

Rail Accident Report



Passenger injury at Ashton-under-Lyne tram stop 12 March 2019

Report 15/2019
November 2019

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.

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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.

The 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 the RAIB has described a factor as being linked to cause and the term is unqualified, this means that the 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 the RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, the RAIB will qualify its findings by use of words such as 'probable' or 'possible', as appropriate. Where there is more than one potential explanation the 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 the RAIB, expressed with the sole purpose of improving railway safety.

Any information about casualties is based on figures provided to the 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. The 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.

The 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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Passenger injury at Ashton-under-Lyne tram stop, 12 March 2019

Contents

Preface	3
Summary	7
Introduction	8
Definitions	8
The accident	9
Summary of the accident	9
Context	10
The sequence of events	13
Analysis	16
Background information	16
Identification of the immediate cause	18
Identification of causal factors	18
Identification of underlying factors	23
Observations	24
Previous occurrences of a similar character	25
Incident at Newton Heath and Moston	26
Summary of conclusions	28
Immediate cause	28
Causal factors	28
Underlying factors	28
Additional observations	28
Previous RAIB urgent safety advice relevant to this investigation	29
Previous RAIB recommendation relevant to this investigation	30
Actions reported as already taken or in progress relevant to this report	31
Recommendations and learning points	32
Recommendations	32
Learning points	33
Appendices	34
Appendix A - Glossary of abbreviations and acronyms	34
Appendix B - Investigation details	35

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Summary

At around 22:55 hrs on Tuesday 12 March 2019, a passenger was involved in a tram dispatch accident at Ashton-under-Lyne tram stop, on the Manchester Metrolink system, which resulted in him falling from the platform onto the track after the tram departed. The passenger sustained facial injuries from the fall which required treatment in hospital.

The accident happened because the passenger had been leaning on the tram as it departed. He suffered from impaired mobility, making it difficult for him to stand unaided. The tram driver had not observed that the passenger was in close proximity to the tram when he moved the tram away from the tram stop. Once the tram had passed by the passenger and it was no longer supporting him, he fell from the platform onto the track.

The RAIB investigation has also identified two underlying factors. Firstly, the tram operator, Keolis Amey Metrolink (KAM) had not provided instructions to its drivers on the use of the side-view CCTV monitors as a tram is departing from a tram stop. Secondly, KAM had not provided any guidance to its staff on appropriate actions in the event that they encounter an impaired passenger on a tram.

As a result of its investigation, the RAIB has made four recommendations. Three are made to KAM, and cover:

- improving guidance to drivers on the use of the side-view CCTV monitors when departing from tram stops;
- improving the visibility of passengers at tram stops; and
- reviewing the guidance given to staff who may encounter impaired passengers.

The fourth recommendation calls for KAM and North West Ambulance Service to jointly develop a communications protocol so that KAM's control office is informed of any actions of the ambulance service that may be relevant to tram operations.

The investigation also identified two learning points for tram operators. The first of these highlights that it can be difficult for tram drivers to see people at the platform-tram interface in their CCTV monitors during night time operation, and that this should be considered in risk assessment and driver training activities. The second learning point highlights the importance of ensuring that staff travelling on board trams are able to react appropriately to emergencies.

Introduction

Definitions

- 1 Metric units are used in this report, except when it is normal practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.
- 2 The report contains abbreviations 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 22:55 hrs on Tuesday 12 March 2019, a member of the public (hereafter called 'the passenger') was involved in a tram dispatch accident at Ashton-under-Lyne tram stop, on the Manchester Metrolink system (figures 1 and 2). The passenger was leaning on the tram as it departed. Once the tram had passed by the passenger and it was no longer supporting him, he fell from the platform onto the track.
- 4 The passenger remained on the track until he was seen by the driver of the next tram to arrive at Ashton-under-Lyne, who summoned the emergency services. The passenger suffered facial injuries and he was detained in hospital.

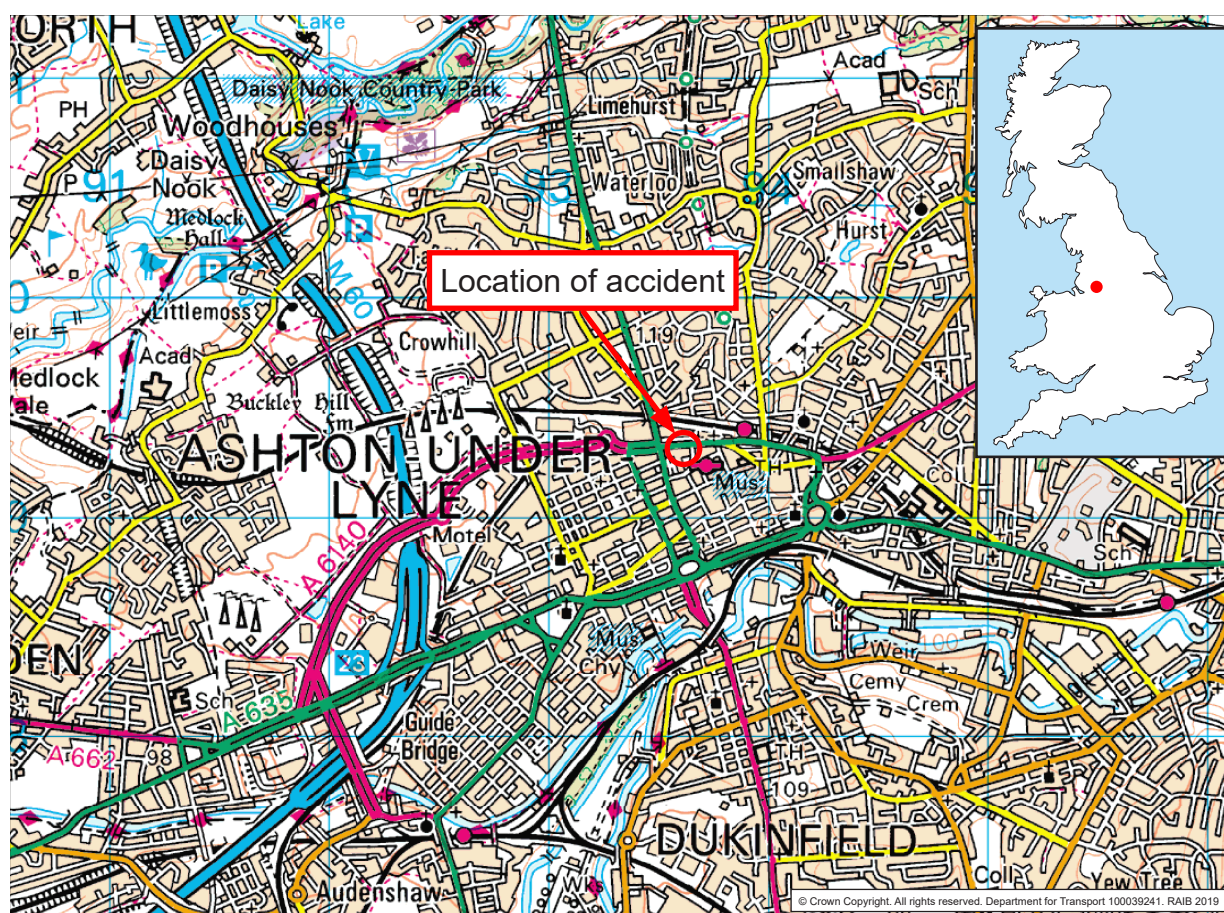


Figure 1: Extract from Ordnance Survey map showing location of accident

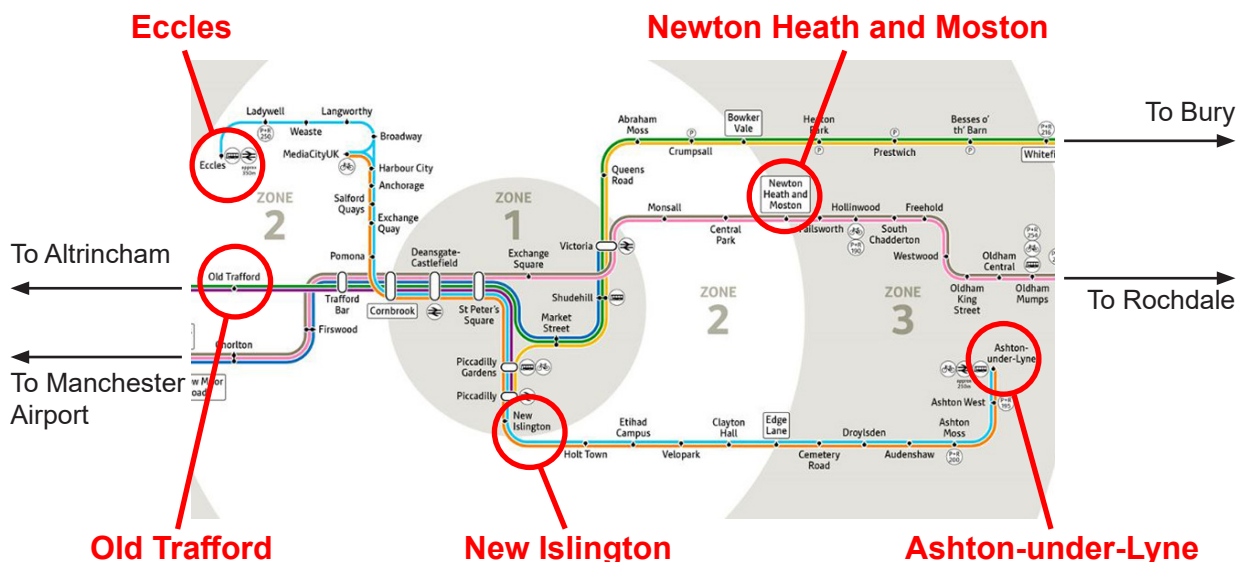


Figure 2: Location of Ashton-under-Lyne and other tram stops on the Metrolink system

Context

Location

- 5 Ashton-under-Lyne tram stop (figure 2) is situated 10.8 miles (17.4 km) from a datum point located in Manchester city centre. It is the terminus of the East Manchester line. The stop has two platforms, identified as platform 'A' and platform 'B'. Platform 'B' (figure 3), where the accident occurred, is the more southerly of the two platforms.



Figure 3: Platform B at Ashton. The red arrow indicates the point at which the passenger was standing when he fell from the platform.

- 6 In common with all other tram stops on the Metrolink system, platforms are provided to match the vehicles in use. At Ashton-under-Lyne, the platform surface is 905 mm above rail height. The tops of the rails are flush with the surrounding concrete surface in which they are laid (figure 3).
- 7 The immediate area around Ashton-under-Lyne tram stop is accessible to pedestrians but not to road vehicles. Such an area is classified¹ as a segregated on-street tramway.

Organisations involved

- 8 Keolis Amey Metrolink (KAM) has been responsible for the operation and maintenance of the Metrolink system since July 2017. It employs the tram driver.
- 9 Control and supervision of the East Manchester line, in common with the rest of the Metrolink network, is exercised from a Network Management Centre (NMC) located at the Metrolink depot, near Old Trafford (figure 2). KAM employs the NMC controllers involved in the accident.
- 10 Transport for Greater Manchester (TfGM) is the public body responsible for co-ordinating public transport in the Manchester area. TfGM is the owner of the Metrolink system. It is responsible for the letting and management of the contract with KAM to operate and maintain the system.
- 11 North West Ambulance Service (NWAS)² provides emergency ambulance services in Manchester and north-west England. NWAS paramedics were involved in the care of the passenger at New Islington (figure 2), and after the accident at Ashton-under-Lyne tram stop.
- 12 All of these organisations freely co-operated with the investigation.

Tram involved

- 13 The tram involved was a Bombardier M5000 vehicle (figure 4), number 3040. It was operating a series of journeys collectively known as Run 38. The journey it was running at the time of the accident had started at Eccles (figure 2).



Figure 4: Photo of an M5000 tram similar to that involved in the accident, with the articulation section indicated

¹ As defined in 'Tramways Principles and Guidance', 1st edition, January 2018, clause 1.12, available at <https://uktram.com/wp-content/uploads/2018/07/Tramway-Principles-Guidance-Final-2.pdf>.

² NWAS is a National Health Service Trust.

- 14 The design and maintenance of the vehicle played no part in the accident. A defect was found with one of the CCTV cameras on board the tram, which was not causal to the accident. This is discussed later at paragraph 82.

Staff involved

- 15 The tram driver joined Metrolink in 2012 and completed his training in 2013. He held all the necessary competency certification for his role, and all his competency assessments were up-to-date. None of his recent assessments had indicated any concerns about his competence or behaviours.

External circumstances

- 16 It was dark at the time of the accident. The weather was dry, cloudy and windy and the temperature³ was around 7°C. The weather had no bearing on the accident.
- 17 On the evening of the accident, a European Champions League football match was being played at the Etihad stadium. The stadium is served by the Metrolink East Manchester line (figure 2). The match, which ended at 21:48 hrs, caused the East Manchester line, and the streets through which it operates in the vicinity of the stadium, to be very busy. This congestion caused delays to the journey of the tram involved in the accident (paragraph 25).

³ Data taken from readings at Manchester Airport, approximately 12 miles (19 km) from Ashton-under-Lyne.

The sequence of events

Events preceding the accident

- 18 At 21:22 hrs on the evening of 12 March 2019, the passenger involved in the accident alighted from a Metrolink tram at New Islington tram stop (figure 2). It has not been possible to determine where the passenger had travelled from, because the on-board CCTV system on the tram from which he had alighted was defective (paragraph 82).
- 19 The passenger initially sat on a bench at New Islington tram stop. At 21:35 hrs he fell from the bench, and CCTV images show him lying motionless on the tram stop platform.
- 20 At 21:46 hrs, a member of the public operated the passenger emergency call (PEC) device at New Islington. This put the person in contact with the controller in Metrolink's NMC (paragraph 9). Using the CCTV provided at the stop, the NMC controller was then able to see the passenger lying on the platform, and she then called for an ambulance to attend.
- 21 Before the ambulance got there, two police officers arrived at the tram stop. They checked on the welfare of the passenger, and placed him back on the bench.
- 22 At 22:16 hrs, the ambulance arrived and two paramedics spoke with the passenger. He declined any medical treatment, but told them that he wished to travel to Ashton-under-Lyne.
- 23 At 22:20 hrs, the tram operating Run 38 arrived at New Islington tram stop. As this tram was destined for Ashton-under-Lyne, the paramedics helped the passenger to board the tram. The tram driver, who was unaware that the paramedics were helping a passenger onto the tram, closed the doors and departed from New Islington with one of the paramedics still on board. The other paramedic remained on the platform.
- 24 The paramedic on the tram knocked on the driver's door and asked the tram driver to stop and re-open the doors. The driver explained that he was unable to do this, as the tram had now departed from the tram stop. As a consequence, the paramedic had to remain on the tram to the Etihad Stadium⁴ tram stop and then return to New Islington to meet his colleague.

Events during the accident

- 25 At 22:53 hrs, the tram arrived at Ashton-under-Lyne tram stop, platform B. Congestion caused by the football crowds had delayed the journey. The scheduled arrival time was 22:46 hrs, with the tram timetabled to return towards Manchester at 22:53 hrs.
- 26 Ashton-under-Lyne is a terminus and so the tram driver walked through the tram to change cabs ready for the return journey towards Manchester city centre. While walking through the tram, the tram driver found the passenger, apparently unresponsive. The driver roused the passenger, helped him to his feet, guided him to the nearest door and assisted him from the tram, onto the platform. The driver then proceeded through the inside of the tram to the Manchester end cab.

⁴ Holt Town tram stop, located between New Islington and Etihad Stadium, is not used when major events take place at the stadium, and therefore the tram did not stop at Holt Town.

- 27 At 22:55 hrs, the tram started to move. At that moment, the passenger was standing on the platform, leaning on the side of the tram. When the tram initially started to move, the passenger moved slightly away from the tram. However, once the articulation section of the tram (figure 4) had passed him, the passenger moved back towards the tram and once again came into contact with its bodyside.
- 28 Once the tram had passed the passenger, he was no longer supported by the side of the tram and he fell from the platform (a height of 905 mm, paragraph 6) and landed on the track (figure 5). Tram stop CCTV shows the passenger lying motionless thereafter.



Figure 5: The passenger falling from the platform onto the track. Image taken from tram stop CCTV (courtesy Keolis Amey Metrolink)

Events following the accident

- 29 At 22:59 hrs, the next tram to arrive from Manchester approached platform B. This was Run 39, operated by tram 3092. Fortunately, the driver of Run 39 saw the passenger lying on the track and was able to stop before reaching the passenger.
- 30 The driver of Run 39 reported the situation to the NMC. The emergency services were called to the tram stop, and the passenger was conveyed to hospital. He had suffered facial injuries, was detained in hospital and subsequently made a full recovery from these injuries.

- 31 Immediately after the driver of Run 39 had contacted the NMC, staff there reviewed CCTV footage from Ashton-under-Lyne tram stop. They realised that the injured passenger was the same person who had been attended earlier by NWAS at New Islington. The circumstances which led to the passenger becoming injured at Ashton-under-Lyne were understood within the NMC by 23:30 hrs.
- 32 The driver of Run 38 was unaware that an accident had taken place at Ashton-under-Lyne. Although NMC staff understood the circumstances of the accident, the driver of Run 38 was allowed to continue working for the remainder of his shift, which ended at 05:28 hrs. This was the driver's last shift before going on holiday.

Analysis

Background information

The tram dispatch process

- 33 All Metrolink tram services are operated solely by a driver. The driver is responsible for deciding when a tram may safely depart from a tram stop. Other staff may, on occasions, be present for revenue protection and other customer assistance purposes.
- 34 The driver is provided with two CCTV screens (figure 6), one on each side of the cab. Each screen measures 127 mm wide by 169 mm high. The images displayed on the screens vary depending on the setting of the door side selector switch (figure 7).

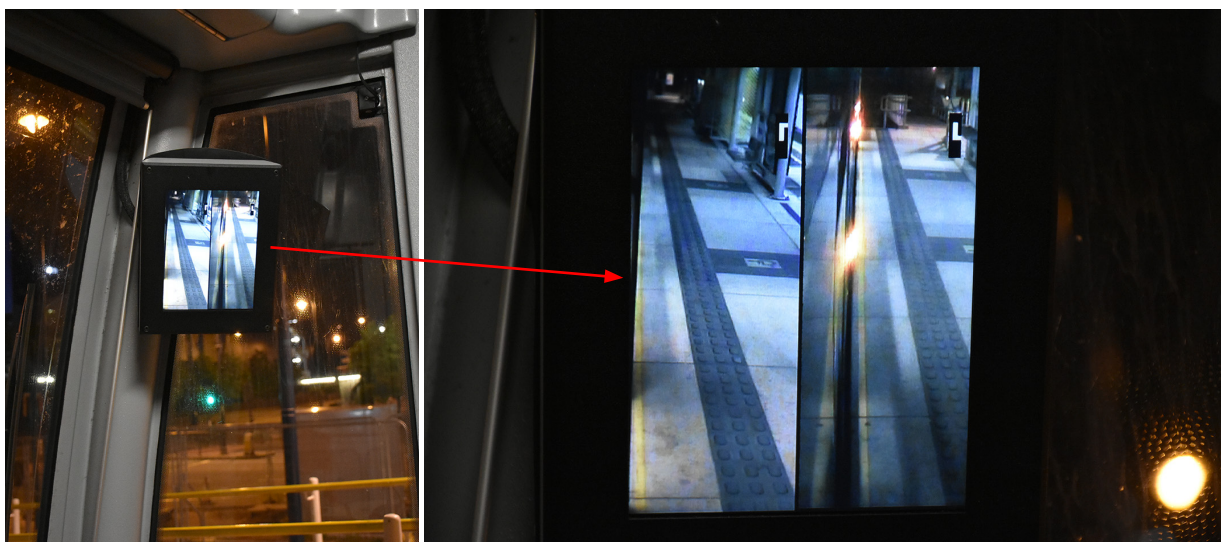


Figure 6: The CCTV screen which provides images to the driver from the side-view cameras. The image shows the screen displaying a 'split' view.

- 35 When the door side selector switch is in the central 'drive' position, the two CCTV screens provide images from cameras located on the side of the tram looking backwards. Each screen provides the rear-facing view from the camera on the respective side of the vehicle. The CCTV screens therefore provide the same type of view as door-mounted rear-view mirrors would on a motor vehicle. The provision of rear-view mirrors, or an alternative provided by CCTV, is a legal requirement⁵ for the operation of trams which can operate on streets with road traffic. For this reason, the door selector switch must be placed into the central 'drive' position before a tram departs from a tram stop.

⁵ Trams are generally required to comply with the legislation covering vehicles which operate on public highways, such as the Road Vehicles (Construction and Use) Regulations 1986 (SI 1986/1078) as amended, although a number of exemptions exist. See also 'Tramways Principles and Guidance', 1st edition, January 2018, clause 8.17 to 8.23, available at <https://uktram.com/wp-content/uploads/2018/07/Tramway-Principles-Guidance-Final-2.pdf>.



Figure 7: The door side selector switch on the driver's console

36 When a tram is at a tram stop, the driver uses the door side selector switch to choose which side of the vehicle the doors will be opened. The doors are opened and closed using separate push buttons. Changing the position of the selector switch causes the CCTV image, on the selected side, to be split vertically (figure 6). The split screen shows:

- on the left side, the view from the front camera looking along the side of the tram towards the rear; and
- on the right side, the view from a camera at the rear of the vehicle looking along the same side of the tram towards the front.

Changes to the dispatch process following an incident at Bury

37 On 30 May 2018, a passenger was trapped and dragged by a departing tram at the Bury tram stop on Metrolink (paragraph 92, [RAIB safety digest 08/2018](#)). Following this incident, KAM issued a series of safety briefs to tram drivers. These safety briefs:

- re-iterated the need to carry out an effective final safety check once the tram doors had been closed; and
- stated that the door side selector switch must remain 'enabled' (i.e. selecting the appropriate side) until after the final safety check had been carried out. This meant that the side-view CCTV image remained split, thereby improving the driver's visibility of the length of the vehicle, and hence reducing the risk that the driver may fail to observe an item trapped in the doors.

38 The driver involved in the accident at Ashton-under-Lyne had received and signed for these safety briefs.

Identification of the immediate cause

- 39 The passenger fell from the platform onto the track when the tram on which he was leaning departed from the tram stop.**

Identification of causal factors

- 40 The accident occurred due to a combination of the following causal factors:
- a) the passenger leaned on the tram for support after he alighted from it (paragraph 41); and
 - b) the tram departed while the passenger was in contact with it (paragraph 46).

Each of these factors is now considered in turn.

Alighting from the tram

- 41 The passenger leaned on the tram for support after alighting from it.**

- 42 The passenger was 46 years old. His mobility was impaired as a consequence of medical issues. At the time of the accident, he had to use a walking aid (a crutch) to support himself. CCTV evidence of his actions at New Islington tram stop (paragraph 19) indicates that he was probably further impaired at the time of the accident. The NWS paramedics who attended him at New Islington tram stop (paragraph 22) reported that he appeared drowsy and possibly intoxicated. As a result of the level of his impairment, he was having difficulty in standing unaided.
- 43 The tram driver first encountered the passenger on the tram as he changed ends at Ashton-under-Lyne to drive the tram back toward the city centre (paragraph 26). Prior to this, neither the NWS paramedics nor the KAM NMC had advised the tram driver that he had a passenger in an impaired condition on his tram, and therefore he had no advance warning of the passenger's condition.
- 44 The tram driver reported to the RAIB that he felt under time pressure due to the late running of his outbound journey (paragraph 52). He felt he needed to quickly determine what action to take when he encountered the passenger. He decided to assist the passenger from the tram (paragraph 26) and leave him standing on the platform close to the tram.
- 45 As a result of his impairments, the passenger was unsteady on his feet and he leaned against the tram for support.

The actions of the tram driver

- 46 The tram departed from the stop while the passenger was in contact with it.**

- 47 The driver had two opportunities to observe that the passenger was in contact with the tram:
- while carrying out the checks prior to moving the tram (paragraph 48); and
 - by checking the side-view CCTV as the tram started to move away from the stop (paragraph 67).

Checks to be carried out prior to departure

- 48 The driver reported to the RAIB that he was aware that the passenger was still on the platform when he decided to drive away, but he did not know that the passenger was in contact with the tram. CCTV evidence shows that the passenger was either in close proximity to, or leaning on, the tram throughout the period after he disembarked.
- 49 The Metrolink Rule Book⁶ requires that, prior to departing from a tram stop, drivers must:
- *‘ensure that doorways are clear of boarding and alighting passengers before closing the doors and that nobody is trapped in the doors after they are closed’;* and
 - *‘keep a special look out at station platforms for passengers who are visually impaired, have other disabilities or restricted mobility, and offer whatever reasonable assistance is possible’.*
- 50 The investigation identified a number of possible factors, some or all of which may have contributed to the driver’s actions:
- a) the driver felt under time pressure to depart from Ashton-under-Lyne tram stop (paragraph 51);
 - b) the dark clothing worn by the passenger made him difficult to see on the tram’s side-view CCTV (paragraph 54); and
 - c) the positioning of the tram signal at Ashton-under-Lyne meant that the driver had to divide his attention between the signal and the side-view CCTV screen (paragraph 60).

Each of these is now considered in turn.

Time pressure

51 The driver felt under time pressure to depart from Ashton-under-Lyne tram stop.

- 52 The inbound journey of tram Run 38 into Ashton-under-Lyne had encountered delays (paragraph 25) and the driver was aware that the next tram, Run 39, would be approaching the tram stop shortly.
- 53 The driver reported that he felt under self-imposed time pressure to depart from Ashton-under-Lyne. It is possible that this led to him carrying out a less effective checking of the CCTV screens than usual.

The visibility of the passenger

54 The dark clothing of the passenger made him difficult to see on the tram’s side-view CCTV.

- 55 It was dark at the time of the accident and the passenger was wearing dark clothing. To assess the visibility of the passenger in the side-view CCTV screen, the RAIB carried out a reconstruction at Ashton-under-Lyne tram stop during the hours of darkness.

⁶ Section H2.4. Document reference number 1614, Issue 03 September 2015. The document was produced by KAM’s predecessor, Metrolink RATP Dev UK.

- 56 The tests were carried out during the night of 31 May into 1 June 2019, using the tram that had been involved in the accident. A member of RAIB staff, of similar build and stature to the passenger, was dressed in dark clothing, provided with a similar walking aid, and acted as the passenger.
- 57 The tram was placed in platform B at Ashton-under-Lyne tram stop, and the actor was then positioned in a similar location to the passenger at the time of the accident (figures 8a and 8b).



Figure 8: a) Photograph taken during the RAIB reconstruction of the accident; and b) CCTV image during the RAIB reconstruction showing the view available to the driver. The individual in the reconstruction is dressed and positioned in a similar location to the passenger at the time of the accident.

- 58 The reconstruction verified that the passenger would have remained within the field of view of the CCTV system regardless of the position of the door side selector switch (paragraph 36) and whether the screen was in 'split' or 'normal' mode.
- 59 However, the reconstruction also showed that a person wearing dark clothing was difficult to see in the CCTV image (figure 8b). Although Ashton-under-Lyne tram stop is well-illuminated, the area to the east of it is dark. Therefore, the CCTV camera looking along the side of the tram would have provided an image of a passenger in dark clothing against a dark background.

The tram signal at Ashton-under-Lyne tram stop

- 60 **The positioning of the tram signal at Ashton-under-Lyne meant that the driver had to divide his attention between the signal and the side-view CCTV screen.**
- 61 A tram's departure from Ashton-under-Lyne tram stop is controlled by a tram signal. The operation of the tram signal is an integral part of the traffic light system controlling the intersection of Wellington Road and Oldham Road, just west of the tram stop. To obtain a proceed aspect on the tram signal, drivers must press the ready to start (RTS) control button in their cab prior to departure. The RTS system causes the tram to communicate, via the Metrolink tram management system (TMS), with the traffic light system.
- 62 This road junction is busy, even late at night. The RAIB was informed by several tram drivers that the junction has a reputation for car drivers 'jumping' the red lights. Tram drivers are wary of the junction and are vigilant for cars which may be making unauthorised movements across the junction, and potentially into conflict with tram movements.
- 63 Once the tram signal changes to show a proceed aspect, the traffic light control system allows 17 seconds for the tram to move off. If the tram fails to move off during that time, then the driver must go through the RTS process again. During that 17 seconds, the driver must make the necessary dispatch checks, close the tram doors and depart from the stop.
- 64 The tram signal for platform B at Ashton-under-Lyne is placed on the left side of the track (figure 9), whereas the screens providing the side-view CCTV images are on the right side of the cab. Therefore, the driver would have been required to split his attention between the signal and the CCTV screens. It is possible that this may have contributed to the driver not seeing the passenger in close proximity to the tram.



Figure 9: View from the cab at Ashton-under-Lyne platform B, showing the tram signal (circled)

Other potential factors

- 65 There is no evidence that the driver was distracted by a mobile device. He had two mobile phones with him at the time of the accident, a personal one and one issued to him by KAM. Analysis of the records for these phones shows no activity by either phone at or around the time of the accident.
- 66 The driver reported to the RAIB that he felt well-rested at the time of the accident. He was working his last night shift of a series of six. The accident occurred towards the start of the shift, and immediately after the driver had walked between the cabs to change ends. This action, and the encounter with the passenger, are likely to have dissipated any drowsiness which the driver may have felt.

Checking the side-view CCTV once the tram had started to move

67 The tram driver did not check the side-view CCTV after the tram started moving.

- 68 The tram driver reported to the RAIB that he did not check the side-view CCTV screens once the tram had started moving. He stated that his attention was solely focused on the road ahead. It is possible that, had the driver checked the side-view screens once the tram started moving, he might have seen the passenger in contact with the vehicle, but for the reason explained at paragraph 59, sighting of the passenger would have been difficult.
- 69 Unlike trains operating on main line railways, trams are fitted with rear-view mirrors or CCTV systems (paragraph 34) which remain operational whilst the tram is in motion.
- 70 The platform CCTV evidence shows that the passenger moved away from the tram once it started to move, but then moved back towards the tram and into contact with it (paragraph 27).

Identification of underlying factors

Interaction with impaired passengers

- 71 **KAM does not provide any guidance to its staff on appropriate actions if they encounter an impaired passenger on a tram.**
- 72 KAM has a 'walk-away' policy covering incidents with passengers who are violent or confrontational, but the passenger involved in the accident was neither violent nor confrontational. No other policies or guidance are provided for on-tram staff or control room staff on actions to be taken in circumstances such as those faced by the tram driver when he encountered the passenger at Ashton-under-Lyne.
- 73 KAM staff reported to RAIB that incidents of encountering impaired passengers have increased noticeably in recent years. The East Manchester line has a particularly high incidence of such occurrences. Suitable guidance would help drivers to balance the needs of the service with their own safety and the needs of impaired passengers.

Use of side-view CCTV monitors

- 74 **KAM's rule book and driver competence management system do not include any instructions on the use of the side-view CCTV monitors as a tram is departing from a tram stop. This is a possible underlying factor.**
- 75 KAM provides instructions to its drivers by means of a rule book and a tram driver's manual. Underpinning these documents are risk assessments covering tram driving and processes for tram driver recruitment, training and competency assessment. None of these documents provides guidance to drivers about when they should check the side-view CCTV monitors as a tram is departing from a tram stop.
- 76 A line of entry in the check list for the driver's assessments requires that drivers 'make additional use of side and rear monitors'. However, no criteria for this assessment are provided.
- 77 Trams operate on public highways, and the requirements of the Highway Code are therefore applicable. Rule 161 of the Highway Code directs drivers to 'use your mirrors frequently so that you always know what is behind and to each side of you'.
- 78 The tram driver believed that once the tram was moving away from the tram stop, he should not look in his side-view CCTV monitor because his attention should be ahead. Had the driver used his side-view CCTV monitor as he moved away from Ashton-under-Lyne tram stop, it is possible he might have seen the passenger leaning against the tram, although as explained at paragraph 59, the passenger was probably not clearly visible on the monitor. Nevertheless, in conditions of better visibility, appropriate use of the side-view CCTV monitors by drivers when leaving tram stops may prevent future accidents.
- 79 The appropriate use of the side-view CCTV monitors should not be to the detriment of a driver's primary focus of attention being on the road ahead.

Observations

Post-accident management

80 The post-accident management of the driver did not comply with KAM's procedures.

81 Although KAM's NMC staff had a full understanding of the accident shortly after it had occurred, the driver of Run 38 was allowed to continue driving for the remainder of his shift (paragraph 32). He was not asked for a report, nor was he tested for the presence of alcohol or drugs. This is contrary to KAM's processes for the management of accidents. However, there is no evidence to indicate that the tram driver was impaired by alcohol or drugs at the time of the accident.

Tram CCTV systems

82 CCTV systems were found to be defective on two trams involved in the events of the night of the accident.

83 It was not possible to determine where the passenger initially entered the Metrolink system because the CCTV system on the tram from which the passenger alighted at New Islington (paragraph 18) was defective.

84 The tram operating Run 38 (vehicle 3040) is fitted with a rear-facing camera. This camera provides the driver in the leading cab with a view taken from the rear cab. The images are displayed on a monitor screen located to the right of, and at a lower level than, the main cab desk (figure 10). The purpose of this system is to detect, among other things, individuals who may be 'tram surfing'⁷. When trams reverse, as at Ashton-under-Lyne tram stop, the images should change so that the driver is shown the view from the rear cab. Vehicle 3040 had a defect such that the view shown to the driver located in the 'Manchester' end cab was obtained from the camera at the 'Manchester' end. Therefore, the monitor did not show the view of Ashton-under-Lyne tram stop as the tram departed.

Communication between NWAS and KAM

85 There was no communications protocol in place between NWAS and KAM.

86 KAM's NMC staff were unaware that the NWAS paramedics had arrived at New Islington until the NMC staff observed the paramedics attending to the passenger on the tram stop CCTV. There was no communication between NWAS and NMC staff about the condition of the passenger or the paramedics' intention to place him on a tram.

87 Subsequently, when the paramedics helped the passenger onto the tram, neither the paramedics nor the NMC staff informed the driver that he had an impaired passenger on board. This meant that the first time that the driver became aware of the impaired passenger was when he found him on the tram at Ashton-under-Lyne tram stop.

⁷ Tram surfing is a dangerous practice whereby individuals ride on the outside of trams, holding onto windscreen wipers or other tram components.



Figure 10: positioning of rear-facing camera monitor screen

88 The lack of communication between NWS and NMC also led to one of the two paramedics becoming stuck on the tram when the doors closed and the tram departed from New Islington (paragraph 23). The paramedic had to travel to Etihad tram stop and back to New Islington during which time the ambulance crew was not available to respond to other calls.

Previous occurrences of a similar character

89 The RAIB has previously investigated several dispatch incidents involving trams.

90 On 15 June 2007, a man attempted to board an eastbound tram at the Wellesley Road stop on the Croydon tram system ([RAIB report 40/2007](#)). His hand or clothing appeared to have been trapped in tram doors, and when it moved off he had to run alongside it for about 15 metres before he could break free. The cause of the accident was that neither the tram driver nor the instructor who was in the cab at the time, reacted to the presence of the man who was trapped in the tram doors. The RAIB did not make any recommendations because Tram Operations Limited (the operator of the Croydon system) had briefed all its drivers and instructors on the lessons from this incident, including the importance of checking the mirrors after the tram has begun to move.

- 91 On 15 December 2017, an empty pushchair became trapped on the outside of a tram at Radford Road tram stop, Nottingham, when its plastic rain cover was caught between closing doors ([RAIB report 15/2018](#)). The incident arose as a result of a discussion between Travel Officers⁸ and a passenger regarding the validity of a ticket, which resulted in the passenger and his family having to get off the tram at Radford Road tram stop. The final visual door check, which drivers are required to carry out using the in-cab CCTV monitors, before departing from a tram stop, did not result in the driver being aware that the pushchair, shown as a small object on the CCTV monitor, was in an unsafe position. The RAIB issued urgent safety advice (reference [01/2018](#), paragraph 105) in response to this incident.
- 92 On 30 May 2018, a passenger was trapped and dragged in the closed doors of a Metrolink tram departing from Bury ([RAIB safety digest 08/2018](#)). The incident occurred because the tram driver was unaware that it was possible for an object to become trapped in the doors without being detected by the door systems. In response to this incident, and the urgent safety advice published following the Radford Road incident, KAM changed the tram dispatch process and briefed its drivers accordingly (paragraph 37).

Incident at Newton Heath and Moston

- 93 At around 20:40 hrs on 28 September 2019, a passenger's fingers were trapped in the doors of a Metrolink tram as it departed from Newton Heath and Moston tram stop (figure 2). The passenger became trapped between the outer seals of the closing doors and was dragged along, and off the end of, the platform over a distance of about 20 metres. CCTV shows the passenger subsequently leave the tram stop after the incident, apparently without serious injury.
- 94 The passenger, who had travelled from Oldham Mumps tram stop, alighted from the tram at Newton Heath and Moston. He became involved in a discussion with KAM Customer Service Representatives (CSR) regarding ticketing. During this discussion, the passenger obstructed the doors with his foot, and then inserted his fingers between the outer seals of the closing doors immediately before the tram left the stop.
- 95 The passenger was not close to the tram at the time the driver carried out checks prior to closing the tram doors. However, the trapped passenger was probably visible on the side-view CCTV monitor. By the time the tram indicated to the driver that the doors were closed, the driver had noticed that the passenger was near the tram, but he did not realise that his fingers were trapped. As happened at Ashton-under-Lyne (paragraph 67), the tram driver did not check the side-view CCTV monitor once the tram had started to move.
- 96 In common with the accident at Ashton-under-Lyne, the passenger involved in the incident at Newton Heath and Moston was dressed in dark clothing and the background beyond the tram stop was very dark. This may have made it difficult for the tram driver to see the trapped passenger on the side-view CCTV monitor.

⁸ Travel Officers (Nottingham Trams) and Customer Service Representatives (Metrolink) have very similar roles. This is to assist customers and to ensure that valid travel tickets are held.

- 97 Two KAM CSRs were standing inside the tram, by the door at which the passenger was trapped. Although they did not see the passenger's fingers protrude through the door seals, the CSRs reported that they were aware that the passenger was being dragged along the platform by the tram. The CSRs told the RAIB that they were unsure what actions they should take to stop a tram in the event of an emergency situation of this nature occurring.

Summary of conclusions

Immediate cause

- 98 The passenger fell from the platform onto the track when the tram on which he was leaning departed from the tram stop (paragraph 39).

Causal factors

- 99 The causal factors were:

- a) the passenger leaned on the tram for support after he alighted from it (paragraph 41, **Recommendation 3**); and
- b) the tram departed from the stop whilst the passenger was in contact with it. This causal factor arose due to one or more of the following:
 - i. the driver felt under time pressure (paragraph 51);
 - ii. the dark clothing worn by the passenger made him difficult to see (paragraph 54, **Recommendation 2, Learning point 1**);
 - iii. the positioning of the tram signal at Ashton-under-Lyne meant that the driver had to divide his attention between the signal and the side-view CCTV screen (paragraph 60); and
 - iv. the tram driver did not check the side-view CCTV once the tram had started moving (paragraph 67, **Recommendation 1**).

Underlying factors

- 100 An underlying factor is that KAM does not provide any guidance to its staff on appropriate actions to be taken if they encounter an impaired passenger on a tram (paragraph 72, **Recommendation 3**).
- 101 A possible underlying factor is that KAM's rule book and driver competence management system do not include instructions on the use of the side-view CCTV monitors as a tram is departing from a tram stop (paragraph 75, **Recommendation 1**).

Additional observations

- 102 Although not directly linked to the cause of the accident, the RAIB observes that:
- a) The post-accident management of the driver did not comply with KAM's procedures (paragraph 81).
 - b) CCTV systems were found to be defective on two trams involved in the events of the night of the accident (paragraph 83).
 - c) There was no communications protocol in place between NWS and KAM (paragraph 86, **Recommendation 4**).

Previous RAIB urgent safety advice relevant to this investigation

- 103 Although the passenger involved in the accident at Ashton-under-Lyne was not trapped in the doors, the previous urgent safety advice below is relevant insofar as it illustrates the importance of carrying out effective visual checks of the platform-tram interface before moving trams away from tram stops.
- 104 Following the incident on 15 December 2017 at Radford Road, Nottingham (paragraph 92), the RAIB issued urgent safety advice. The advice called for tram operators to take urgent steps to confirm or ensure that tram drivers:
- perform a thorough check after obtaining door interlock and before moving the tram to confirm that nothing outside the tram is trapped in the doors;
 - do not place sole reliance on the door interlock system when deciding whether anything outside the tram is trapped in the doors; and
 - are provided with the means to achieve the above.

Previous RAIB recommendation relevant to this investigation

105 Following the incident at Radford Road, Nottingham (paragraph 92), the RAIB made a recommendation which sought that Nottingham Tram Limited reviews:

‘...the initial training, refresher training and monitoring needed to ensure that travel officers:

- *apply appropriate procedures when removing passengers from trams;*
- *understand trap and drag risk and how this affects their work; and*
- *appreciate what should be considered as emergency situations and how they should respond to these.*

This recommendation may apply to other tramways...’

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

- 106 The Light Rail Safety and Standards Board (LRSSB) created a working group to provide guidance to operators of light rail systems on how to manage to risks from incapacitated or otherwise impaired passengers or other members of the public. The LRSSB has reported to the RAIB that this work is at an early stage.
- 107 KAM has met with all the emergency services who operate within the Metrolink area. The objective of the meeting was to commence work to improve inter-working between KAM and the emergency services.
- 108 KAM is in the process of revising its rule book covering operations on the Metrolink system. The revised rule book contains clear instructions for drivers when departing from tram stops. Section 2.2.5 of the revised rule book requires that the driver checks for people who may be too close to trams prior to departure, and that these checks, where reasonably practicable, continue until the back of the tram has left the platform.
- 109 KAM issued a safety alert to its staff following the incident at Newton Heath and Moston. This alert stated that drivers must stop the tram if they see passengers running alongside the tram. The alert also reminded drivers of the briefings issued following the Bury incident (paragraph 37) and also advised staff on board trams of the actions to be carried out if they believe that someone is trapped in the doors.

Recommendations and learning points

Recommendations

110 The following recommendations are made⁹:

- 1 *The intent of this recommendation is to minimise the risk of accidents at the platform-tram interface by improving drivers' observation of the interface, as trams depart from tram stops.*

KAM should complete the provision of the instructions to tram drivers about the correct use of the side-view CCTV monitors when departing from tram stops so that, where appropriate, drivers continue to scan the interface as the tram starts to move. These revised instructions, contained in the updated rule book, should be briefed to all tram drivers, and incorporated into the training and assessment procedures used within the driver management function within KAM.

- 2 *The intent of this recommendation is for tram drivers to have improved visibility of any passengers near trams at tram stops.*

KAM should:

- (a) carry out a review of the lighting conditions at tram stops to identify any local lighting conditions, taking into account backgrounds, which may make it difficult for tram drivers to see passengers in close proximity to the tram, particularly during night-time operations.
- (b) implement the findings of the review, in conjunction with TfGM, to improve the visibility of passengers at the platform-tram interface (e.g. by improving platform lighting and/or tram CCTV systems).

This recommendation may apply to other light rail operators in the UK.

⁹ 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.

- 3 *The intent of this recommendation is that tram drivers are better able to manage the safety of impaired passengers, particularly around the platform-tram interface.*

KAM should undertake a risk-based review of the actions which tram drivers should carry out if they encounter an impaired passenger. This review should consider the well-being of both the staff member and passenger. Once completed, the output of the review should inform guidance for staff. This guidance should be incorporated into the training and assessment procedures used within the driver management function within KAM.

This recommendation may apply to other light rail operators in the UK.

- 4 *The intent of this recommendation is to improve the communication between North West Ambulance Service and KAM, to reduce risk to both staff and passengers.*

North West Ambulance Service and KAM should jointly develop and agree communication protocols so that each organisation is aware of the other's intentions and actions when dealing with incidents and accidents which affect Metrolink operations. The protocols should aim to reduce overall risk to both staff and passengers and should be communicated to all relevant levels within both organisations.

Learning points

111 The RAIB has identified the following learning points¹⁰:

- 1 The RAIB reconstruction in this investigation showed that in certain circumstances it is difficult for drivers to see people at the platform-tram interface in their CCTV monitors during night time operation. Therefore, it is important that operators of tram systems are aware of which tram stops may be prone to such sighting difficulties and take this into account in their risk assessments and driver training processes.
- 2 The incident at Newton Heath and Moston, and the previous incident at Radford Road, Nottingham, show the importance of ensuring that revenue protection and similar customer support staff are trained and understand the actions to be taken in an emergency situation when on board a tram.

¹⁰ 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the 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

CCTV	Closed-Circuit Television
CSR	Customer Service Representative
KAM	Keolis Amey Metrolink
LRSSB	Light Rail Safety and Standards Board
NMC	Network Management Centre (Metrolink)
NWAS	North West Ambulance Service
PEC	Passenger Emergency Call
RTS	Ready to Start
TfGM	Transport for Greater Manchester
TMS	Tram Management System

Appendix B - Investigation details

The RAIB used the following sources of evidence in this investigation:

- information provided by witnesses;
- information taken from the tram's data recorder;
- closed-circuit television (CCTV) recordings taken from New Islington and Ashton-under-Lyne tram stops;
- CCTV recordings taken from the trams involved;
- site photographs and measurements;
- reconstruction of the events at Ashton-under-Lyne tram stop; and
- a review of previous RAIB investigations that had relevance to this accident.

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