RAIB

Rail Accident Investigation Branch

Rail Accident Report

Fatal accident at Stratford London Underground station
26 December 2023

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This investigation was carried out in accordance with:

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

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Preface

The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability. Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

RAIB's findings are based on its own evaluation of the evidence that was available at the time of the investigation and are intended to explain what happened, and why, in a fair and unbiased manner.

Where RAIB has described a factor as being linked to cause and the term is unqualified, this means that RAIB has satisfied itself that the evidence supports both the presence of the factor and its direct relevance to the causation of the accident or incident that is being investigated. However, where RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, RAIB will qualify its findings by use of words such as 'probable' or 'possible', as appropriate. Where there is more than one potential explanation RAIB may describe one factor as being 'more' or 'less' likely than the other.

In some cases factors are described as 'underlying'. Such factors are also relevant to the causation of the accident or incident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, words such as 'probable' or 'possible' can also be used to qualify 'underlying factor'.

Use of the word 'probable' means that, although it is considered highly likely that the factor applied, some small element of uncertainty remains. Use of the word 'possible' means that, although there is some evidence that supports this factor, there remains a more significant degree of uncertainty.

An 'observation' is a safety issue discovered as part of the investigation that is not considered to be causal or underlying to the accident or incident being investigated, but does deserve scrutiny because of a perceived potential for safety learning.

The above terms are intended to assist readers' interpretation of the report, and to provide suitable explanations where uncertainty remains. The report should therefore be interpreted as the view of RAIB, expressed with the sole purpose of improving railway safety.

Any information about casualties is based on figures provided to RAIB from various sources. Considerations of personal privacy may mean that not all of the actual effects of the event are recorded in the report. RAIB recognises that sudden unexpected events can have both short- and long-term consequences for the physical and/or mental health of people who were involved, both directly and indirectly, in what happened.

RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of any inquest or fatal accident inquiry, and all other investigations, including those carried out by the safety authority, police or railway industry.

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Summary

At around 13:57 on 26 December 2023, a passenger alighted from a London Underground Jubilee line train at Stratford station. The passenger then sat on a platform bench, opposite the point where they left the train. At around 14:45, the passenger stood up, but immediately stumbled forwards and fell from the platform onto the adjacent track. Unable to get to a position of safety, the passenger lay on the track undiscovered for around 5 minutes before being struck by an arriving train, which then stopped normally in the platform.

The presence of the passenger remained unknown and a further three inbound trains entered the terminal platform and went through the location where the passenger was lying. The passenger was fatally injured.

The passenger fell at a time when there were no other passengers or staff present on the platform and there was no intervention made to prevent the first train from arriving. RAIB found that the operator of the first train did not see the passenger on the track ahead of the train as it arrived at the platform. This was possibly because their level of attention was reduced due to the use of automatic train operation. The operator may also have been distracted by the presence of another operator who was standing on the platform as the first train arrived at the station.

The consequences of the accident were made more severe because the operator of the second inbound train to arrive at the platform also did not see the passenger, while the operator of the third inbound train saw something when they were arriving at the platform, but did not recognise what they saw as being a person. The fourth inbound train was not stopped by a customer service assistant who was present on the platform when it was entering the station, even though the assistant was by now aware that a person was on the track. Although the operator of the fourth inbound train had independently recognised that there was a person on the track, they did not stop their train. The train operators working the trains in the outbound direction were not aware of the passenger because the passenger was underneath their respective trains before they departed.

RAIB's investigation concluded that the repetitive nature of the task under automatic train operation may lead to a state of underload, resulting in the attentional capacity of train operators being diminished. This can increase the likelihood of effects on performance such as reduced alertness or distraction. RAIB also found that at terminus stations some train operators are getting ready to leave their train before it has stopped, meaning they may not be focusing on tasks relating to the operation of the train.

Although London Underground Limited had quantified the risk of a passenger falling from the platform and being struck by a train at Stratford station, the risk controls adopted were not sufficiently effective in this instance to prevent the accident from occurring.

RAIB has made two recommendations, both addressed to London Underground Limited. The first relates to considering the use of technology that can detect if a passenger is in a dangerous position and intervene or warn as necessary to stop an approaching or departing train. The second concerns reviewing the environmental, organisational and job factors related to operating trains in automatic train operation mode to understand how underload may affect train operators. Additionally, a learning point has been identified reminding staff of the importance of using safety-critical communications when reporting and responding to incidents.

Introduction

Definitions

1 Metric units are used in this report, in accordance with normal practice on London Underground Limited.

2 The report contains abbreviations and acronyms, which are explained in appendix A. Sources of evidence used in the investigation are listed in appendix B.

The accident

Summary of the accident

3 At 13:56:53 on 26 December 2023, a passenger alighted from a London Underground Jubilee line train at Stratford station and sat down on a bench on platform 13, opposite the point of alighting.

4 Forty-eight minutes later, at around 14:45, the passenger stood up, but immediately stumbled forwards, and fell from the platform onto the adjacent track. They lay on the track undiscovered for around 5 minutes before being struck by an inbound (eastbound) arriving train, which then stopped normally in the platform. As Stratford is a terminus station, the train later departed as an outbound (westbound) service.

5 The presence of the passenger remained unknown and a further two inbound trains entered the platform and went through the location where the passenger was lying. These trains also formed outbound (westbound) services, which meant that these trains also passed through this point in the opposite direction as they departed.

6 At 15:16, London Underground staff became aware that the passenger was on the track adjacent to platform 13 and the alarm was raised. However, before trains could be stopped, a fourth inbound train entered the platform and went through the location where the passenger was lying.

7 The passenger was fatally injured in the accident.

Context

Location

8 The accident occurred at Stratford station, in east London (figure 1). Stratford station is used by London Underground, London Overground, Docklands Light Railway, the Elizabeth line, and mainline railway services.

9 Stratford station is an above-ground terminus station on the London Underground system, situated at the eastern end of the Jubilee line (figure 1). The Jubilee line serves 27 stations between Stanmore and Stratford. Trains on the Jubilee line are powered using a nominal 630 Volt DC (direct current) rail electrification system. This uses two conductor rails, one situated in the middle of the track and one on the side furthest from station platforms.

10 Inbound trains approach from the west with their speed controlled automatically, but normally at just below 30 km/h, before entering platform 13 and stopping with the leading cab at the east end of the platform. The Jubilee line uses platforms 13, 14 and 15 at Stratford station (figure 2). During normal operations, platform 13 is used only during the early morning, and is closed off from around 07:20 with metal gates to prevent passenger access. For the rest of the day only platforms 14 and 15 are used.

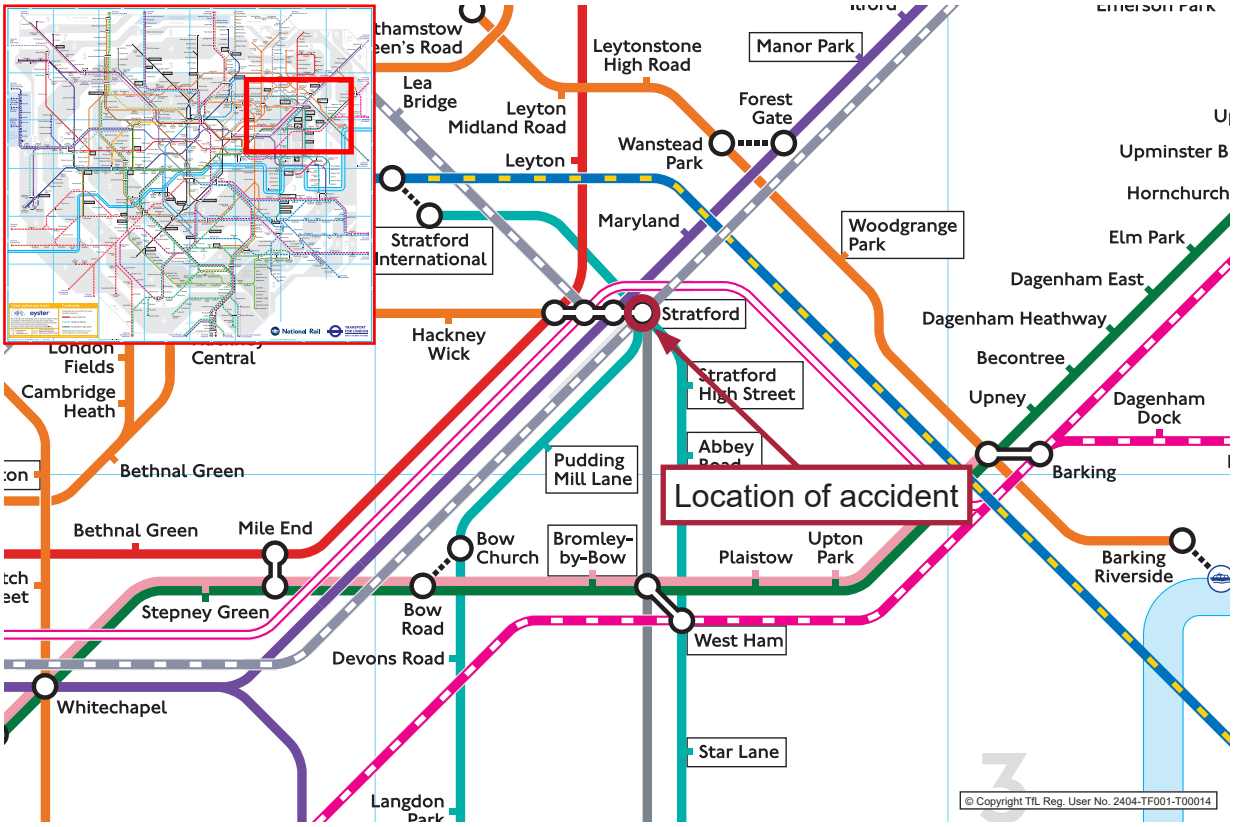

Figure 1: Map of the London Underground showing location of the accident at Stratford station.

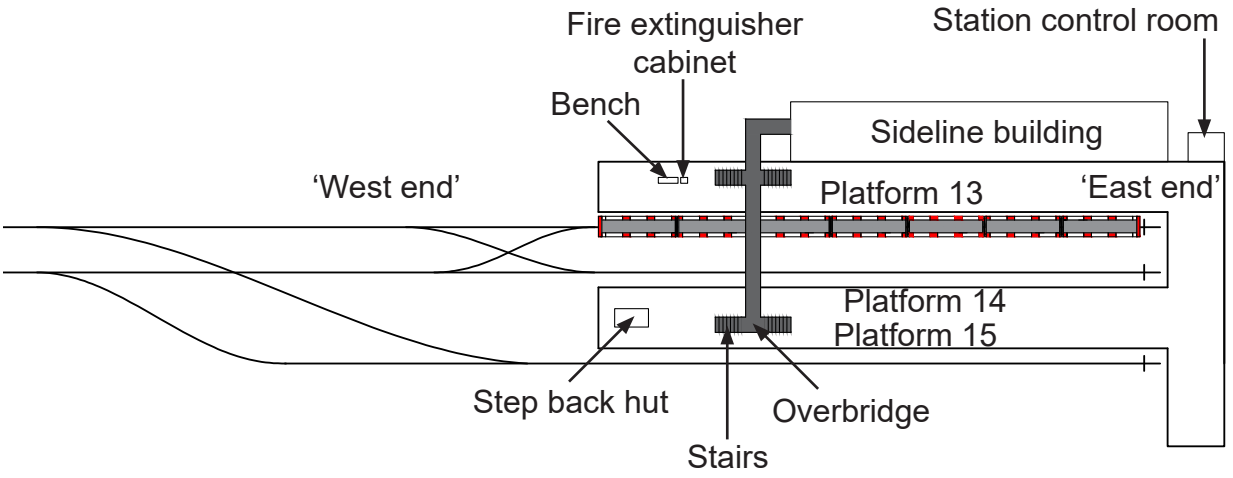

Figure 2: Diagram of Stratford station showing the Jubilee line platform west (outbound) and east (inbound) end. Not to scale and not all features shown.

11 When operating the normal timetable, a process called 'stepping back' is used for trains terminating at Stratford. This means that when a train arrives at a platform, there is already a train operator (TO) waiting to take that train out again in the opposite direction. The incoming TO will then wait at the station in readiness to take the next train. This increases capacity on the line and ensures punctual departures. This operation is co-ordinated by a trains manager who is usually in the 'step back hut' located in the space between platforms 14 and 15 (figure 2).

12 Stepping back was not being used on 26 December 2023 as a special timetable with a less frequent service was in place which used all three Jubilee line platforms. The TOs involved in the accident were either ending their shifts at Stratford, having a meal break there, or taking the same train back out again. This was not being co-ordinated by the trains manager so the step back hut was not in use.

13 A station control room is located at Stratford station, on the concourse, at the east (terminal) end of platform 13 (figure 2). This provides a base for the customer service staff and also interfaces with Jubilee line control, which is based at Neasden (see paragraph 30).

14 There are 384 closed-circuit television (CCTV) cameras at Stratford station, six of which are on the Jubilee line platforms. The images from these cameras are available to staff in the station control room and Jubilee line control. There is no requirement for station control room staff to monitor CCTV images and the system will normally be set to cycle through each of the relevant camera views on rotation. Staff would normally stop the automatic cycling of camera views in response to a specific need, such as a report of an incident.

15 A building runs the length of platform 13, which houses staff facilities. This is known as the Sideline building and is where most TOs using platform 13 would go for their personal needs breaks.

16 There is a recess under the face of platform 13 intended to provide an emergency refuge for a person to move into should they fall onto the track.

Organisations involved

17 London Underground Limited (LUL), a wholly owned subsidiary of Transport for London (TfL), is the operator of Jubilee line trains and owner and maintainer of the infrastructure. It employs all the staff involved in this accident.

18 LUL freely co-operated with the investigation.

Trains involved

19 Four trains were involved in the accident. Three of these trains formed both inbound and outbound services from platform 13, while the fourth only made an inbound movement due to services being stopped. Table 1 provides details of the trains involved, their order and direction and their operators.

Train reference	Order of train and movement (inbound or outbound)	Train Operator (TO)
1	First inbound	TO1
1	First outbound	TO2
2	Second inbound	TO3
2	Second outbound	TO4
3	Third inbound	TO5
3	Third outbound	TO5
4	Fourth inbound	TO6

Table 1: List of the trains and operators involved and the order and direction of their movement after the passenger fell onto the track.

20 All the trains involved in the accident were formed of 7-car, 1996 tube stock, which is not fitted with forward-facing CCTV. After the accident, no defects were found with any of the trains involved. There were no reports from any of the TOs involved of issues with the trains that may have caused a distraction or reduced their ability to see the view ahead through the windscreen.

21 On the Jubilee line trains are normally operated using automatic train operation (ATO). ATO automatically accelerates and brakes the train for signals and station stops and so controls the train's speed. In stations, the TO is responsible for opening and closing the train's doors and initiating the despatch of the train (figure 3). Between stations, LUL train operator competence management system (CMS) guidance states that the TO should '*maintain cab discipline, vigilance and alertness throughout the journey*' and '*respond appropriately to in-cab indications, people on the line*…'. ATO helps minimise the gaps between trains and provides the capability for the Jubilee line to operate up to 30 trains per hour during peak times. It is possible for TOs to take control and drive the trains manually, but doing so means it is not possible to operate such an intensive service. For this reason, manual driving is normally only done at weekends.

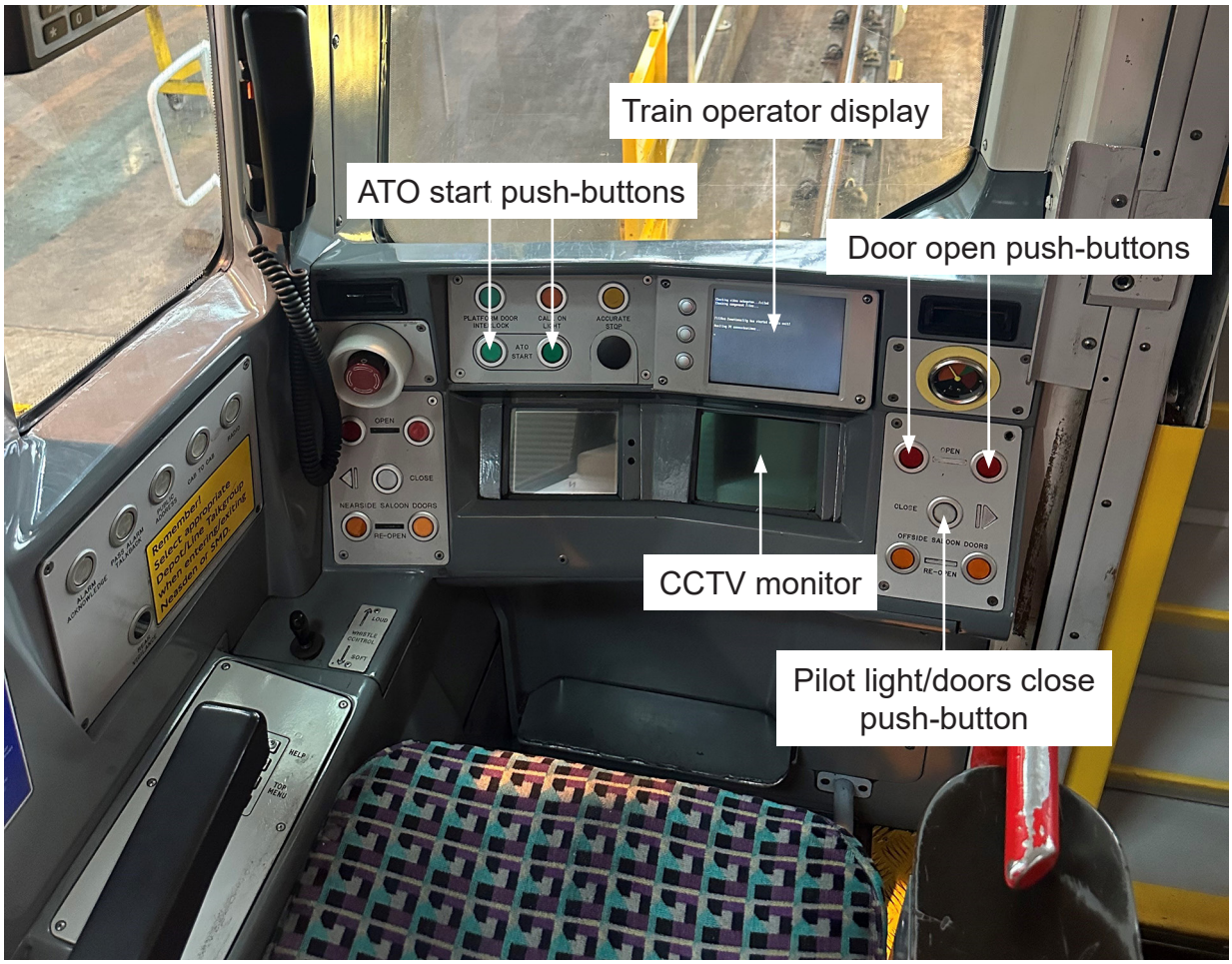

Figure 3: Overview of the ATO system and equipment.

Persons involved

22 The fatally injured passenger was 72-year-old Brian Mitchell. He had been visiting friends and had travelled using TfL buses earlier in the day, before entering the LUL network at Stanmore station (see paragraph 33).

23 The operator of train 1 on the first inbound service to enter platform 13 after the passenger fell onto the track (TO1) had been a TO for 10 years at the time of the accident. They have worked on the Jubilee line since 2017 and had previously worked as a TO on the Piccadilly line from 2013 to 2017. All relevant competence assessments were up to date.

24 The operator of train 1 on the first outbound service to leave the platform after this point (TO2) has worked for LUL since 2007 and has been a TO on the Jubilee line since 2014. All relevant competence assessments were up to date.

25 The operator of train 2 on the second inbound service (TO3) started working for LUL in 2018 as a night tube TO and has been a TO on the Jubilee line since 2020. All relevant competence assessments were up to date.

26 The operator of train 2 on the outbound service (TO4) has worked for LUL since 1995 and has been a TO since 1996. They have been a TO on the Jubilee line since 2009. All relevant competence assessments were up to date.

27 The operator of train 3 on the third inbound and outbound service (TO5) has worked for LUL since 2002 and has been a TO since 2007. All relevant competence assessments were up to date.

28 The operator of train 4 on the fourth inbound service (TO6) has worked for LUL since 2012 and has been a TO since 2013. All relevant competence assessments were up to date.

29 There were a number of members of LUL station staff on duty at Stratford station on the day of the accident. Those directly involved were:

a. The customer service manager (CSM). The CSM is responsible for the running of the station and reports to the area manager. The CSM involved in this accident joined LUL in 2002 and has worked as a CSM at Stratford since 2016.

b. The customer service supervisor (CSS). The CSS is responsible for managing the customer service assistants (CSAs) and making sure they have undertaken their duties. CSSs support the CSM to manage the station effectively and are generally based in the station control room. The CSS involved in this accident joined LUL in 2002 and has worked as a CSS since 2015.

c. CSAs are responsible for assisting passengers and carrying out station security checks. There are two grades of CSA in LUL, CSA1 and CSA2. The CSA1 grade has a higher level of training and is permitted to carry out safety-critical tasks, which the CSA2 grade is not. Both CSA1 and CSA2 grades report to a CSS. There were two CSAs involved in this accident:

   i. A CSA1 (CSA1) carried out the station check on the day of the accident at 14:00 and had worked as a CSA1 at Stratford since 2015 on a part-time basis.

   ii. A CSA2 (CSA2) was sent to check the platform after a report of something on the track. CSA2 started working for LUL as a TO in 2016 and had been redeployed to the role of CSA2 in 2023 for medical reasons.

30 The service controller involved in the accident was based at the Jubilee line control centre located at Neasden depot. A service controller is responsible for managing the passage of trains and responding to accidents and incidents.

External circumstances

31 The accident occurred during daylight and the weather was dry and cool with a temperature of 6°C to 8°C. It was overcast with no bright sunshine or glare, providing clear visibility. The station was busy intermittently, and all three Jubilee line platforms were being used, so there was regular train noise which may have played a role in the accident (see paragraph 68).

The sequence of events

Events preceding the accident

32 TO1's shift started at 07:37 and included a meal break at Stratford which started at 11:36. After the break, TO1 took over train 1 at 12:39, which they worked to Stanmore and back towards Stratford.

33 The passenger entered the London Underground network at Stanmore station at 12:54 and, some time after that, boarded an eastbound Jubilee line train to Stratford. This train arrived at Stratford at 13:55 where the passenger got off and sat on a bench opposite the doors from which they alighted, towards the west end of the platform, approximately 10 metres from the platform end barrier. The passenger placed a bag on the floor in front of them (figure 4). CCTV images show that the passenger was wearing a dark coloured coat, a dark coloured hat and dark trousers, with a lighter coloured shirt partially visible under their coat.

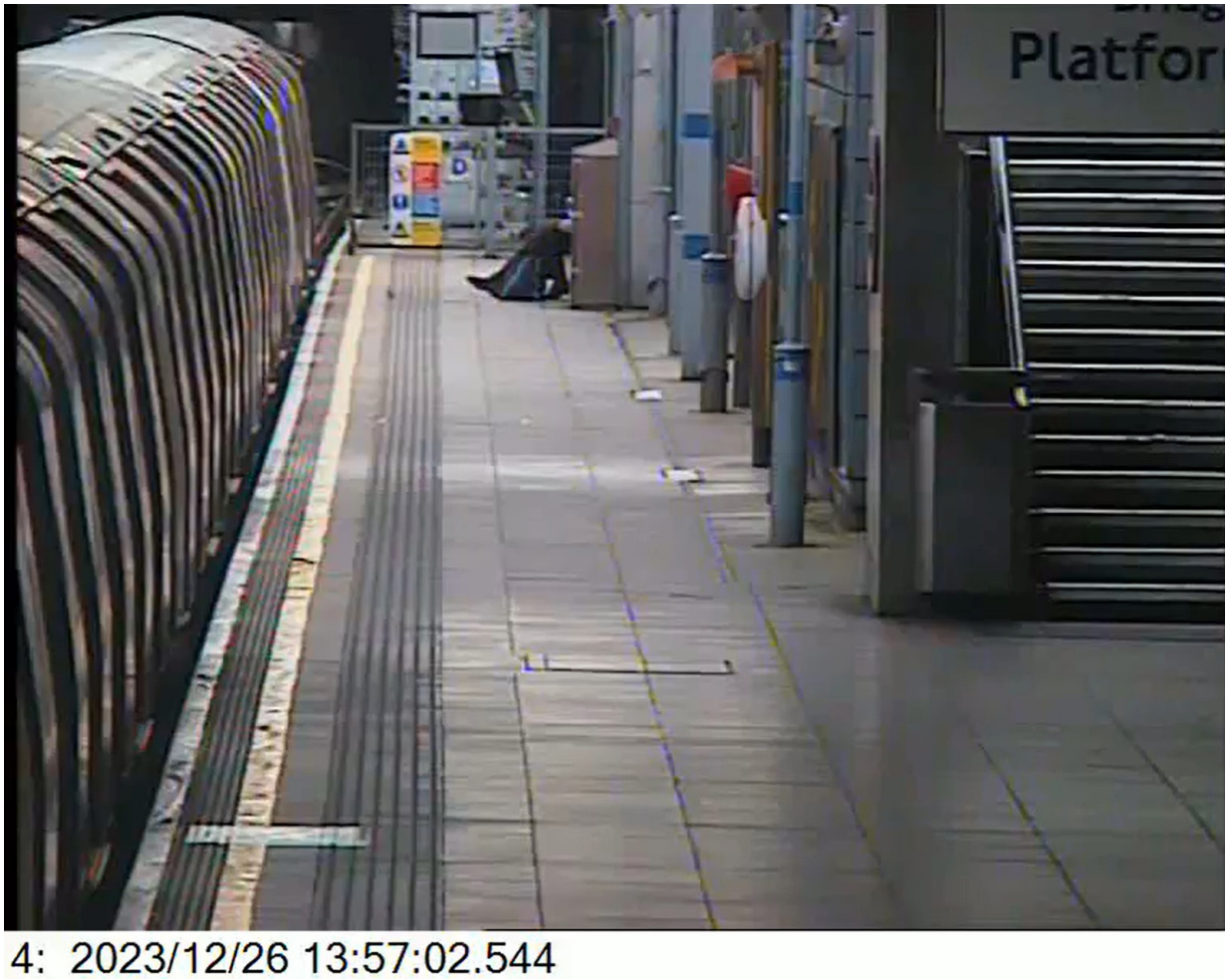

Figure 4: CCTV image of the passenger sat on the bench (courtesy of LUL).

34 Over the next 48 minutes, the passenger remained seated on the bench. CCTV footage shows that the passenger did not interact with anyone else on the platform, and, while remaining seated, can be seen to be moving throughout. During this time four trains arrived at and departed from platform 13. The TO, who was taking one of these trains out at 14:40, later remembered seeing the passenger sitting on the bench but stated that they did not think this was unusual. At 14:44, a train arrived at platform 14, opposite platform 13 where the passenger was sitting. This is discussed further in paragraph 62.

Events during the accident

35 At 14:44:54, station CCTV shows that the passenger stood up from sitting on the bench and immediately stumbled forward, falling a distance of around 0.7 metres from the platform surface and onto the track. The bag remained on the platform in front of the bench.

36 Between approximately 14:45 and 14:46, station CCTV images show the passenger sitting up and making attempts to get back onto the platform. They then lie down on the track, parallel to the rails, on the part of the track between the platform and the nearest running rail (figure 5).

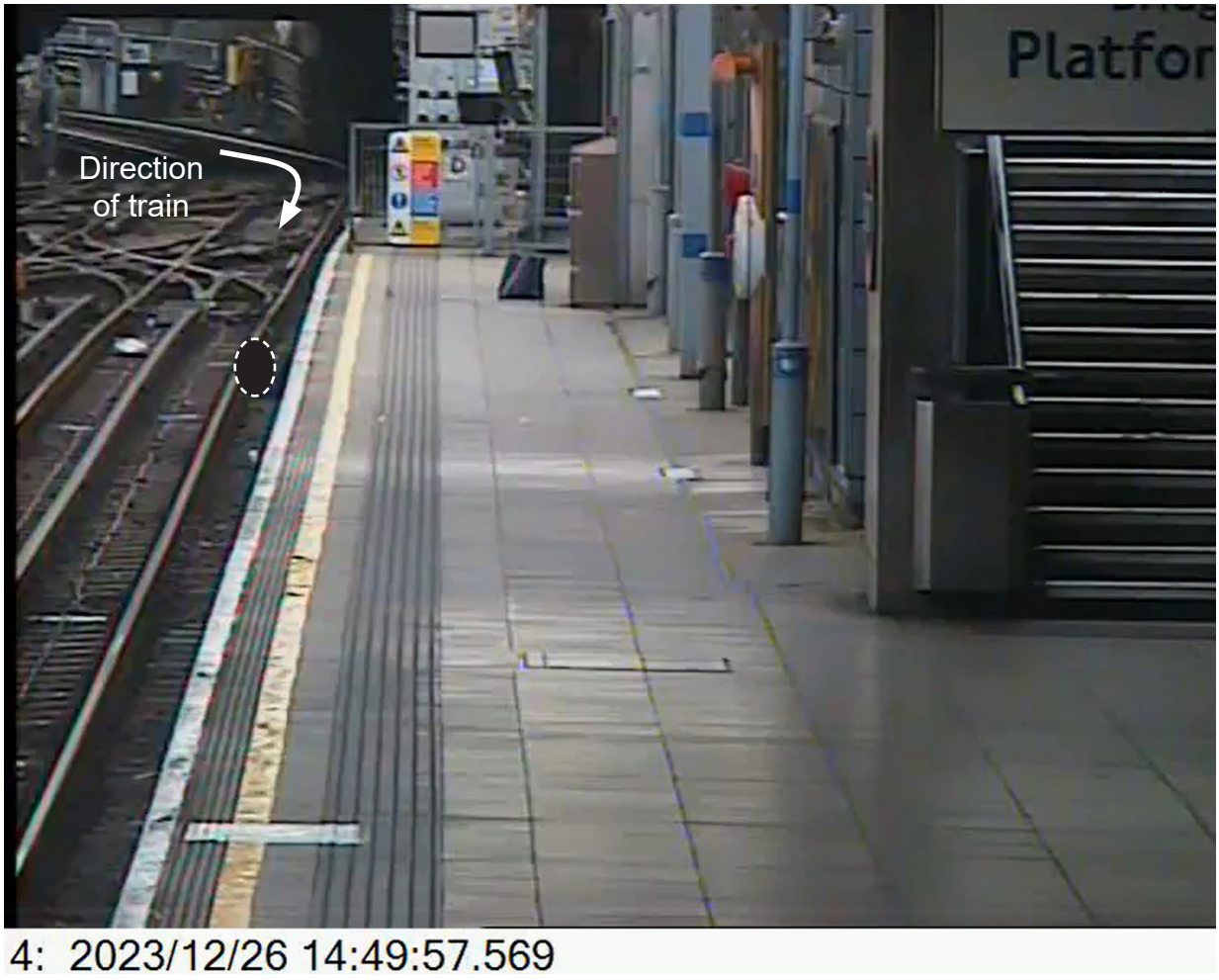

Figure 5: CCTV image of the passenger's position on the track, with an oval outlined in white depicting location of the passenger (courtesy of LUL, with RAIB annotations).

37 At 14:50, TO2 walked past the passenger's bag while walking along platform 13 in readiness for the inbound arrival of train 1, which they were to take over and operate on its outbound journey. TO2 walked straight towards the bag and looked into it as part of applying TfL's standard procedure for dealing with unattended property, known as the HOT procedure.[1] CCTV footage shows that TO2 did not look towards the track, and they later stated that they were unaware of the passenger's presence and did not hear anything unusual. Around this time, the train in platform 14 started to depart on its outbound journey which might have masked any noise the passenger might have been making.

38 Train 1 approached platform 13 inbound at around 30 km/h. CCTV images indicate that, as it did so, the passenger remained on the track, lying between the platform and the running rail nearest to the platform. Part of the passenger's upper body and head were on or very close to this running rail. At 14:50:31, approximately 5½ minutes after they fell from the platform, CCTV images show that the passenger was struck by train 1 as it travelled into platform 13. Train 1 stopped in its normal position in platform 13 and TO1 then exited the cab at the east end of the platform and booked off duty, as their shift had ended. The stopping position of the train meant that the passenger was underneath the seventh car, at the rear, and not visible on CCTV images or to anyone on platforms 13 or 14.

39 TO2 then entered the cab at the west end of platform 13 to prepare train 1 for its outbound journey. TO2 used the train's radio to report the bag on platform 13 to Jubilee line control at 14:54. The train subsequently departed platform 13 on its outbound journey at 14:55 and in doing so passed through the location on the track where the passenger was lying.

40 Following the departure of this train, the passenger again became visible on CCTV. No discernible further movement of the passenger can be seen from this point onwards on the station CCTV footage examined by RAIB.

Events following the accident

41 At 14:56, the CSM and TO4 (who was due to take over train 2 and operate it outbound from platform 13) can be seen on the station CCTV walking towards the passenger's bag. The CSM looks into the bag, having been sent to collect it as lost property, following the report by TO2 to Jubilee line control. Around this time train 2, operated by TO3, approached platform 13 inbound. As it did so, the CSM acknowledged the approaching train by raising an arm. Train 2 went through the location where the passenger was lying at 14:56:53. By this time, the CSM had retrieved the passenger's bag and was walking back along the platform with it. Neither the CSM nor TO4 reported seeing or hearing anything unusual.

[1] The HOT procedure is a security protocol used to evaluate unattended items. H: is the item hidden or deliberately concealed? O: is the item obviously suspicious? T: is the item typical for the location?

42 Train 2 stopped in its normal position in platform 13 at 14:57:17. TO4 can be seen boarding the train around 20 seconds later. The passenger was again located underneath the train in the platform and so was not visible to those on the platform or on CCTV systems. Around 7 minutes later at 15:03:52, train 2, now operated by TO4, started its outbound journey, and again went through the location on the track where the passenger was lying. TO4 did not report seeing, hearing, or feeling anything unusual on departing from the platform.

43 Train 3, operated by TO5, travelled inbound through the location where the passenger was lying and stopped in its normal position in platform 13 at 15:05. TO5 left the cab at the east end of the platform and entered a staff area for a personal needs break. TO5 was booked to operate train 3 on its outbound journey but, before doing so, called Jubilee line control at 15:11 to report seeing an inflatable doll when arriving at the platform. TO5 can be seen on the platform CCTV images at 15:12 looking down between the train and the platform while on the phone to Jubilee line control. TO5 stated that, while talking to Jubilee line control, they were checking to see if anything was under the train but saw nothing unusual. CCTV images show they were not close to where the passenger was lying at this time. TO5 then checked the track area ahead of the west end of the train before entering the driving cab and preparing train 3 for its outbound journey. Train 3 departed platform 13 at 15:14.

44 Jubilee line control contacted the CSS at Stratford to pass on the report from TO5. The CSS asked CSA2, who was in the station control room at the time the call was taken, to go to platform 13 to investigate. CSA2 went to the platform and at 15:14:14 made a radio call to the CSS in the station control room to report that they couldn't see anything. The CSS selected the CCTV camera that viewed the whole length of platform 13 and noticed that CSA2 was not in the correct place and so instructed them to walk the whole length of the platform.

45 CSA2 can be seen on CCTV footage at 15:15 walking along the platform and looking onto the track from the platform edge. CSA2 then used a radio at 15:15:55 to call the CSS and report a person on the track. At this point, the terminology used by CSA2 to describe the accident caused confusion for the CSS, and it took the CSS longer to understand what was happening. Once they understood the situation, the CSS made a call to the CSM on duty at the time to report it.

46 The CSS then also made a call to the Jubilee line control emergency line at 15:16 to report that a person was on the track. The Jubilee line controller arranged for trains to be stopped and for the emergency services to be called.

47 At around the same time, and before trains were able to be stopped, train 4 approached platform 13 inbound. This train was operated by TO6. On CCTV footage, CSA2 can be seen standing on the platform with their back to the approaching train and talking on a handheld radio. The train went through where the passenger was located at 15:16:45 and then stopped in its normal position in platform 13 at 15:17:09.

48 Other LUL staff then arrived on the platform, including the CSM. At 15:21 the traction current was confirmed to be switched off. CCTV footage shows the first responding unit from the emergency services to attend were officers from the British Transport Police, who arrived on platform 13 at 15:23. They were followed by the London Fire Brigade, which arrived on the platform at 15:28, LUL's Emergency Response Unit, which arrived at 15:32, and the London Ambulance Service, which arrived at 15:39.

Analysis

Identification of the immediate cause

49 The passenger had fallen from the platform and was lying on the adjacent track when they were struck by train 1.

50 The CCTV camera covering platform 13 recorded the passenger falling onto the track. As train 1 approached the platform inbound, CCTV images indicate that the passenger remained on the track with their upper body and head on or very close to the running rail nearest the platform. Approximately 5½ minutes after they fell from the platform, CCTV images show that the passenger was struck by train 1 as it travelled into platform 13 (paragraphs 35 to 38).

51 Following the departure of train 1 outbound, the passenger again became visible on CCTV. No discernible further movement of the passenger can be seen on the station CCTV footage following the departure of train 1 (paragraph 40).

Identification of causal factors

52 The accident occurred due to a combination of the following causal factors:

a. The passenger fell from the platform onto the track and was unable to reach a position of safety after falling (paragraph 53).

b. There was no intervention that prevented train 1 arriving at and departing from the platform (paragraph 59).

c. TO1 did not see the passenger on the track ahead of train 1 as it arrived at the platform (paragraph 69).

Each of these factors is now considered in turn.

Fall from the platform

53 The passenger fell from the platform onto the track and was unable to reach a position of safety after falling.

54 In the available CCTV images, the passenger does not appear to fall due to a slip, or trip, but appears instead to stand and immediately fall forwards, after sitting on a bench for 48 minutes (paragraph 35). RAIB observed no obvious trip hazards on the platform, and the surface was reported to be clean and dry.

55 The passenger's feet were around 1.5 metres from the platform edge when they fell forwards. They then fell vertically around 0.7 metres onto the track and appeared to fall directly on the running rail nearest to the platform edge. The passenger can be seen placing their hand on the top edge of the platform and attempting to stand up after the fall but appears unable to do so. There is no indication on CCTV images that the passenger attempted to move towards the recess under the platform (paragraph 16).

56 It is not possible to say from evidence gathered after the accident, including the post-mortem examination, if the passenger was injured in this fall. However, this remains a possibility and, had they been injured in this way, then this may have affected their ability to stand up once they were on the track.

57 The post-mortem toxicology report recorded a blood alcohol concentration for the passenger of 272 milligrams of alcohol per 100 millilitres of blood. This blood alcohol concentration is over 3 times the legal drink-drive limit in England, Wales and Northern Ireland, which is 80 milligrams of alcohol per 100 millilitres of blood. The post-mortem toxicology report states that coma may occur at a blood alcohol concentration of 200 milligrams to 300 milligrams per 100 millilitres of blood.

58 While the possibility that the passenger suffered a medical episode which caused a loss of balance or consciousness, or which prevented them from standing up once on the track, cannot be discounted, the post-mortem examination report stated there were no notable previous medical conditions of relevance.

Intervention after falling

59 There was no intervention that prevented train 1 arriving at and departing from the platform.

Other passengers on platform 13

60 When the passenger fell from the west end of platform 13, CCTV images show that there were no other passengers present at that end of the platform. Although CCTV images show that there was a passenger sitting around halfway along platform 13, they are facing the other way and set back from the platform edge. Other passengers become visible around a minute after the passenger fell onto the track, but they do not walk anywhere near the platform edge or past the point on the platform where the passenger was lying. Another passenger becomes visible on platform 13 around 2 minutes later, but also does not go anywhere near where the passenger was lying.

61 RAIB undertook a reconstruction to understand how visible the passenger on the track would have been to people on platform 13. Due to the location and orientation of the passenger, a person standing on the platform would need to be standing at, or near to, the platform edge to be able to see the passenger. The reconstruction showed that the distance from the platform edge that someone would be required to stand to see the closest running rail ranged from around 0.8 metres for someone who is 5 feet (1.52 metres) tall to 0.95 metres for someone who is 6 feet (1.83 metres) tall (figure 6).

The train on platform 14

62 CCTV shows that there was a train in platform 14 when the passenger fell on to the track. There is no evidence that anyone on this train reported seeing the fallen passenger on the track. RAIB established that the TO of the train in platform 14, when in their normal seated driving position, would not have been able to see the passenger either when they were sitting on the bench, or after they had fallen on to the track.

63 It cannot be determined from the available evidence if any passengers were in the car of the train on platform 14 which was opposite the location where the passenger fell. Evidence from the RAIB reconstruction found it is possible to see the location of the fallen passenger from a train in platform 14 if someone is positioned very close to the window on the side of the train nearest platform 13 or standing up in the middle of the leading end car and looking through a window in the correct direction (figure 10). The passenger on the track would not be visible to anyone sitting down on the opposite side of the car (the side furthest from platform 13).

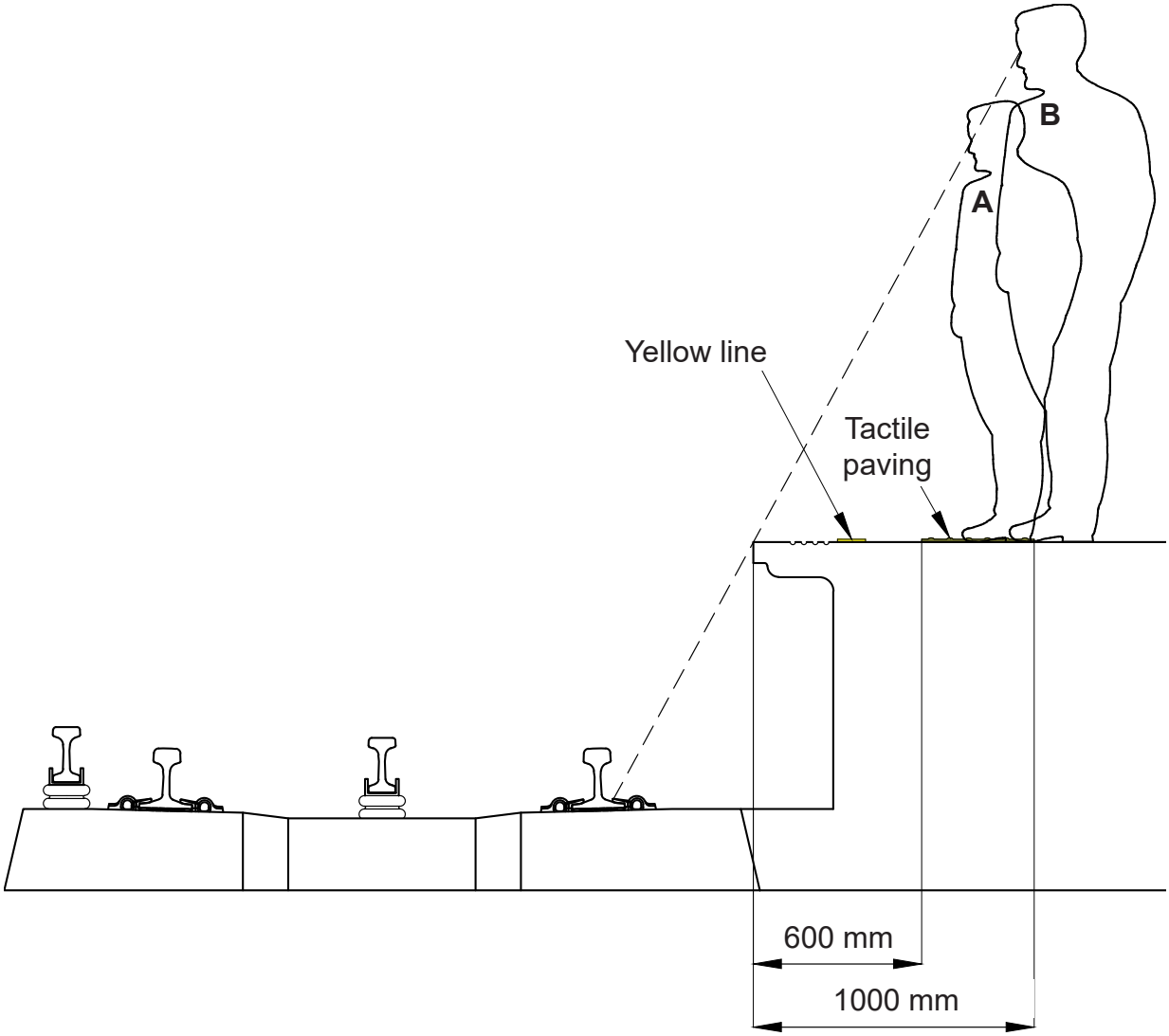

Figure 6: Diagram showing sighting angles and distances of a 5ft (1.52 m) person (A), and a 6ft (1.83 m) person (B).

Figure 7: View of platform 13 from inside a carriage of a train in platform 14. The green rectangles represent the position of the passenger on the track.

LUL staff

64 Station staff duties include a requirement to carry out hourly station security checks covering the Jubilee line platforms and concourse. LUL arranges for these security checks (often referred to by staff as 'walkarounds') to be carried out by different members of staff, usually a CSA1 or CSA2, to increase the opportunity for different things to be spotted each time. LUL's Rule Book 11 'Station management and emergency response', issue 8 dated November 2021, section 4.1, states that station staff '*must thoroughly check all public areas of the station to make sure there are no unattended or hidden items*' and that they '*must record all findings from the station security checks onto the prepared checklist*'. The focus of these security checks is to look for issues such as doors to restricted areas being left open, or potential threats, such as unattended luggage. Station staff stated that security checks also include looking for vulnerable passengers who exhibit signs of looking upset or being clearly affected by alcohol, so that they can offer help.

65 The last security check before the accident was started at 14:00, about 45 minutes before the passenger fell onto the track. The CSA undertaking the security check, CSA1, visually checked the west end of platform 13 by looking across to it from platform 14 at approximately 14:06. CSA1 then entered the overbridge connecting platforms 14 and 13, but as they did so, platform 13 became full of passengers alighting an arriving service. CSA1 can be seen on CCTV footage descending from the bridge onto platform 13 at 14:07 and walking towards the station control room.

66 CSA1 did not walk down to the west end of platform 13 where the passenger was sitting at any point during their check, even though LUL required them to do so as part of the security check. CSA1 stated that they could get a very good view of platform 13 from the overbridge so there was no need to enter the platform. However, the passenger was at this time sitting on the bench and not apparently drawing attention to themselves. It is likely, therefore, that there would have been no reason to approach the passenger even if CSA1 had walked to the west end of the platform at this point.

67 Station CCTV footage shows that TO2 entered platform 13 at 14:50 around 5 minutes after the passenger fell onto the track. On entering the platform, TO2 saw the passenger's bag and applied the standard TfL procedure for dealing with unattended property (paragraph 37). CCTV footage shows that TO2 did not look towards the track while doing this. As the bag was located around 1.5 metres from the platform edge, TO2 would not have been able to see the passenger even if they had looked towards the track at this point (paragraph 61 and figure 6). TO2 later stated that they were unaware of the passenger.

68 While TO2 was dealing with the passenger's bag, inbound train 1 approached platform 13, and the train in platform 14 was getting ready to depart. The noise of these trains entering and departing might have been sufficient to have masked any noise the passenger may have been making at this point, and there was no evidence or reports of any noise from the passenger being heard by any passengers or staff.

Train operator 1's actions

69 TO1 did not see the passenger on the track ahead of train 1 as it arrived at the platform.

70 Station CCTV images show that the passenger was lying alongside the rail closest to the platform edge once they had fallen onto the track. They were wearing dark outer clothing with their lighter shirt also being partly visible (paragraphs 33 and 36).

71 During the reconstruction (paragraphs 61 and 63), a test object (a dark blue oblong measuring 1.85 x 0.5 x 0.2 metres) was placed on the track in the same location as the passenger. An out-of-service train of the same type as that involved in the accident was then operated inbound towards platform 13. The TO was aware there was a test object placed on the track adjacent to the running rail and was asked to sound the train's whistle when they could first see it during the train's approach. The train was being operated in ATO, and the speed was the same as the accident train, at around 30 km/h.

72 As the train approached the station during the reconstruction, the TO reported first seeing the test object from approximately 112 metres away (figure 8). For the reconstruction, LUL sprayed a yellow line across the track at a distance of 40 metres on approach to the passenger's location. This yellow line was positioned at what LUL had calculated to have been the latest point at which the emergency brake could have been applied to stop the train before reaching the passenger, taking into account the deceleration rate of the train and the decision time of the TO. When the TO could see this yellow line, they were able to discern the nature of the obstruction on the track, and to judge that there was a clear safety risk. Therefore, RAIB has concluded that the train could have been stopped before reaching the passenger, had the passenger been seen and the brakes applied before or at this point (figure 9).

Figure 8: The moment that the reconstruction TO was able to recognise the reference object on the track, approximately 112 metres from the object.

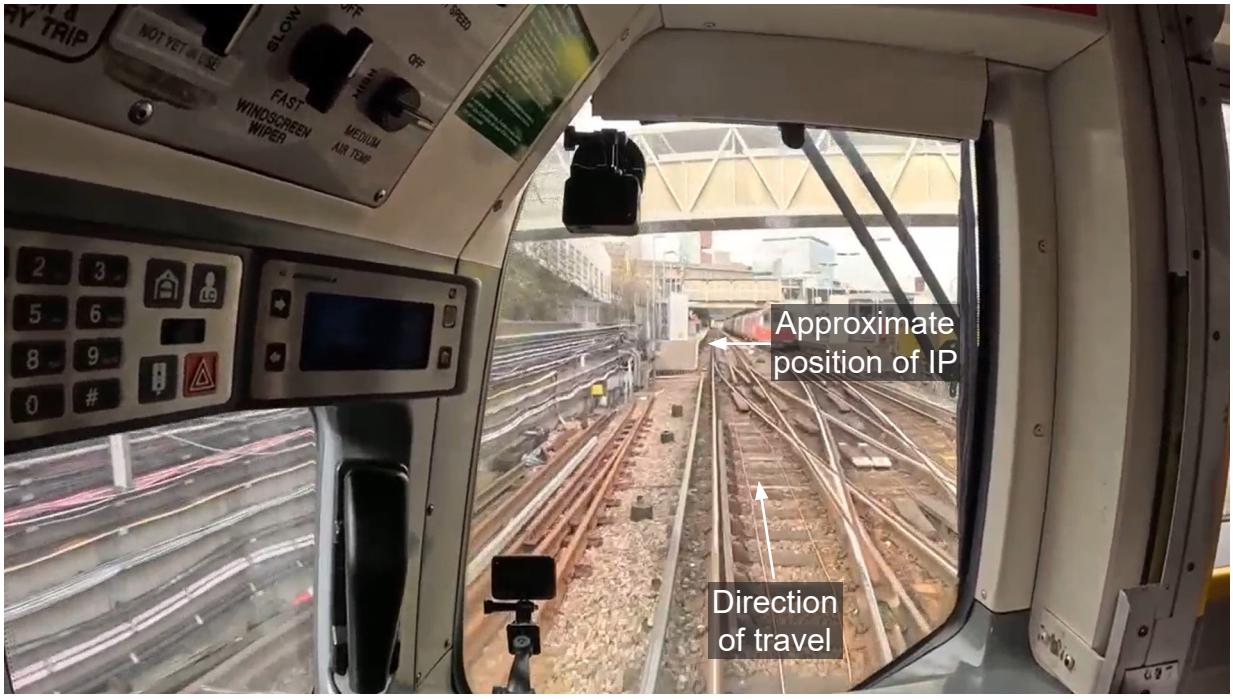

Figure 9: The moment that the reconstruction TO stated they would have recognised the obstruction as a safety risk and applied the emergency brake, approximately 40 metres from the object.

73 While RAIB cannot be certain why TO1 did not see the passenger on the track ahead of their train, this causal factor likely arose due to a combination of the following:

i. TO1's level of attention was possibly reduced because train 1 was operating in ATO (paragraph 74).

ii. TO1 was possibly distracted by seeing TO2 on the platform (paragraph 78).

Each of these factors is now considered in turn.

Automatic train operation

74 TO1's level of attention was possibly reduced because train 1 was operating in ATO.

75 The repetitive nature of automatic train operation, together with periods of little active input, can result in underload for a TO. In periods of low workload, attention will begin to degrade and capacity to deal with new information is reduced, which can lead to overall impaired performance in the main task of operating the train.[2]

76 LUL instructs its TOs to remain vigilant on approach to platforms (paragraph 21). However, when arriving at a platform in ATO mode, this system will automatically control the train's speed to bring the train to a stand at a specified stopping point. This means that a TO does not need to constantly monitor the train's approach to the stopping point by looking ahead of the train. This contrasts to the approach needed when manually driving a train which requires the TO to control the train's speed on approach and to look ahead to the stopping point. This naturally requires the operator to look at the track in front of them. The potential effects of ATO on TO attention are discussed further from paragraph 100.

[2] Young, M. & Stanton, N. (2002) Attention and automation: New perspectives on mental underload and performance. Theoretical Issues in Ergonomics Science. 3. 10.

77 When trains arrive at platforms, LUL stated that it considers the main risk to be passengers falling directly in front of a train, for example, where passengers are standing or walking close to the platform edge, or where platforms are crowded. At the time of the accident, there were very few people on the platform, so the risks associated with passengers being close to the platform edge at a busy platform were not present.

Distraction

78 TO1 was possibly distracted by seeing TO2 on the platform.

79 Station CCTV images are not clear enough to determine exactly where TOs are looking as trains approach platform 13. However, TO1 stated that they remembered seeing TO2 (who was to take train 1 on its outbound journey) and the bag on the platform as train 1 arrived. Witness evidence indicates that TO1 acknowledged TO2 and that TO1 saw TO2 looking at a bag. TO1 also recalled that the rest of the platform was empty (that is, they saw no other staff or passengers).

80 If TO1's attention was diverted towards TO2 and the bag, then it is possible that they became TO1's main focus at this point, particularly in the perceived absence of other people on the platform and any associated risks. This is known as 'attentional selection' and can lead to 'inattentional blindness'.[3] This occurs when someone is unable to see something that is clearly in view because they are focusing on something else. This may explain why TO1 did not notice the passenger on the track ahead of their train despite the reconstruction suggesting that they would have been visible to them (paragraph 72).

81 It is not possible to be certain at which point on the approach to the platform TO1's attention may have become diverted towards TO2 and the bag. This may have occurred after the train had passed the point at which an emergency brake application would have stopped the train before it reached the passenger (paragraph 72).

Factors affecting the severity of consequences

Train 2

82 TO3 did not see the passenger on the track ahead of train 2 as it arrived at the platform.

83 Just after train 1 had departed outbound, the CSM went to platform 13 to collect the passenger's bag (paragraph 41). The CSM walked to the west end of the platform to do this. CCTV footage shows that, when the CSM is almost at the bag, TO4 (due to take train 2 outbound) arrives on platform 13 and they walk together to the bag. They both examine the unattended bag and do not look towards the track. Around this time train 2, operated by TO3, can be seen approaching platform 13 inbound (paragraph 41). The CSM picks up the bag, acknowledges TO3, and begins to walk back towards the control room as train 2 is arriving at the platform.

[3] Mack, A. (2003) Inattentional blindness: Looking without seeing. Current directions in psychological science, 12(5), pp.180-184.

84 TO3 stated that they remembered seeing TO4 as they approached the platform since they recognised them, having worked with them previously, and they also recalled seeing a second person walking away (this would be the CSM). TO3 stated that they had been operating the train from a seated position, but that they stood up as the train was coming to a stop, upon seeing people there. TO3's account suggests it is likely that their attention was focused on the platform and TO4 as the train approached the platform.

Train 3

85 TO5 saw an object but did not perceive it to be a person as train 3 arrived at the platform.

86 As train 3, operated by TO5, was arriving at platform 13, they saw what they believed to be an inflatable doll on the track (paragraph 43). They did not intervene to stop the train because they did not think what they saw was a person. ATO stopped the train normally in platform 13 at 15:06, after which TO5 left the train and entered the sideline building for a personal needs break. Five and a half minutes later, TO5 made a call to Jubilee line control to report what they had seen.

87 TO5 did not immediately report the presence of what they had seen to control because, although they recognised that it had some human-like characteristics, they dismissed the possibility that it could be a person. TO5 believed that, because a train had only just departed from Stratford, if a person was on the track, or there was an emergency of any kind, trains would have been stopped from departing or entering the station.

88 During the call to control, TO5 stated what they had seen when they were coming into the platform. The controller, having clarified that the perceived object was around the size of a person, did not take measures to prevent or warn other TOs operating trains approaching platform 13 at Stratford that an object had been reported on the track.

The response to the reported object on the track

89 CSA2 did not attempt to stop train 4.

90 CSA2, when they were told to investigate the report of something on the track, initially went to the east end of platform 13 and radioed the CSS to say that they could not see anything amiss. At this point, the CSS brought up the relevant CCTV view on one of their screens and directed CSA2 to the west end of the platform (paragraph 44).

91 The CSS stated that they did not see anything on the track on the CCTV image at this point as they were preoccupied with ensuring that CSA2 went to the correct location. RAIB reviewed a recording of the same CCTV footage viewed by the CSS and observed that the passenger was not conspicuous due to their small relative size within the image, and the lack of contrast between them and the image's background.

92 When CSA2 located the passenger on the track they reported this to the CSS (paragraph 45). CSA2 can be seen on CCTV images using their radio while walking away from the passenger. At this point, the CCTV shows inbound train 4 operated by TO6 approaching the station. As CSA2 is walking back along the platform, their back is towards the approaching train. They can be seen to turn around briefly, but not make any hand signal to stop the train (paragraph 45).

93 Section 8.4 of LUL Rule Book 7 'Train incidents and safety equipment', issue 8.1 dated November 2021, states that '*if a person has fallen onto the track at your station,* [station staff] *must carry out the following instructions in the order that you think is appropriate:*

- *tell the controller*
- *try to stop a train from entering the platform*
- *arrange for traction current to be switched off.*'

In the event of an emergency, LUL operational staff are trained to wave both arms above their head to signal to an approaching TO that they need to bring their train to an immediate stop. This was covered in initial training for the CSA2 role and CSA2 had also been trained on this procedure as part of their previous role as a TO. CSA2 stated that when they turned initially, they could not see a train approaching, and they did not want to turn around again as they did not want to see the passenger on the track again, as they were in shock.

Train 4

94 TO6 saw the passenger on the track but did not attempt to stop train 4.

95 TO6 drove train 4 inbound to platform 13. They later stated that they recalled seeing a member of staff on the platform who looked like they were looking for something. They stated that after seeing the member of staff, they had looked down to the track and saw what they believed to be a body but they "froze" and allowed ATO to continue to control the train to a normal stop in platform 13, where they released the train's doors.

96 Section 8 of Rule Book 7 states that:

'*If a person has fallen onto the track in front of your train you must:*

- *immediately apply the emergency brake*
- *tell the controller (using the emergency message)*
- *ask the controller to switch traction current off*
- *show a hand danger signal to any train approaching on an adjacent line (where possible).*

If you are at a station, you must sound the train whistle to attract the attention of the station staff.'

97 The on-train data recorder (OTDR) data from train 4 shows that there was no application of the train's emergency brake, nor was the whistle sounded. TO6 also did not make a mayday emergency call to the controller.

Outbound TOs

98 None of the outbound TOs saw the passenger on the track.

99 When each arriving train stopped in the platform, the passenger on the track was hidden from view under the rear of the arriving train (the front as each train departed). For this reason, none of the TOs of departing trains were aware of the presence of the passenger under their trains.

Identification of underlying factors

Operation in ATO mode

100 When trains are operating in ATO mode, TO alertness can decrease because they have less active input into the control of the train. There is also evidence that some TOs may undertake tasks not related to the operation of their trains when approaching terminal platforms using ATO. This is a possible underlying factor.

101 When the train is being operated in ATO mode, the TO does not have to manage the speed of the train, or control where it stops in stations, because these tasks are undertaken automatically. However station duties, such as deciding when to close the doors and determining when it is safe to depart a station, remain the responsibility of the train operator. Between stations, a TO's attention is therefore mainly directed to monitoring the train operator display (figure 3) and looking for any obstructions on the line ahead of the train, activities requiring very little active input from the TO. The repetitive nature of the tasks involved in operating trains in ATO can also result in the TO responding automatically.[4] During this time, attentional resources may be withdrawn, due to the routine nature of the task. When there is low task-related activity, alertness is also reduced which can result in cognitive underload and an increased risk of distraction.[5]

102 All the trains involved in the accident were being operated in ATO mode. Operating the train in this way can lead to cognitive underload for the TO, particularly between stations. Stations, in contrast, require a high level of attention and vigilance with the operation of door controls by the TO. Difficulties can arise in making the switch between low and high levels of activity. When people experience cognitive underload, research has shown that it can lead to faster reaction times but reduced attention and more errors.[2] Withdrawing attention when it is not required is an adaptive adjustment to a task, because humans have limited attentional capacity.

[4] Waters, S. Whitmore, A. Basacik, D. & Reed, N. (2015) Assessing cognitive underload during train driving: A physiological approach (CUPID).

[5] Rail Safety and Standards Board (RSSB), (2019), 'Identifying dentifying and evaluating techniques to mitigate cognitive underload for train drivers'.

103 Because ATO is controlling train speed and stopping position when approaching platforms, this presents an opportunity for TOs to start to prepare to leave the train before it has stopped, to save time. This would include activities such as putting on coats, packing bags and other actions not related to operating a train. RAIB observations suggest that at terminus stations such as Stratford ATO provides an opportunity for TOs to do this because the train is being automatically controlled to a stop in the platform. In addition, if the platform is not busy, the risk of a passenger falling in front of the train is reduced or not present and so less likely to be perceived to need continuous monitoring.

104 None of the TOs discussed in this report stated they were preparing to leave the train on arriving at Stratford platform 13 and CCTV footage is not clear enough to see where they were looking as their trains approached the platform.

105 In early January 2024, RAIB inspectors undertook observations of 34 trains arriving at platforms 13, 14 and 15 at Stratford station. This showed that, as their trains entered the platforms, 10 TOs remained seated, 21 TOs adopted a standing position, which is permitted, and the position of the remaining 3 TOs could not be clearly determined. Of the standing TOs, 2 were seen to be putting on their coats as the train entered the platform, 1 was putting on a backpack and another TO was standing at the cab door, away from the controls. RAIB has also received evidence from a former LUL TO who operated trains regularly in ATO that TOs often prepared to leave trains before they had stopped in the platform at terminus stations. Observations carried out by RAIB at Waterloo and West Ham stations (which are not terminus stations) on the Jubilee line showed that almost all TOs remained seated as their trains entered the platforms.

106 RAIB undertook a further survey at Stratford and High Barnet (both terminus stations) on 5 February 2024. It was observed that most operators were looking forwards and that none were putting on coats or bags. It is not possible to be certain whether TO behaviour has changed since the initial observations in January 2024. However, there may have been an increased awareness among TOs that the direction of TO attention at terminal stations while operating trains in ATO was an area being considered by investigations into this accident.

107 TOs are subject to periodic assessments. In some cases, the TO will be aware that an assessment is taking place, because the assessor is present in the driving cab. The TO may be asked to drive in ATO mode or manually. Among other things, the assessor would observe the TO controlling the train arriving at a station and how they were managing the platform-train interface (PTI). Assessors may also travel in the passenger saloon of a train, without the TO being aware, to assess activities such as door operation, management of the PTI and the quality of their passenger announcements. Whether TOs operating trains in ATO are paying full attention at terminal stations is not currently monitored by LUL as part of these assessments.

Quantified risk assessment

108 LUL had not fully quantified the risk of a passenger falling from the platform and being struck by a train at Stratford station, and its local risk controls were not sufficiently effective to prevent this accident.

109 LUL quantifies operational risk using the London Underground Quantified Risk Assessment (LUQRA). The LUQRA is a series of mathematical models which aims to predict the risk to passengers from hazardous events. The models consist of two parts, a fault tree showing how hazardous events can occur, and event trees that model the consequences of the hazardous events.

110 This fault tree analysis uses historical data to assess the frequency of customers falling from the platform onto the track on the Jubilee line. This accident category was assessed as contributing just over three occurrences per year. LUL stated that the predictions made by the LUQRA reflect the actual number of incidents on the Jubilee line before the publication of the model in 2022.

111 The event tree relating to a fall from a platform on the Jubilee line is shown in figure 10, which models a range of possible interventions once a passenger has fallen from the platform. In effect, each branch of the tree represents a different scenario, the nature of which varies according to the success or otherwise of each intervention (such as the customer being seen by the TO before the train arrives or being saved by staff). Each scenario has a frequency and a consequence in terms of harm. The extent of the harm is expressed in terms of fatalities and weighted injuries (FWI). This is a method that quantifies the potential harm that could arise as either a fatal injury or one or more major or minor injuries.

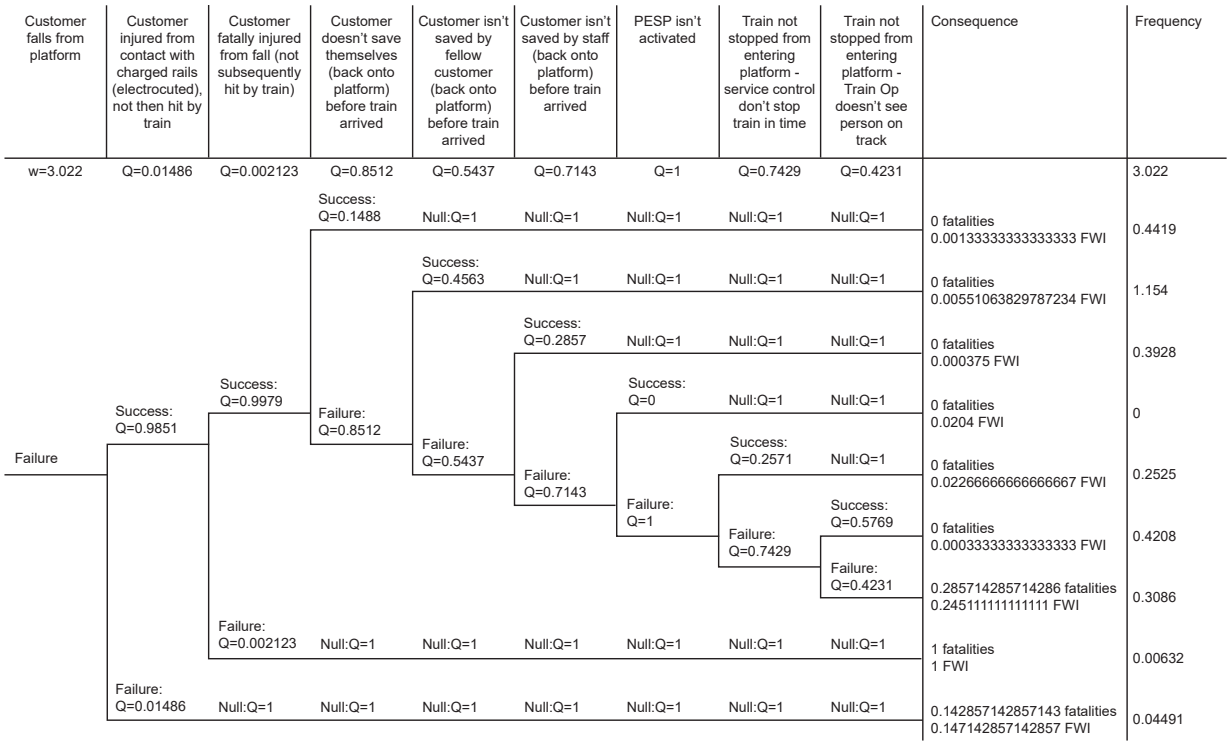

Figure 10: Event tree for when customers fall from the platform on the Jubilee line.

112 A scenario where the TO does not see the person on the track and the train is not stopped has a predicted frequency of 0.3086 in LUQRA, which amounts to approximately 1 person every 3 years predicted to fall from the platform and be struck by an approaching train on the Jubilee line. LUL has predicted that a fatality will occur from falling from the platform approximately once every 3.5 years.

113 LUL regards this risk to be broadly acceptable as defined by TfL standard S1521, 'Safety decision making', issue A11, dated November 2023.

114 LUL states there have been 100 reported passenger falls from platforms across the LUL network between June 2021 and May 2024. Of these passenger falls, 13 incidents occurred on the Jubilee line, five of which, including the accident at Stratford on 26 December 2023, resulted in the person being struck by a train. This is five times the number of incidents of this type predicted by LUQRA.

Local risk management

115 LUL uses the LUQRA to quantify and manage the likelihood of a passenger fatality on a line-by-line and network-wide basis. This is supplemented by a localised assessment of risk to customers on a station, or group of stations, known as the Customer Risk Assessment (CRA). Each CRA considers the probability of harm to station users, including risks from the PTI and events not directly linked to train operation, such as falls on escalators or stairs. LUL stated that CRAs assess risk using historical incident and accident data relevant to the location being assessed, together with the expected effects of applying the requirements in standards, staff training, rule books and information provided to customers, among other mitigation measures.

116 There are three CRAs relevant to this accident, one covering the whole of Stratford station, and two covering the Jubilee line platforms at Stratford station. All assessments consider PTI risk and a person falling from a platform. Among the control measures to prevent these incidents are:

- *'in-cab CCTV equipment – used by the TO to monitor the PTI before departure, identify customers boarding and alighting, see if any incidents are occurring and ensure safe train despatch*
- *platform staff managing congestion and station staff undertaking security checks every hour*
- *staff trained and briefed on assisting vulnerable customers, for example, to intervene when customers are intoxicated to reduce potential for accidents*
- *CCTV monitored by station staff located in the station control room 24/7 should intervention be required.'*

TOs seeing a passenger on the track ahead and stopping the train was not identified as a control measure on any of the CRAs.

117 The control measures were not effective in the circumstances of this accident because:

- The security checks did not identify that the passenger was on the track for 5½ minutes before they were struck by train 1 (paragraph 65). LUL stated that a continual series of security checks would have been in progress during this time but that a check would have needed to have been in the correct location at the relevant time to have seen the passenger on the track. As station staff are encouraged to vary their routes during their security checks there is no way of predicting at what exact time they will pass any given point.
- While staff identified the passenger's unattended bag as a potential security issue, they did not identify that the passenger was on the track and in an unsafe position (paragraph 86).
- CCTV images are not continuously monitored and not all areas of the station are viewable at the same time due to the number of cameras in use. In addition, once the passenger was on the track, they were not conspicuous on the individual CCTV camera views available, which reduced the opportunity for staff to intervene (paragraph 94).

118 While not identified as a specific control measure in the CRA, the LUQRA model estimated that, for 58% of occasions where a person has fallen onto the track, a TO would see the person on the track ahead of the train. Whether this would then allow the TO to stop the train before reaching the fallen person would depend on the speed of the train and the distance from which the person was seen. However, in this accident, of the four inbound trains, two TOs did not see the person on the track in front of their train (paragraphs 38 and 41). One TO saw something but did not identify what they saw as a person (paragraph 43) and one TO identified the passenger on the track but did not stop their train (paragraph 47).

Observations

Safety-Critical Communication

119 Ineffective safety-critical communications were evident in the calls between some of the LUL staff involved in this accident.

120 Accurate, clear and correctly understood communications are essential, particularly when reporting and dealing with emergencies. Although not causal to the accident, some of the safety-critical communications were below the standard in LUL Rule Book 1 'Communications', issue 6 dated November 2021.

121 For example, the conversation between TO5 and the controller was a missed opportunity to explore the situation further. Had the controller led the conversation and had a clear understanding been reached surrounding the circumstances of TO5's report, action could have been taken to prevent the fourth train from arriving at the station (paragraph 91). In the conversation between CSA2 and the CSS, the use of jargon led to some initial confusion and a delay in an emergency being declared (paragraph 45).

Previous occurrences of a similar character

122 On 26 May 2020 at approximately 10:10, a passenger fell into the gap between the northbound Bakerloo line platform and the train from which they had just alighted at Waterloo Underground station. The passenger was unable to free themself and the train departed with the passenger still in the gap, crushing them as it moved off. The passenger remained motionless on the track and was subsequently hit by a second train that entered the station. Bakerloo line trains are driven manually by the TO and do not have ATO equipment. RAIB's investigation (RAIB report 05/2021) found that the accident occurred when there were no staff or other members of public nearby to assist the fallen passenger. With only their head and arm above platform level, the passenger was difficult to detect on the despatch monitors and was not seen by the TO. The TO of the following train was unaware of the passenger because their attention was focused on the platform and the train's stopping point.

123 On 30 September 2022 at approximately 21:54, a passenger fell between the train they had just alighted and the platform at High Barnet Underground station, an LUL surface station, where the train had terminated. At the time of the accident it was dark. After they had fallen, the passenger's bag was left wedged between the train and the platform. The bag was discovered by the TO and dealt with as lost property. The passenger was not discovered as they were hidden by the stationary train and were subsequently run over by it as it departed. The passenger remained undiscovered on the track for around 5 minutes. A second train passed over the passenger and stopped in the platform where the passenger lay on the track, but the TO had not seen them. The passenger suffered life-changing injuries. RAIB undertook a preliminary examination into this accident and decided to undertake a review of LUL's internal investigation report.

Subsequent occurrence of a similar character

124 On 29 September 2024 at approximately 04:15, a passenger fell from the platform onto the track at Clapham South Underground station on LUL's Northern line. Before they fell, the passenger had been on a bench on the platform for around 53 minutes. Approximately 5 minutes after they fell, the passenger was struck by a train as it departed the station. The TO, as they arrived and stopped in the station, did not see the passenger. Once passengers had alighted and finished boarding, the TO started the train and it left the platform. A second train arrived around 6 minutes later. The TO of the second train saw the passenger on the track ahead of their train and reported this to the line control. The passenger suffered life-changing injuries in this accident. RAIB undertook a preliminary examination into this accident and the decision was made to undertake a review of LUL's internal investigation report when it becomes available.

Summary of conclusions

Immediate cause

125 The passenger had fallen from the platform and was lying on the adjacent track when they were struck by train 1 (paragraph 49).

Causal factors

126 The causal factors were:

a. The passenger fell from the platform onto the track and was unable to reach a position of safety after falling (paragraph 53, **Recommendation 1**).

b. There was no intervention that prevented train 1 arriving at and departing from the platform (paragraph 59, **Recommendation 1**).

c. TO1 did not see the passenger on the track ahead of train 1 as it arrived at the platform (paragraph 69, **Recommendation 2**). This causal factor arose due to a combination of the following:

   i. TO1's level of attention was possibly reduced because train 1 was operating in ATO (paragraph 74, **Recommendation 2**).

   ii. TO1 was possibly distracted by seeing TO2 on the platform (paragraph 78, **Recommendation 2**).

Factors affecting the severity of consequences

127 The factors that affected the severity of consequences were:

a. TO3 did not see the passenger on the track ahead of train 2 as it arrived at the platform (paragraph 82).

b. TO5 saw an object but did not perceive it to be a person as train 3 arrived at the platform (paragraph 85).

c. CSA2 did not attempt to stop train 4 (paragraph 89).

d. TO6 saw the passenger on the track but did not attempt to stop train 4 (paragraph 94).

e. None of the outbound TOs saw the passenger on the track (paragraph 98).

Underlying factors

128 The underlying factors were:

a. When trains are operating in ATO mode, TO alertness can decrease because they have less active input into the control of the train. There is also evidence that some TOs may undertake tasks not related to the operation of their trains when approaching terminal platforms using ATO. This is a possible underlying factor (paragraph 100, **Recommendation 2**).

b. LUL had not fully quantified the risk of a passenger falling from the platform and being struck by a train at Stratford station, and its local risk controls were not sufficiently effective to prevent this accident (paragraph 108, **Recommendation 1**).

Observations

129 Ineffective safety-critical communications were evident in the calls between some of the LUL staff involved in this accident (paragraph 119, **Learning point 1**).

Previous RAIB recommendation relevant to this investigation

130 The following recommendation, which was made by RAIB as a result of its previous investigations, has relevance to this investigation.

Trap and drag accidents at Archway and Chalk Farm stations 18 February and 20 April 2023, RAIB report 06/2024, Recommendation 4

131 Recommendation 4 reads as follows:

> *The intent of this recommendation is to reduce the risk of train operators losing attention and awareness while operating automatic train operation trains.*
>
> *London Underground should review the environmental, organisational and job factors related to operating trains in automatic train operation mode to understand how underload may affect train operators. This review should specifically consider the effect that underload may have on undertaking safety-critical tasks, such as train despatch, and what improvements may be made to assist train operators in maintaining attention. These improvements should include consideration of how the driving task is designed and the cab environment as well as measures such as individual awareness and training.*

132 RAIB's Archway and Chalk Farm report was published on 27 June 2024. For this reason, the safety authority for railways in Great Britain, the Office of Rail and Road (ORR), has not, and is not yet required to, provide RAIB with an update on LUL's progress in implementing the recommendation.

133 RAIB is making a further similar recommendation to LUL following the accident at Stratford on 26 December 2023 that will build upon recommendation 4 from RAIB's Archway and Chalk Farm investigation (Recommendation 2, see paragraph 134).

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

134 LUL reported to RAIB that:

- It has started work as part of its PTI plan to look into emerging technologies to detect the presence of PTI risk and people on the track.
- The HOT procedure has been expanded to include the requirement to visually check the track area for people on the track (once an item has been declared non-suspicious) when items are discovered near the track area, which includes platforms and overbridges. This also includes appropriate checking when a train is berthed in the platform.
- It has produced a video that will be used to remind staff of the importance of completing thorough station security checks including an emphasis on customer service and being a visible presence on the station.

Recommendations and learning point

Recommendations

135 The following recommendations are made:[6]

1 *The intent of this recommendation is to reduce the risk of a person being struck by a London Underground train in circumstances where they have fallen, slipped, tripped or have otherwise inadvertently come to be on the track adjacent to a platform.*

Considering the circumstances of the accidents discussed in this report at Stratford, Clapham South and High Barnet stations, and the accident which took place at London Waterloo (RAIB report 05/2021), London Underground Limited should identify the effectiveness of its current risk controls and evaluate possible measures to further reduce the risk of a passenger being struck by a train where they have inadvertently entered the track adjacent to a platform.

This review should specifically include considering the use of technology that can detect if a passenger is in a dangerous position and intervene or warn as is necessary to stop an approaching or departing train.

Following this review, London Underground Limited should determine what improved or further risk reduction measures may be required to ensure that risks of passengers being struck by trains in these circumstances are reduced (paragraphs 126a, 126b and 128b).

[6] Those 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 the Office of Rail and Road to enable it to carry out its 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 200 to 203) can be found on RAIB's website www.gov.uk/raib.

2 *The intent of this recommendation is to reduce the risk of train operators losing attention and awareness while operating trains in automatic train operation mode.*

London Underground Ltd should review the environmental, organisational and job factors related to operating trains in automatic train operation mode to understand how underload may affect train operators.

This review should specifically consider the effect that underload may have on train operators of trains travelling between stations and then arriving at or passing through platforms, and should build upon any work already being undertaken in response to recommendation 4 of RAIB's report into the trap and drag accidents at Archway and Chalk Farm stations (RAIB report 06/2024) (paragraphs 126c to 128a).

Learning point

136 RAIB has identified the following important learning point.[7]

1 Staff are reminded of the importance of safety-critical communications when reporting and responding to incidents. This includes:

- accurately describing what is known about the incident
- avoiding using jargon
- providing accurate details regarding the location of the event
- repeating back information to ensure a clear understanding is reached
- ensuring that all parties involved know what is expected of them (paragraph 129).

[7] 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Appendices

Appendix A - Glossary of abbreviations and acronyms

Abbreviation / acronym	Full term
ATO	Automatic train operation
CCTV	Closed-circuit television
CMS	Competence management system
CRA	Customer Risk Assessment
CSA1	Customer service assistant 1
CSA2	Customer service assistant 2
CSM	Customer service manager
CSS	Customer service supervisor
DC	Direct current
FWI	Fatalities and weighted injuries
HOT	Hidden, obvious, typical
LUL	London Underground Limited
LUQRA	London Underground Quantified Risk Assessment
ORR	Office of Rail and Road
OTDR	On-train data recorder
PTI	Platform-train interface
RSSB	Rail Safety and Standards Board
TfL	Transport for London
TO	Train operator

Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses
- information taken from the OTDR of the trains involved
- CCTV recordings provided by LUL covering platforms 13 and 14 at Stratford station
- RAIB site visits, site photographs, observations and measurements
- weather reports and observations at the site
- post-mortem report and toxicology results
- a full reconstruction of the accident
- LUL risk assessments, processes and procedures
- LUL investigation reports
- a review of previously reported incident and accident data
- a review of previous RAIB investigations that had relevance to this accident.

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