RAIB
Rail Accident Investigation Branch

Rail Accident Report

Tube train driven in the wrong direction, Camden Town, Northern Line 10 June 2007

Department for Transport

Report 06/2008
March 2008

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

Any enquiries about this publication should be sent to:

RAIB
The Wharf
Stores Road
Derby UK
DE21 4BA

Email: enquiries@raib.gov.uk
Telephone: 01332 253300
Fax: 01332 253301
Website: www.raib.gov.uk

This report is published by the Rail Accident Investigation Branch, Department for Transport.

This page is left intentionally blank

Tube train driven in the wrong direction, Camden Town, Northern Line, 10 June 2007

Contents

Introduction

1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.

2 The RAIB does not establish blame, liability or carry out prosecutions.

3 Access was freely given by London Underground Ltd (LUL) to their staff, data and records in connection with the investigation.

4 Appendices at the rear of this report contain the following glossaries:

- acronyms and abbreviations are explained in Appendix A; and
- technical terms (shown in *italics* the first time they appear in the report) are explained in Appendix B.

Summary of the report

Key facts about the accident

5 On Sunday 10 June 2007 at approximately 17:35 hrs, consequent upon repairs being carried out on the train regulation equipment on the Northern Line of London Underground, northbound *train 005* was directed to the incorrect branch of the line at Camden Town. To correct this, crews and passengers were exchanged between train 005 and train 042, which had been immediately following it, while both trains were standing different platforms at Camden Town.

6 During the exchange, the *train operator* of train 005 entered the *cab* at the wrong end of the train and drove it southwards for some 108 metres. There was no collision, derailment or injuries to passengers or staff.

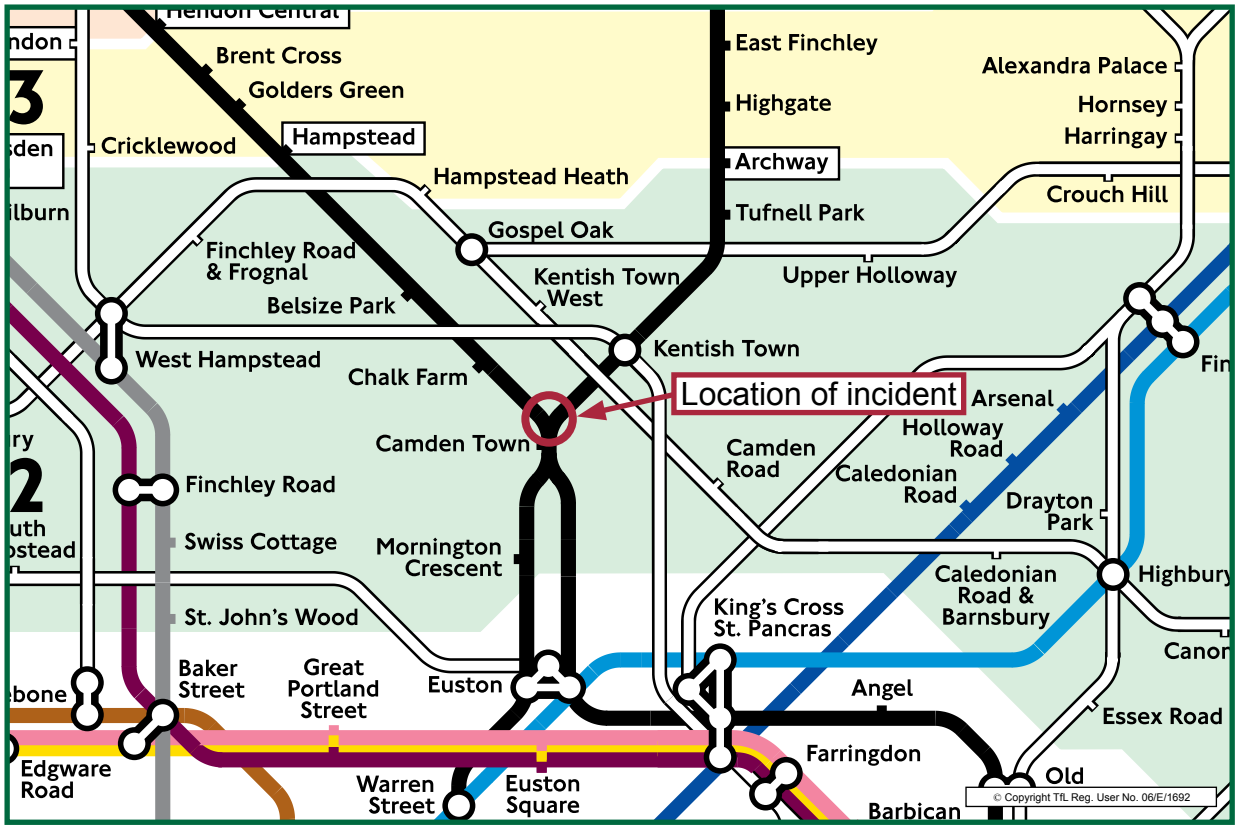

Figure 1: Section of London Underground map showing location of incident

Immediate cause, causal and contributory factors

7 The immediate cause of the accident was that the operator of train 005 entered the incorrect cab when joining the train and drove the train in the wrong direction from Camden Town station.

8 The causal factor was that:

- the train operator did not carry out the correct procedure for starting a train from a station.

9 Contributory factors were that:

- the s*ervice operator* did not know that a defect investigation into the train regulation equipment was in hand and placed the system in an inappropriate mode causing Train 005 to be misrouted;
- the train operator was not familiar with changing trains at Camden Town;
- none of the methods of preventing the train being moved in the wrong direction, neither through the presence of an item of equipment or the use of a specific procedure indicated in this report, nor an independent check that the operator had entered the correct cab, were in place;
- the CCTV image of the green *repeater* signal confirmed the train operator's belief that it was safe to proceed; and
- the train operator did not observe and respond to a stop board.

Severity of consequences

10 Apart from temporary operational disruption to the Northern Line, there were no consequences of the incident.

Recommendations

11 Recommendations can be found in paragraph 130. They relate to the following areas:

- methods of warning train operators when they are about to enter the wrong cab, and of preventing them moving trains in the wrong direction;
- ensuring that train operators are familiar with the layout of stations where they may be required to move from one platform to another; and
- notification to control room staff when there is a requirement to use a particular mode of train regulation.

The Incident

Summary of events

12 On Sunday 10 June 2007 repairs were being carried out to train regulation equipment on the Northern Line of the London Underground (LUL). A service operator, who was unaware of the work being carried out, altered the operating mode of the equipment to an inappropriate, but not unsafe, mode.

13 At approximately 17:35 hrs this caused a northbound train (number 005) destined for Edgware to be wrongly routed towards High Barnet at the Camden Town junctions. This led to an exchange of passengers and train operators between this and the following train (042) while they were standing in the Edgware and High Barnet platforms at Camden Town station.

14 The train operator who went to the train standing in the High Barnet platform (now to be renumbered 042) entered the cab at the south end instead of the north end and drove the train southwards away from Camden Town on the northbound track.

15 After his train entered the tunnel, the train operator of train 042 became aware of a train (043) standing on the track ahead and brought his train to a stand some 108 metres south of the platform *headwall* and 20 metres away from the approaching train.

16 There were no injuries and no damage to infrastructure or rolling stock.

17 The route taken by the train operator from the Edgware platform to the High Barnet platform and the relative positions of the trains immediately before the wrong direction move occurred are shown in Figure 2.

The parties involved

18 London Underground operated all the trains and employed all the staff involved.

Location

19 The incident occurred on the Northern Line of London Underground at and immediately south of Camden Town station.

20 The Northern Line runs from Morden in south London to Edgware and High Barnet in north London. There are two routes through central London, one via Charing Cross and the other via Bank, which diverge at Kennington and rejoin at Camden Town. At Camden Town the branches to Edgware and High Barnet diverge.

21 The junctions which allow trains to run from either of the central branches to either Edgware or High Barnet are south of Camden Town station. The northbound platforms at Camden Town are therefore designated ‘Edgware Branch’ or ‘High Barnet Branch’.

Track layout

22 Immediately to the south of the High Barnet Branch platform, lines coming from the Bank and Charing Cross Branches of the Northern Line converge.

23 The converging points are protected by signal E9b on the Charing Cross Branch which is 128 metres south of the Barnet Branch platform. The *toe* of these points is 75 metres south of the platform headwall.

Trains

24 The trains involved were both formed of '95 Tube Stock used on the Northern Line. The design and condition of the trains did not contribute to the incident.

External circumstances

25 There were no circumstances external to the underground railway system which had any influence on the incident.

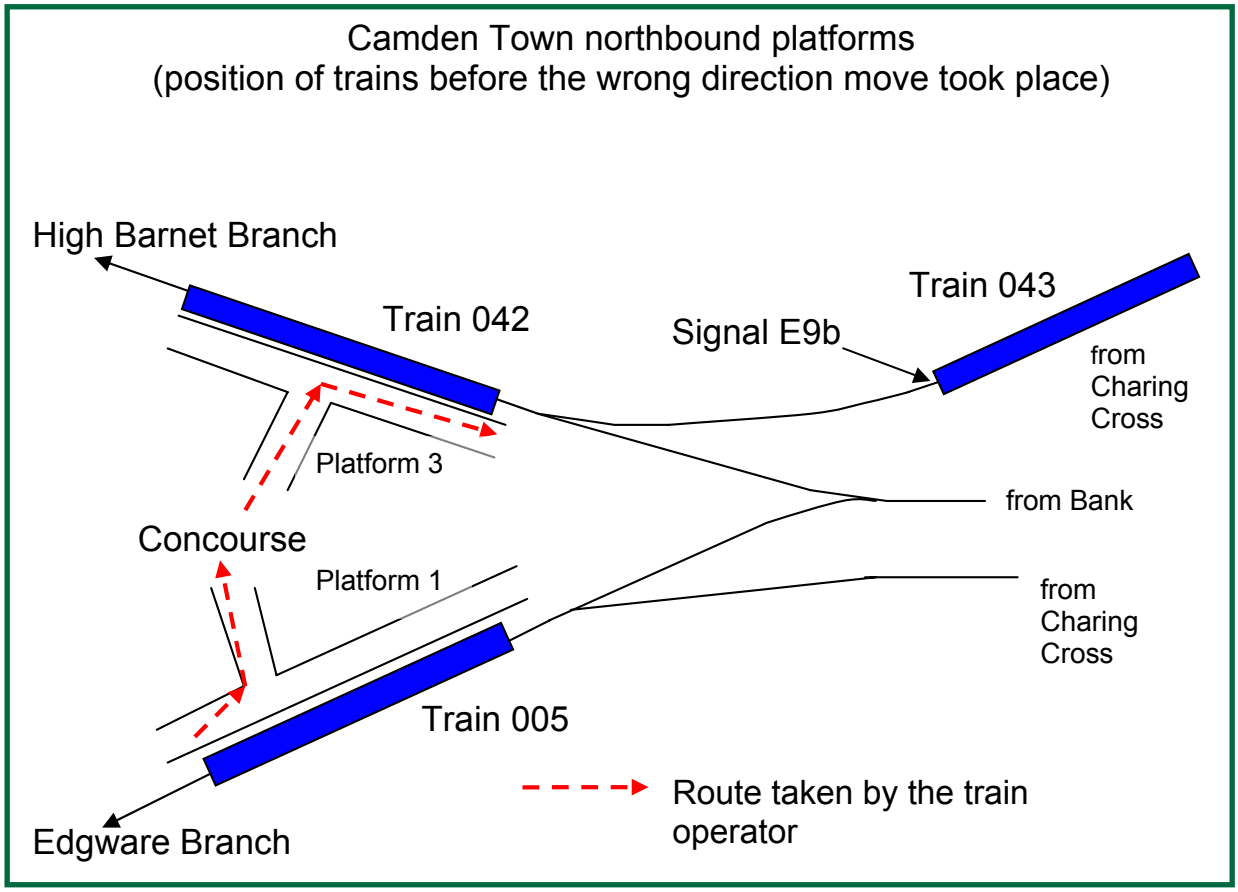

Figure 2: Camden Town northbound platforms, junctions and the positions of the trains immediately before train 042 was driven in the wrong direction

The Investigation

Sources of evidence

26 These comprise:

- Witness evidence.
- CCTV recordings taken at Camden Town.
- *Train Data Recorder* (TDR) evidence taken from the train.
- Voice recordings taken from Coburg Street Control.
- Downloads of the data recorded by the signalling equipment.
- Site visits to Camden Town station and Coburg Street control room.
- Observation of driving techniques.

Key Information

Events preceding the incident

27 On Sunday 10 June 2007 the central branch from Kennington to Camden Town via Bank was closed for engineering work to take place. All trains were run via Charing Cross.

28 Problems had been occurring over the previous few days with the *positive train identification* (PTI) equipment. This works together with *programme machines* connected to the points to direct trains to their destinations. When the PTI is functioning correctly, it can direct the trains without intervention from the staff in the control room.

29 With the agreement of the *service controller*, a signalling technician began repairing the PTI equipment at about 08:00 hrs. Since this would involve interference with the working of the PTI, it was agreed that the service operators would operate the junctions on the Northern Line manually. This required them to set the points for each train individually, no automatic equipment being used, and is known as '*push button*' operation. Such an arrangement is a normal practice, but it is not defined in the *Rule Book*.

30 The technician explained to the service controller, and as a courtesy mentioned to the service operators, that while repair work was taking place another mode of operation – '*first come first served*' – was not to be used. This mode relies on the identification of trains by the PTI. Since the PTI was under repair it could not be relied upon to identify trains correctly, rendering 'first come first served' unsuitable.

31 The service operator did not make an entry in the *log book* that work on the PTI was taking place and that there was a restriction on the mode of operation of the train regulation system.

32 A change of service controllers and service operators occurred during the day, before repairs to the PTI had been completed. The staff who took over were not aware of the work being carried out on the PTI and the temporary prohibition on the use of the 'first come first served' mode. There was no written record to indicate this and no verbal instruction had been given during the change over.

33 During the later part of the afternoon the technician reinstated the PTI equipment as part of the repair process in order to carry out further tests. The PTI equipment functioned satisfactorily at first. The service operators, who had come on duty after the repair work had started, gained the impression that the PTI was working properly.

34 This did not prevent the service operators continuing to use push button operation, but the service operator controlling the junctions at Camden Town altered the mode of operation from 'push button' to 'first come first served'. This action did not compromise the safety of train movements provided by the signalling in any way.

35 Soon after 17:35 hrs, train 005 bound for Edgware approached the junctions at Camden Town. At about this time, the fault under investigation re-emerged and caused the PTI equipment to fail and route all trains towards the northbound High Barnet Branch platform.

36 The train operator of train 005 *accepted* the inappropriate routing, stopped his train and made a radio call to the service controller who agreed that the train should enter the High Barnet Branch platform.

37 The service controller decided to correct the situation by carrying out a *stock and crew change* with the following train, train 042, which was bound for High Barnet. This entailed routing train 042 into the Edgware Branch platform and exchanging passengers and train operators between the trains.

38 The service controller called the train operator of train 042 and advised him of the situation. He, in turn, advised the passengers on his train of the need to leave the train at Camden Town and move to the train which would be standing at the High Barnet Branch platform. The final part of this process would involve the correction of train numbers so that the train in the High Barnet Branch platform would now become identified as train 042 and that in the Edgware Branch platform as train 005.

39 The train operator was not familiar with the layout of the passages between platforms at Camden Town, though he had driven trains through there on both routes in both directions since joining the Northern Line some 5 years previously. He was not aware of having made such a change before. He was concerned to restart the train to maintain the service.

40 On arrival at Camden Town, the train operator *berthed* his train before leaving the cab and proceeding to the High Barnet Branch platform. The berthing procedure includes placing the *Traction/Brake Controller* (TBC) in the '*stow*' *position* and closing the cab down. The TBC is not locked and can be moved, but is held in 'stow' by spring pressure sufficient to prevent it moving of its own accord. A train cannot be moved from a given cab unless all other TBCs are in the 'stow' position.

41 When the train operator left the train in the Edgware Branch platform, he did not return the TBC to the 'stow' position since he knew that the other train operator would be driving the train from the same cab.

42 He passed the train operator from the other train in the passage between the Edgware platform and the concourse at the foot of the escalators where they acknowledged each other.

43 The train operator continued across the concourse and walked along the right hand side of the passage leading from the concourse at the bottom of the escalators to the High Barnet Branch platform.

Events during the incident

44 CCTV images show that the train operator did not hesitate when he reached the High Barnet Branch platform, but turned right immediately. This led him towards the back of the train.

45 At Camden Town in the northbound direction a train to Edgware departs to the right while one to High Barnet departs to the left as seen from the platform. Simply facing the train will not indicate to an operator which end is the front. There are no signs indicating the direction of travel visible from the platform when a train is standing at the platform.

46 A repeater signal is normally mounted on or close to the headwall at the leading end of tube platforms. There is no equivalent signal on the headwall at the rear of the platform. The High Barnet Branch platform at Camden Town has this arrangement.

47 A group of passengers briefly conversed with the train operator as he walked along the platform. Although he did turn round when talking to them, they did not cause him to alter his overall direction.

48 The south end of the platform is similar to the end of many other tube station platforms. It is narrow, the last passenger doors do not open and the rear cab of a northbound train may project a short distance into the tunnel. Similar situations arise across the tube network.

49 The north end of the platform is wider than the south end, though not to the full width, and it has a repeater signal. When a train is standing at the platform all the passenger doors on the leading car are opened.

50 On reaching the south end of the platform the train operator entered the train and put the south end cab into operation. This included re-identifying the train as train 042.

51 CCTV images of the platform appear automatically when the cab is activated. At any given platform the images presented to the train operator are the same for that platform regardless of which cab is in use. They give exactly the same indication in the rear cab as in the leading cab.

Figure 3: The image displayed by the CCTV

52 One of the images included the headwall at the front end of the platform. The repeater signal appeared in that image and was, correctly, exhibiting a 'proceed' aspect. The train operator noted this and took it as confirmation that he was authorised to proceed.

53 Once he had entered the cab, there were further indications to the train operator that he was at the wrong end of the train.

54 A signal is placed in the tunnel at the departure end of all platforms on the Northern Line. There is no such signal at the south end of the High Barnet Branch platform.

55 A red board with the word 'stop' in white letters is exhibited on the left of the tunnel wall a short distance into the tunnel at the south end of the platform. It is not specifically illuminated, but it would be reflected in the trains headlights and be visible to a person seated in the train operator's seat by the train's headlights when the train is ready to be moved as shown in Figure 4.

56 When starting away the train operator is responsible for observing the platform from which his train is departing through the CCTV monitor. Once the *starting signal* has been passed, there is no immediate need to observe the tunnel continuously as the train leaves the station and some observation must be kept on the platform until the train has cleared it completely.

Figure 4: The forward view from the cab at the south end (left) and the north end (right) of a train standing at the Barnet Branch platform at Camden Town

57 The operator on train 042 in the High Barnet platform observed the repeater at the north end of the platform showing a 'proceed' aspect in the CCTV, closed the train doors and moved the train away from the platform in a southwards direction towards the junctions.

58 A train moving southwards from the High Barnet Branch northbound platform encounters a left hand curve. The train operator is seated on the left hand side of the cab. Although the junctions are illuminated, the light cannot be seen from the train operator's position until the train has moved away from the platform, but it comes into view very soon after entering the tunnel.

59 While the stock and crew change was taking place, the following train destined for the High Barnet Branch, train 043, reached the junctions at Camden Town. It stopped at Signal E9b, which was displaying a 'stop' aspect because the High Barnet Branch platform was occupied, 128 metres south of the end of the platform.

60 On becoming aware of the presence of train 043, the operator of train 042 brought it to a stand. The trains were about 20 metres apart. No collision occurred.

Events following the incident

61 The operator of train 042 called the service controller and explained that he had driven the train the wrong way. The service controller instructed him to move to the cab at the north end of the train and wait for a member of the Camden Town station staff to contact him.

62 The service controller then made a '*Code Red*' call to trains in the Camden Town area instructing them to stop until authorised to move. He then called the operator of train 043 with instructions to continue to East Finchley for relief from duty to allow recovery from any potential subsequent reaction to the event.

63 On reaching the north end of his train, which was at the south end of the platform, the operator of train 042 made visual contact with a member of Camden Town station staff who signalled to him that he could move his train back into the platform. He did so and received another call from the service controller instructing him to tell the passengers to leave the train and then to drive it empty to East Finchley.

64 At East Finchley the operator of train 042 was relieved of duty for interview and screening for the presence of drugs or alcohol, in accordance with LUL routine practice after an incident.

65 Train 042 was taken to Highgate depot for extraction of data from the Train Data Recorder.

66 Train 043 ran in normal service following train 042.

Consequences of the incident

67 Apart from temporary operational disruption to the Northern Line, there were no consequences of the incident.

Situation and condition of the train operator

68 There was no evidence that the train operator was fatigued. He had been on duty some 3½ hours and was approaching a meal break at the time of the incident. He did not consider that he had any particular matter on his mind to cause him to lose concentration. Tests after the incident did not reveal the presence of drugs or alcohol.

Data obtained from the Train Data Recorder (TDR)

69 Data has been obtained from the TDR on the train which made the wrong direction move.

70 It shows the train stood in the Barnet Branch platform for 3 minutes 38 seconds and a further 26 seconds elapsed after the train operator activated the cab before closing the doors.

71 Data on the actual movement in the wrong direction is tabulated below:

Action	Duration	Total Time	Distance	Total Distance
Power	18 seconds	18 seconds	61 m	61 m
Coast	4.4 seconds	22.4 seconds	28.9 m	89.9 m
Brake	0.3 seconds	22.7 seconds	1.9 m	91.8 m
Emergency Brake	5.3 seconds	28 seconds	17.1 m	108.9 m

72 The maximum speed achieved during the wrong direction move was 23.7 km/h.

73 The cab at the south end was active for a further 2 minutes 11 seconds after the train had stopped.

74 The *service brake* was applied for 0.3 seconds before the emergency brake. This very short duration represents the time taken for the controller to be moved through the service brake position as part of an emergency brake application. The overall deceleration of the train was 1.17 m/s². This indicates that the brake was functioning correctly.

Previous movements of trains in the wrong direction

Kings Cross, 12 March 1990

75 A reversal was required owing to line closure on the Piccadilly Line west of Kings Cross due to fire brigade attendance at Covent Garden.

76 A train operator became distracted and convinced that the reversing crossover was at the eastern end of the station when it is actually at the western end. He drove his train eastwards to where he thought the crossover was. The operator of a stationary westbound train cut off the traction current, causing the train operator moving in the wrong direction to make an emergency brake application.

77 The train operator missed possible triggers similar to those at Camden Town as described in paragraphs 48 to 55. The incident occurred 4¾ hours into the shift and 20 minutes after the train operator had taken his meal break.

High Street Kensington, 1 January 1997

78 A train was to be reversed from one track to the other following out of course withdrawal from service. This required a forward movement towards Gloucester Road/Earls Court in the open before setting back onto the other track. The train operator left his equipment in the leading cab and walked back the length of the train detraining passengers. On reaching the rear cab he entered it and drove the train in the wrong direction towards Notting Hill Gate.

79 The train operator missed possible triggers such as the lack of a controlling signal at the end of the platform. Before detraining passengers, he clearly realised that he had to drive forward as he left equipment in the leading cab. Disorientation appeared to occur while he was on the platform.

Gunnersbury, 8 March 2002

80 Following signalling difficulties east of Acton Town on the District Line, an eastbound train was required to reverse at Gunnersbury. This required a forward movement to the crossover east of the station. The train operator detrained passengers, entered the rear cab and drove westwards along the eastbound track, passing a *fixed red signal* at the west end of the platform. He stopped his train on seeing a train standing south of Kew river bridge.

81 The operator apparently thought there was a crossover between Gunnersbury and Kew Gardens. His move involved passing a fixed red signal, the first instance of this in his career. He had been involved with detraining passengers while receiving instructions from signallers. The incident occurred at approximately 10:00 hrs and he had been on duty since 04:49 hrs.

Finchley Central, 4 July 2002

82 A train operator was required to make a timetabled 'rusty rail' move. These moves are made to keep little used rails clear of rust. After arriving southbound from Mill Hill East, the train was to be emptied, moved forwards into a siding south of the station and then back, through a northbound platform, to a siding at the north end. From there it was to travel southwards to Highgate Depot.

83 The train operator detrained passengers on arrival, entered the north end cab and drove northwards on the southbound track. The incident report does not make it clear why he stopped the train, but it was some 56 metres from a stationary southbound train.

84 The incident occurred at approximately 20:45 hrs. The train operator had been on duty since approximately 15:30 hrs and had taken a meal break from 18:30 hrs for about 50 minutes. The signal at the south end of the platform was correctly clear for the move. The train operator noted the repeater for this signal as being clear and took it as his authority to move northwards in the absence of a *shunt signal* to authorise the move.

Common features

85 In each of these incidents, the train operator found himself on a station platform unexpectedly and each train was required to move forward, out of the platform where it had stopped, before reversing. The train operators entered cabs at the wrong end of the trains despite possible triggers, the principal ones being either a signal at 'danger' or the lack of a platform starting signal, to show them that they had made an error.

Analysis

Identification of the immediate cause

86 The immediate cause of the incident was that the train operator of train 042 entered the wrong cab and drove the train away from Camden Town station in the wrong direction.

Identification of causal and contributory factors

Precursor event

87 The defect in the PTI equipment caused it to fail and to route all trains to the High Barnet branch, regardless of their correct destination, because the service operator was using the 'first come first served' mode of regulation. The operator of train 005, bound for Edgware, accepted the incorrect route.

88 The absence of a written notification relied on the control room staff giving verbal notice at the change of shift to those coming on duty of the prohibition on the use of 'first come first served' mode of operation.

89 Neither of these two errors, the use of an inappropriate mode of regulation and the acceptance of the incorrect route, was individually or in combination unsafe, but both were needed to produce the situation which led to the stock and crew change and are, therefore, contributory factors.

Stock and crew change procedures

90 The procedure specified in the LUL Rule Book when making a stock and crew change is for each train operator to berth their train as if they were leaving it at the end of a journey. This includes placing the TBC in 'stow', as described in paragraph 40.

91 If the train operator who berthed the train in the High Barnet Branch platform had left the TBC in the north end cab away from 'stow', any train operator attempting to move the train using the south end cab would have had to go to the cab at the north end to stow the TBC. It is very likely that in doing so he would have noticed that he had initially gone to the wrong cab and would have corrected the situation.

92 At the time of the incident there was no procedural check that a train operator had entered the correct cab when carrying out a stock and crew change.

Entry to the wrong cab

93 Tube trains are symmetrical in that they can be driven from either end and entered from either side. The side used is entirely dependent on the place where the train is standing. During any shift an operator may well enter from both sides. Tube station platforms may be on either side of the track so that the correct direction of travel may be either to the left or right when facing the train from the platform.

94 It may be that having started the change from the Edgware platform, where the train would have been on the left of a person facing the direction of travel, the train operator subconsciously expected to find the train he was now to board on his left. This would have caused him to turn right.

95 The train operator could have used the presence of the repeater signal on the front headwall to check which end of the train was the front as he entered the platform.

96 The lack of a repeater signal on the rear headwall might have acted as a prompt to the train operator that he was approaching the wrong end of the train. The absence of an item, particularly an illuminated one, is less noticeable to the observer than its presence.

97 Although the train operator turned round when he conversed with a group of passengers, they did not cause him to alter his overall direction and thus did not influence his actions.

98 The train operator's concern to restart the train may well have applied some subconscious pressure to concentrate on moving the train rather than ensuring he went to the correct end.

99 When a train operator replaces another during the course of a train's journey, the operator leaving the train does not normally do so until the operator who is to take over the train reaches the cab which is in use. This prevents unauthorised persons interfering with the cab and ensures that the new operator goes to the appropriate cab. This is not possible during a stock and crew change as one operator has to leave his train first.

100 Train operators are only permitted to leave a train unattended when properly relieved (as described in paragraph 99), after *stabling* a train, in an emergency or under the instruction of an operating official. The service controller took the role of an operating official in instructing the stock and crew change to take place.

101 This produced a situation where train operators were moving unaccompanied between trains at a station which was unfamiliar to at least one of them. This situation was a factor contributory to the incident.

102 This situation was similar to the other incidents described in paragraphs 75 to 85 in that train operators were moving unaccompanied on a station platforms.

Movement of the train in the wrong direction

Preparation to start the train

103 The surroundings and indications to the train operator from within the cab were as they would have been at the north end of the train. The nature and content of the CCTV images were exactly as the train operator expected to see them and included a view of the repeater signal on the north end headwall. They may have confirmed in his mind that he was at the correct end of the train.

104 The London Underground Rule Book (Section 8, paragraph 3.5) requires train operators to follow a series of checks before starting a train from a station platform in service. This requirement includes checking twice at different points in the sequence that 'the station starting signal is clear'. The rule is explicit that it is the station starting signal which must be observed and makes no mention of any repeater signal.

105 That the train operator drove away in the absence of a starting signal indicates that he could not have carried out these checks correctly. This omission is a causal factor in development of the incident.

106 Since the repeater signal exhibits an aspect to indicate that shown by the station starter signal itself, the train operator observed the repeater in the CCTV image and used it to establish that the starting signal was exhibiting a clear aspect. This may explain why the train operator did not also look for the station starting signal which would have been clearly visible to him had he been at the correct end of the train. This was a factor contributory to the incident.

107 There is no evidence that the train operator was aware of the 'stop' board. Had he observed the board, it is unlikely that he would have driven past it without taking other factors into account which would probably have caused him to realise that he had entered the wrong cab. This was a factor contributory to the incident.

Subsequent movement of the train

108 A train operator seated at the leading end of a train standing at the High Barnet Branch platform would have seen only the starting signal. Apart from the lack of such a signal and the presence of the stop board, the view presented to a train operator at the rear end of a train is initially similar.

109 Had a starting signal been present at the south end of the platform, it would have been exhibiting a 'danger' aspect. Any train passing it in that condition would have been stopped by the operation of the associated *train stop*. The absence of such a signal can be regarded as contributory to the incident. While the provision of such a signal is technically feasible, the control of the associated train stop to prevent a northbound train being inappropriately stopped would incur costs disproportionate to the benefit and the RAIB does not recommend it.

110 Once the train had moved about 5 metres it would have passed both the stop board and the point at which a train operator might have expected to observe a starting signal. The requirement to ensure platform safety through observing the CCTV image may have caused the train operator not to look at the tunnel ahead of him while much of the train was still in the platform.

111 The illumination of the junctions can be seen from the platform and it would have come into the view of the train operator very soon after entering the tunnel. Such a light would not be present in the tunnel at the other end and should have acted as an indication that the train was travelling in the wrong direction.

112 The TDR data shows that train was driven for 61 metres and for 18 seconds under power. During that time the train operator must be assumed to have been unaware that he was travelling in the wrong direction. It is commensurate with him concentrating on the CCTV.

113 It is likely that the train operator made an emergency brake application as soon as he realised that he was approaching a stationary train. He allowed the train to coast for 4.4 seconds before applying the brake. Part of this time would have been taken up noting the presence of train 043 and reacting to it, but it is unlikely to have taken this entire time. This may indicate that he was aware of the approach to a junction, where the permitted speed would be restricted, and used coasting to control his speed before he assimilated the implications of the presence of the junction and took evasive action.

Prevention of the movement of the train

114 The Northern Line is not yet equipped with *Automatic Train Operation* (ATO). Had it been in use, it would have prevented any train being unintentionally moved in the wrong direction.

Response to the incident

115 The service controller was concerned to maintain the service on the Northern Line and to minimise the distress and disruption to passengers. To have held trains 042 and 043 at Camden Town while relief train operators were summoned would have prevented the movement of trains northwards on the Charing Cross Branch south of Camden Town.

116 It is usual in accordance with the LUL procedures for train operators to be relieved following an incident.

117 Relief train operators are not available at Camden Town; the nearest train operators would have been at East Finchley or Golders Green. It would have been impossible for an operator to have reached Camden Town from either of these locations in less than 15 minutes after the service controller had decided to obtain one and an overall time of 30 minutes would be more likely.

118 Because of the time it would have taken, it would have been necessary to hold trains in station platforms, effectively suspending the service in the northbound direction and having an adverse effect on the southbound service.

119 Although both train operators were in contact with the service controller, there was no formal face-to-face assessment of the condition of either train operator, nor of the risk of allowing either of them to continue to take their train forward.

120 The decision to allow train 042 to continue empty to East Finchley and to allow the operator of train 043 to drive it in service to the nearest point where relief was available was driven by the need to clear the route promptly and relied on the service controller's experience and judgement. It did not introduce an unacceptable risk arising from the train operators' reaction to the incident as described in paragraphs 121 and 122.

121 The delay to train 042 caused by the incident would have increased the distance between it and the train ahead, reducing the likelihood of a signal displaying a 'danger' aspect being encountered. Had such a signal been encountered, the automatic train stop system would have brought train 042 to a stop before it would have been in collision with another train.

122 Train 043 was delayed at Camden Town while the passengers from train 042 boarded, increasing its distance from train 042. Together with the train stop system, this delay contained the risk of an accident arising from the condition of either train operator adequately.

Conclusions

Immediate cause

123 The immediate cause of the incident was that the operator of train 042 entered the incorrect cab when joining the train and drove the train in the wrong direction from Camden Town station (paragraph 86).

Causal factors

124 The causal factor was:

- the train operator did not carry out the correct procedure for starting a train from a station (paragraph 105).

Contributory factors

125 The following factors were considered to be contributory:

a. the service operator did not know that a defect investigation into the train regulation equipment was in hand and placed the system in an inappropriate mode leading to the inappropriate routing of train 005 (paragraph 89, Recommendation 3);

b. the train operator was not familiar with changing trains at Camden Town (paragraph 101, Recommendations 1 and 4);

c. none of the methods of preventing the train being moved in the wrong direction, neither through the presence of an item of equipment or the use of a specific procedure indicated in this report, nor an independent check that the train operator had entered the correct cab, were in place (paragraphs 92, 109, 114 & Recommendation 2);

d. the CCTV image of the green repeater signal confirmed the train operator's belief that it was safe to proceed (paragraph 106);

e. the train operator did not observe and respond to the stop board (paragraph 107).

Actions reported as already taken or in progress relevant to this report

126 London Underground has issued an Internal Communication to all Northern Line train operators and the control room in connection with stock and crew changes at Camden Town. This requires a train operator involved in a change to advise the service controller of the number of the car being vacated before leaving it. On reaching the train he is to take over, the train operator must confirm the number of the car he has entered to the service controller before starting the train. Additionally, the train operator must confirm to the service controller that the starting signal is visible and that it is displaying a green aspect.

127 London Underground has established that crew changes of this particular nature only occur at Camden Town and has included a module on familiarity with the layout of the station in the training of Northern Line train operators. Information on the station layout has also been issued to current train operators.

