



Rail Accident Investigation Branch

RAIB Bulletin 01/2009

Collision of tram and double decker bus in September 2008

Description of the accident

- 1 In September 2008, a tram and a bus collided at a complex road junction (see Figure 1). The tram was derailed by its front bogie and the bus suffered extensive structural damage to its front offside corner and driver's compartment. A member of the public travelling at the front of the upper deck of the bus was thrown out of a side window and received fatal injuries. Six other people, including the bus and tram drivers and passengers on the bus and the tram, were injured.
- 2 The tram had been signalled to pass through the junction, and was travelling at 29 km/h (18 mph) immediately prior to the collision. Although the bus had initially stopped at red traffic lights, it then drove forward and hit the tram. