.

Part 1 of this paper draws on the RAIB's experience in accident investigation to provide an overview of those activities on the railway where human factors have often featured in the causal chain of accidents and incidents. It includes an appendix which describes human factors themes in more detail and how the safety implications can be addressed.

Part 2 of the paper takes one specific theme, fatigue, and shows how it affects people undertaking different railway activities, as well as discussing the steps taken by the railway industry to manage the problem and areas where further initiatives might be taken.

PART 1 - OVERVIEW OF HUMAN FACTORS IN RAIB INVESTIGATIONS

Scope of the paper

In its widest definition the term 'human factor' can encompass any factor which bears the imprint of human action. By way of an example, it is possible to describe a decision made by a Victorian designer that leads, 160 years later, to the failure of a structure as a 'human factor'. More commonly, the term is applied to the actions, errors and omissions of individuals more directly associated with cause of accidents and incidents.

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[1] *Lord Cullen's inquiry report on the Ladbroke Grove rail accident in 1999 recommended that an organisation should be established to independently investigate railway accidents. The RAIB was established by the Railways and Transport Safety Act 2003. The Act enabled the Secretary of State to make detailed provision in regulations - the Railways (Accident Investigation and Reporting) Regulations 2005 - about the RAIB's powers and duties, the scope of its work and dealings with other people and organisations involved in rail accidents. The Regulations enabled the RAIB to become operational. The establishment of the RAIB also fulfils the UK's duty to provide an independent rail accident investigation body under the European Railway Safety Directive (2004/49/EC).*

Using this broad interpretation, it is inevitable that human factors are found in every investigation. However, this paper is focused on those accidents and incidents investigated by the RAIB where the actions or inactions of an individual, or group of individuals, has been found to be directly linked to the cause; or the management of the immediate aftermath. The paper does not encompass the underlying systemic and organisational factors that are identified in many investigations (although these are of equal importance and would merit a conference paper in their own right).

Human factors in the RAIB's investigations

Since the RAIB started carrying out investigations in October 2005 it has investigated 222 accidents. Of these, 192 have been published as reports and 30 as shorter bulletins. Taken together these investigations provide a rich source of data on the types of human factor that have contributed to accidents and incidents on the UK railways. Using this data set, this paper identifies the areas of railway activity in which human behaviour has been shown to have played a significant role in the causality of an accident or incident and to provide examples of the types of factors that had been identified by the RAIB in the relevant investigation reports.

The analysis also identifies the broad measures to prevent recurrence recommended by the RAIB.

Results of the analysis

The results of the analysis described above are presented at Appendix 1. The first column lists the areas of railway activity that were identified. The second shows for each area the number of investigations where it has been found that human behaviour directly contributed to the accident or incident. The third column gives examples of the human factors that were found to have applied and the last two columns summarise the broad types of measure recommended to prevent recurrence.

Findings

The accidents and incidents investigated by the RAIB are generally characterised by their serious consequences or by their potential to have caused significant harm. Therefore, the analysis in this paper, while not exhaustive, provides useful data on the impact of human factors in the causation of high risk events.

The analysis revealed that the actions of train drivers featured in 47 RAIB investigations and the actions of track workers in 26. This should not be taken as evidence that these workers have a greater propensity to make errors and omissions than any other group of railway staff, but rather that the potential consequences of errors in these areas are much greater, so they tend to be more prominent in RAIB investigations. The same logic also applies to the other areas of activity where there is a higher occurrence of human actions linked to causation, as shown below:

Area of activity	Number of RAIB investigations in which human actions within that area of activity are a significant factor
Train driving	47
Working on the track	26
Shunting/train preparation	16
Use of level crossing users by members of the public	16
Operation of level crossings by railway staff	9
Control/signalling of trains	13
Defect missed during inspection	15
Actions of third parties	8
Operation of road rail vehicles	4
Dispatch of trains from stations	4

Appendix 1 provides examples of the types of human factors that have featured within each of the areas of activity. It is considered that these break down into seven main categories:

- knowledge-based mistakes leading to a task being carried out incorrectly (eg signaller's mismanagement of points during equipment failure);
- distraction, loss of concentration (eg signaller inadvertently raises level crossing barrier before the arrival of the train);
- cognitive lock-up (eg signaller becomes focused on one particular problem at the expense of processing other relevant information);
- loss of situational awareness (eg track worker becomes unaware of his position relative to the track)
- inaccurate mental models (eg train driver has an inaccurate expectation of a sequence of signal aspects);
- omissions (eg shunter forgets to check that a handbrake is released before the departure of the train); and
- deliberate violations (eg unauthorised system of work in work site).

Appendix 1 also shows examples of the principal types of barrier to human error that have been identified in RAIB recommendations. These fall into one or more of the following categories:

a. **Removal of the hazard;** such as the avoidance of a hazardous task.

b. **Enhancement of design;** physical measures to reduce the likelihood of staff or members of the public making errors or to minimise their consequences (such as the provision of measures to prevent signallers from opening level crossing barriers before a train has passed clear or improvements to layouts at level crossings).

c. **Enhancement of design assurance and approvals;** these recommendations are typically designed to prevent design deficiencies that have led to human error from being replicated in future trains and infrastructure.

d. **Steps to address safety culture;** such recommendations are designed to address attitudes and behaviours within railway organisations (such as attitudes to safety among track workers).

e. **Management process;** typically these are changes to management arrangements in order to better manage a particular risk. Such changes may address organisational deficiencies or the processes that are in place for planning, implementation, monitoring, review and audit.

f. **Enhancement of procedures (operational, maintenance, etc.);** this can be done to implement an improved process or alternatively to improve the clarity of existing procedures.

g. **Training & competency;** since the safety of the railway is critically dependent on the professionalism of its staff many recommendations address the way that staff are trained and assessed as competent.

It is observed that most, if not all, of the above would follow from an evaluation of risk and identification of the optimum way of managing it.

Next steps

This high level analysis of data from investigations undertaken by the RAIB has emphasised the significance of human factors in railway accidents, and has confirmed the view held by many in the industry that it is necessary to continue to study the human performance of those staff who are often required to work alone, or with minimal supervision, in front-line roles. This category includes train drivers, signallers, crossing keepers, track workers, shunters, machine operators/controllers and those who are tasked with the visual inspection of equipment and infrastructure. It has also re-emphasised the importance of continuing to strive to understand the factors that influence the behaviour of level crossing users.

An extension of this analysis to a larger data set should lead to a better understanding of the recurrent causes of human error and the effectiveness of current control measures (such as training and management systems). This improved understanding is important since it will assist investigations while also shaping the additional barriers proposed in future recommendations. The RAIB plans to extend and refine the analysis

presented at Appendix 1 in order to prepare a database of the human factors identified and associated mitigation measures. This will be done in consultation with RSSB and other industry bodies with an interest in the field.

PART 2 - FATIGUE AS A FACTOR IN RAIB INVESTIGATIONS 2005-12

Introduction

Specialists in fatigue draw a distinction between fatigue and sleepiness. Fatigue can be defined as the impairment of mental activity associated with the pattern of work and rest. Sleepiness is the propensity of the individual to fall asleep. It is possible to be fatigued without being sleepy, and conversely to be sleepy without being mentally fatigued. However, from the perspective of performance, alertness is related to both of these and can be defined as a state of wakefulness when a person is best able to process information and be responsive to the external environment. This paper uses the term 'fatigue' as a proxy for lack of alertness, irrespective of whether its root cause is actually fatigue or some other factor such as sleepiness.

Proving that an individual is suffering from fatigue can be difficult. Evidence can be gathered in relation to the actual circumstances of the accident or incident and the background of the individual involved which may suggest that fatigue was a possibility or even a likelihood. However, unless the individual concerned provides evidence that fatigue was a factor, there will always be an element of uncertainty.

Since becoming operational in 2005, the RAIB has carried out 10 investigations where fatigue has been a factor in the causal chain. Those accidents or incidents have involved the actions (or inactions) of a manager, train drivers, an on-track machine driver, signallers and a freight train preparer. We have investigated accidents and incidents where fatigue has arisen because of the cumulative effect of the numbers of hours worked and others where it has arisen after days spent off-duty, but where the individual concerned has been trying to adapt to a different type of shift (particularly the transition into night shifts).

The management of fatigue

In its endeavours to manage fatigue, the railway industry has employed a number of different measures such as:

- Limits on working time.
- Use of tools to help employers to generate 'fatigue-friendly' rosters. These tools will normally focus on the avoidance of the worst excesses of cumulative fatigue.
- Adoption of rostering principles to combat the risk of fatigue, such as the avoidance of counter-clockwise shift rotation.
- Advice to staff on how to manage their lifestyles so that the risk from fatigue when they are at work is minimised.
- Establishment of the principle that staff can declare themselves unfit through fatigue.

The Office of Rail Regulation has recently issued guidance to the industry on good fatigue management practices. Despite this, and advances made in fatigue risk management in the railway industry, incidents and accidents arising from fatigue are still occurring.

Case studies

The following three example case studies below, taken from investigations undertaken by the RAIB, attempt to illustrate how the measures described in the previous section can be respected, but did not manage to prevent fatigue from being a causal factor in the accident or incident described.

Case Study 1: Signal passed at danger

The incident

At around 11:03 hrs on an August morning, a freight train passed a signal at danger by 35 metres following a shunting move at a station. The train was stopped by the intervention of the Train Protection and Warning System, but the driver immediately reset the equipment without speaking to the signaller and continued his journey. The train was finally stopped by the signaller changing another signal to red in front of the train.

Principal investigation findings relevant to fatigue

(1) It is possible that the driver of the freight train was fatigued.
(2) When the incident occurred, the driver was working his sixth turn of duty that was either a night shift or an early shift with an early start. On the day of the incident, his sleep had been interrupted by a thunderstorm at 01:00 hrs, and after that he hardly slept again until his alarm sounded to wake him at 03:45 hrs.

What do we learn from this incident?

Although drivers are provided with lifestyle guidance to help them in managing their lives away from the workplace in a manner that is helpful to minimising the risk from fatigue, there are factors, such as those which occurred here, that neither the employer nor the employee was able to control. In the circumstances described, the thunderstorm severely curtailed the driver's sleep and left him vulnerable to fatigue later on during his shift, although he did not feel fatigued when he started work.

Case Study 2: Derailment of freight train

The accident

At around 02:40 hrs on a November morning two locomotives hauling a freight train derailed on a set of points. The immediate cause of the accident was that the signaller had not set the points for the safe operation of the train. This was a task that he would not normally have had to perform, but was required to do so on this occasion because of a signalling system failure.

Principal investigation findings relevant to fatigue

(1) It is probable that the signaller's actions were affected by fatigue, as a result of the number of hours and the nature of the shifts that he had worked. In the four weeks leading up to the accident, the signaller had worked 238.5 hours (an average of almost 60 hours/week) and 64.5 hours more than the base roster (37% increase on base hours).
(2) The roster worked by the signaller was not subject to assessment using fatigue assessment tools.
(3) The duty holder had no suitable framework of controls to manage fatigue in safety-critical staff.

What do we learn from this accident?

Limits on working time and the avoidance of obvious bad practices such as counter-clockwise shift rotation are not necessarily an effective method of controlling fatigue. The shifts worked by the signaller always rotated forwards and the hours worked conformed to the duty holder's limits on working time, but as these permitted very long working hours, they were not enough by themselves to control the risk of fatigue. While the base roster had been evaluated using predictive fatigue tools, the amended roster worked by the signaller was not.

Case Study 3: Uncontrolled roll-back of freight train

The incident

At around 02:05 hrs on an August morning, a freight train was travelling uphill when it slowed to a stop and then ran back until the driver braked the train to a stand about four minutes later. During the roll-back, the train reached a maximum speed of 51 mph (82 km/h) and travelled 2.2 miles (3.5 km). The driver was working his first night shift after a week of early turn duties and two rest days and had been on duty for around 7.5 hours when the incident occurred.

Principal investigation findings relevant to fatigue

(1) The driver was not sufficiently alert at the time of the incident because he was probably fatigued.
(2) The driver had been exposed to a work pattern that was likely to induce high levels of fatigue.
(3) The scores predicted by the mathematical fatigue model used by the duty holder and the nature of the rail industry guidance on using such models were underlying factors in the incident.

What do we learn from this incident?