128 London Underground has investigated the sources of unreliability of the PTI equipment and implemented modifications to improve its performance.

129 It is planned to equip the Northern Line with ATO equipment in 2012 and this will eliminate the possibility of a train being driven in the wrong direction.

Recommendations

130 The following safety recommendations are made[1]:

Recommendations to address causal and contributory factors

1 LUL should arrange for the installation of suitable signs at Camden Town northbound platforms to warn train operators if they are approaching a south end cab (paragraph 125).

2 LUL should investigate the possibility of either instructing train operators that when they leave a cab to which another train operator will return imminently and from which the train must be driven, the Traction Brake Controller is not to be placed in the 'stow' position, or the provision of some other method of being assured that they have entered the correct cab (paragraphs 125 and 126).

3 LUL should introduce a process to ensure service operators are given written notification, and an entry made in the service controller's log book, if a particular mode of operation is required or prohibited during a technical intervention (paragraph 125).

4 LUL should incorporate a familiarity induction to stations where train operators may be required to change platforms between trains in service into training procedures and ensure that this familiarity is maintained by train operators (paragraphs 125 and 127).

[1] Duty holders, identified in the recommendations, have a general and ongoing obligation to comply with health and safety legislation and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, these recommendations are addressed to ORR (HMRI) to enable them to carry out their duties under regulation 12(2) to:

(a) ensure that recommendations are duly considered and where appropriate acted upon; and

(b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 167 to 171) can be found on RAIB's website at www.raib.gov.uk

Appendices

Glossary of abbreviations and acronyms — Appendix A

ATO	Automatic Train Operation
CCTV	Closed circuit television
LUL	London Underground Limited
PTI	Positive Train Identification
TBC	Traction/Brake Controller
TDR	Train Data Recorder

Glossary of terms — Appendix B

Accept(ed)	Signals indicate to a train operator the route over which the train is to be directed. When a train operator observes the indication and drives the train over that route it is termed 'accepting the route'.
Automatic Train Operation	The automatic movement of trains at controlled speeds, stopping in accordance with signals and at stations without the intervention of the train operator.
Berth	A train is berthed when it is placed in a condition in which it is safe to leave it unattended.
Cab	The compartment at the ends of a train from which it is driven.
Coast	A train coasts when it runs with neither power nor the brakes applied.
Code Red	A call made to train operators instructing them to stop their trains immediately.
First Come First Served	An automatic mode of operation in which the signalling equipment relies on information received from the PTI equipment to direct trains. No account is taken of the timetable and trains are passed in the order in which they reach a junction.
Fixed red signal	A signal which permanently exhibits a 'stop' aspect by showing a red light.
Headwall	The wall at the end of an underground platform at right angles to the track.
Log Book	A bound book in which events and decisions taken by the Service Controller are recorded. When a Service Controller starts duty, entries in the log book are discussed as necessary with the Controller going off duty.
Positive Train Identification	A control system which identifies each train and instructs the signalling equipment where to route it.
Programme Machine	Equipment used to set points automatically on the underground. Each machine contains a programme with the timetable on it so that the points are set in accordance with the timetable.
Push Button	The direct control of the settings of the points at a junction on the London Underground by the regulators without the use of automatic equipment.
Repeater	A signal which indicates the aspect displayed by another signal reached after a train has passed the repeater signal.
Rule Book	The internal publication specifying the duties of railway personnel to ensure the safe and efficient operation of the railway.
Service brake	The position of the controller used during normal, non-emergency, stopping of a train.

Service Controller	The member of staff in overall control of a line, such as the Northern Line, on London Underground.
Service Operator	The member of staff controlling and supervising the movement of trains over a section of route within a line under the direction of the Service Controller.
Shunt signal	A signal which, when exhibiting a proceed aspect, permits a train to be moved past it within the immediate, defined locality.
Stabling	A train is stabled when it is placed out of service, inaccessible to the public and usually with all systems on it switched off.
Starting Signal	The signal at the end of a platform.
Stock and crew change	The exchange of crews and rolling stock between two Trains such that each set of rolling stock assumes the identity of the other Train.
Stow position	The position of the TBC in which it is placed fully inside the arm of the train operator's seat.
Toe	The moving end of the rails at a set of points.
Traction/Brake Controller	A lever mounted in the arm of the train operator's seat which controls the application of power and the brakes.
Train Data Recorder	The equipment on a train which records parameters such as speed, distance run and the positions of controls.
Train Operator	The member of staff responsible for driving the train and opening and closing the exterior doors.
Train stop	A device controlled by the signalling equipment which will automatically stop a train which passes a signal displaying a 'danger' aspect.
Train *XXX*	The unique identity of a particular train in the timetable indicated by the three digit number. The identity indicates the starting time, route and destination of the train.

This page is left intentionally blank

This page is left intentionally blank

This page is left intentionally blank

This report is published by the Rail Accident Investigation Branch,
Department for Transport.

Any enquiries about this publication should be sent to:

RAIB
The Wharf
Stores Road
Derby UK
DE21 4BA

Telephone: 01332 253300
Fax: 01332 253301
Email: enquiries@raib.gov.uk
Website: www.raib.gov.uk