The extent that predictive fatigue tools can be relied on and their uses and limitations should be made clear by the supplier and must be properly understood by the user. The duty holder had used such a tool in developing the roster, but the tool used was designed to identify the risk of fatigue arising from cumulative hours of duty; it was not able to identify the risk of fatigue associated with a first night duty that followed a series of early turns and rest days. The causes of fatigue are more complex than cumulative hours on duty alone and a roster should be compiled taking account of all the possible causes of fatigue.

Common features in the three case studies

The three case studies have some features in common, which highlight the issues that face the railway industry:

1. None of the employees concerned behaved recklessly or even irresponsibly. All had acted in accordance with good fatigue management principles, but had found themselves unable to control the ill-effects of fatigue.
2. None of the employees had started their shift in a fatigued state, thereby undermining their employer's stated policy of self-declaration of fatigue. This is particularly significant in the case of the two incidents involving train drivers. Train driving is a solitary occupation and help is not easily at hand. It would be a significant step for a train driver to ask to be replaced en route or for his train to be routed into a yard while he took a nap. There is an implicit motivation to 'keep going' and fight the effects of fatigue and a reluctance to self-declare fatigue.
3. The employers, in all cases, had a fatigue risk management system in place, but it did not address the specific circumstances that each of the employees found themselves in.

Conclusions

Railway duty holders do have arrangements in place for managing fatigue and good practice in fatigue management is constantly developing. It is not the purpose of this paper to provide a list of principles for managing the risk from fatigue; ORR's recent guidance effectively does this.

In the ten investigations that included fatigue in the causal chain, the RAIB has made a total of 19 recommendations. These have been made to infrastructure controllers, train and freight operators, regulators and RSSB. They have covered local working arrangements such as rostering of staff, limits on working time, research into fatigue guidance to the industry and to staff on fatigue-related matters and the refinement of tools for predicting fatigue.

The RAIB's experience in investigating accidents and incidents where fatigue was a factor in the causal chain leads to three general points that we consider it useful to make:

1. Duty holders must understand the limitations of the tools that they use to assess the probability of fatigue when designing staff duty schedules and rosters; fatigue does not arise from a single cause and fatigue tools need to be capable of considering all causes.
2. Fatigue can manifest itself at any time; a policy of permitting staff to declare themselves unfit through fatigue at the beginning of their duty needs to be augmented by consideration of how staff experiencing fatigue during a duty can be assisted
3. If duty holders are to obtain a better understanding of the circumstances under which fatigue is occurring, then it is vital that they establish a 'no-blame' reporting mechanism which allows employees to explain the exact circumstances and context in which they suffered fatigue in the knowledge that they will be supported and suffer no formal or informal repercussions. This is critically different from existing confidential reporting systems. Where fatigue is concerned, duty holders need to know exactly which aspects of its own operation are contributing to fatigue events and also to understand the characteristics of their own workforce and how and why they are experiencing fatigue.

Bibliography

[All RAIB reports are available at www.raib.gov.uk]

[1] Signal T172 passed at danger at Purley station, Surrey 18 August 2006. RAIB investigation report 27/2007, August 2007.

[2] Derailment of two locomotives at East Somerset Junction, 10 November 2008. RAIB investigation report 28/2009, November 2009.

[3] Uncontrolled freight train run-back between Shap and Tebay, Cumbria, 17 August 2010. RAIB investigation report 15/2011, August 2011.

Appendix 1 Summary of some important human factors identified in RAIB investigations and types of measures identified to address them

Area of activity	No. of investigations	Examples of factors that applied	General measures included within RAIB investigation recommendations	Examples
Train driving	47	▪ loss of alertness leading to SPADs, collisions, derailments or loss of control (some case studies are included in Part 2 of this paper) ▪ misjudgements (for example, in train braking on the approach to buffer stops) ▪ errors while undertaking unfamiliar tasks (e.g. walking between wagons in conductor rail territory or mismanagement of failed trains) ▪ errors arising from competence management failings (e.g. mismanagement of steam locomotive boilers) ▪ inappropriate/slow response to alarms ▪ violations (e.g. overspeeding)	Enhanced procedures	Review of professional driving policy
			Removal of hazard, enhancement of design or enhancement of procedures	Junction risk assessments and implementation of changes
			Training & competency	Route learning
			Enhanced design	Additional TPWS at high risk junctions
			Management process	Arrangements for providing suitable safety briefings at work sites
Working on the track (total 26)				
▪ working on lines open to traffic	3	▪ lack of appropriate experience ▪ misunderstanding of rules	Training & competency	Enhanced training (eg awareness of risk working in proximity to junctions)
			Enhanced procedures	Clarification of railway rules and associated standards
			Remove hazard	Minimisation of working on lines that are open to traffic
▪ local knowledge of safety leaders	4	▪ competence shortcomings, e.g. lack of local knowledge needed to establish safe system of work	Management process	Local knowledge of safety leaders on site and their involvement in planning of the work
▪ safety leadership and culture	10	▪ cultural issues, e.g. controller of site safety lacked authority to influence behaviour and unsafe systems of work not challenged by junior staff ▪ violation of rules including disregard of warnings and briefings ▪ workload and competence issues, e.g. unsafe systems of work not identified by senior staff	Addressing safety culture	Safety leadership training

Area of activity	No. of investigations	Examples of factors that applied	General measures included within RAIB investigation recommendations	Examples
▪ planning of the work	9	▪ insufficient planning ▪ planning errors ▪ insufficient communication and coordination	Management process	Improvements to planning of works and associated documentation
Shunting/train preparation	16	▪ competence issues, e.g. handbrakes not released before journey (causing damage to wheels and subsequent derailment) or mismanagement of points ▪ ergonomic issues e.g. hoppers and doors left open and not detected ▪ violations, e.g. shunter entering gap between vehicles during shunting operations ▪ errors and oversights, e.g. shunter remaining in the path of vehicles during shunting ▪ characteristics of individuals, e.g. lack of effective communication between driver and shunter	Enhanced procedures	Enhanced maintenance and testing of handbrakes
			Training & competency	Enhanced training and supervision in freight yard
			Enhanced design	Modifications to prevent dragging handbrakes
Errors by level crossing users	16	General factors	Enhanced procedures	Process for risk assessments and the identification of reasonably practicable measures to take into account: ▪ accurate census of users ▪ local factors likely to affect user behaviour ▪ history of misuse, near-misses and accidents
			Training & competency	Enhanced training of risk assessors
			Enhanced design	Improved layouts (eg the angle of the pedestrians approach relative to the line)
			Remove hazard	Closure of level crossings
			Management process and enhanced procedures	Adoption of interim measures pending safety improvements at high risk crossings
	4	▪ violations or inappropriate behaviour, e.g. at footpath and vehicular crossings with no warning lights users do not look (or look but do not react)	Enhanced design	Changes to layout, or provision of audible or visual warnings
	1	▪ misjudgement, e.g. of speed and/or distance at tram crossing	Management process	Marking and enforcement of permitted speeds
	1	▪ environmental factors - limited visibility (fog) at footpath crossing		

Area of activity	No. of investigations	Examples of factors that applied	General measures included within RAIB investigation recommendations	Examples
Errors by level crossing users (cont.)	2	▪ insufficient consideration of hazards (poor risk management) - effect of darkness at footpath and user worked crossings with no warning lights	Enhanced procedures	Impact of darkness to be assessed as part of routine risk assessments
	1	▪ disregard of warning lights at user worked crossing with miniature warning lights		
	1	▪ design -.user entered crossing after first train passed and struck by another in the other direction (station pedestrian crossing)	Enhanced design	Provision of addition signs
	3	▪ ergonomic issues - limited sighting distance at footpath and user worked crossings with no warning lights	Enhanced procedures	Enhanced management of vegetation
			Enhanced design	Marking the optimum position for level crossing users to look for approaching trains
	1	▪ information deficiencies - provision of signage at footpath crossing	Enhanced design	Adoption of alternative warnings where train horns are insufficiently audible Optimisation of the position of whistle boards
	1	▪ human performance - audibility of train horns at footpath crossing	Enhanced procedures	Investigation of the impact of only sounding single tone on approach to crossings
	2	▪ ergonomic issues - conspicuity of lights at Automatic Open Crossing (with no barriers)	Enhanced design	Improved conspicuity of lights Provision of barriers at high risk Automatic Open Crossings
	1	▪ individual – capabilities of users (eyesight)		
Deliberate misuse of level crossings (it should be noted that the RAIB's policy is that it generally will not investigate accidents when an accident has been caused by reckless and deliberate violation).	6	▪ violation 'encouraged' by long waiting times due to lack of visibility to signaller of train location on long signal sections ▪ disregard	Enhanced design	Provision of device to permit a signaller to determine the location of a train in a long section
			Management process	Improved communications between infrastructure owner and authorised users of crossings
			Enhanced operations procedures	Improve the reporting of misuse and near-misses

Area of activity	No. of investigations	Examples of factors that applied	General measures included within RAIB investigation recommendations	Examples
Operation of level crossings by railway staff	9	▪ individual performance - driver not responding correctly to signals ▪ competence - poor management of brakes in low adhesion conditions and lack of understanding of how crossing controls operate when barriers failed ▪ distraction, causing signaller to raise barriers before train has passed clear ▪ lapses in attention	Training & competency	Enhanced training of drivers who are required to observation the correct operation of crossings Enhanced training of signallers
			Enhanced procedures	The provision of accurate operating instructions (particularly during equipment failure)
			Enhanced design	Provision of engineering safeguards to avoid accident resulting from a crossing keeper's error (eg approach locking)
Train control/signalling	13	▪ competence - mismanagement of points and signaller authorised movement of train when route not correctly set (possibly linked to fatigue -see Part 2) ▪ violation - unauthorised system of work during equipment failure ▪ human capabilities - poor communications	Training & competency	Signaller training to take into account failure and emergency scenarios
			Management process	Control of hours worked (see Part 2)
			Management process and enhanced procedures	Improved guidance on the management of fatigue and to identify the risk of over-reliance on numerical models
Inspection of the infrastructure - missed or deficient inspection	15	▪ work overload leading to missed inspection of points in degraded condition ▪ competence shortcomings leading to gauge widening not detected and misaligned joint and heavy wear not identified ▪ management systems did not detect missed and deficient inspections ▪ absence of suitable standards for the guidance of staff	Management process	Enhanced training of staff with responsibilities for inspection and maintenance of safety critical components
			Management process	Management processes to detect missed inspections
			Enhanced design	Enhanced design to reduce the reliance on visual inspection
			Management process and enhanced procedures	Risk based approach to identify potential failure modes and suitable mitigation measures Monitoring and review of data relating to the service performance of safety critical components and action as appropriate

Area of activity	No. of investigations	Examples of factors that applied	General measures included within RAIB investigation recommendations	Examples
Actions of third party	8	▪ various lapses on the part of road vehicle drivers leading to incursions	Management process	Steps to reinvigorate the process for the management of road vehicle incursion risk (involving local highway authorities and the railway industry)
Operation of road rail vehicles	4	▪ competence - poor on-tracking technique and over-reliance on interlock and insufficient allowance made for affect of poor adhesion on steep gradient ▪ training - lack of awareness of how to respond to runaway	Enhanced procedures	Provision (and improved presentation of) information for RRV controllers (eg details of gradients)
			Enhanced design assurance	Identification of potential failure modes and associated engineered control measures
			Training & competency	Enhanced training of machine controllers (and introduction of new competency standard)
			Enhanced design	Introduction of measures to prevent runaway (eg reliable interlocks to prevent both sets of rail wheels becoming unbraked at the same time)
			Remove hazard	Independent braking of rail wheels
			Enhance approvals	Approval processes to take into account potential failures during on and off-tracking that may cause runaway
Train dispatch	4	▪ ergonomics - driver's poor visibility of CCTV monitor and partially obstructed view ▪ competence - inadequate check by driver before taking power ▪ individual errors - inadequate visual inspection of the platform train interface before giving signal for train to depart	Enhanced procedures	Review and alterations to dispatch procedures (drivers and station staff)
			Enhanced procedures	Assessment of dispatch risks associated with 'driver only operations' and adoption of changes
			Training & competency	Re-briefing of drivers of correct dispatch arrangements
			Enhanced design	Relocation of CCTV monitors and associated signage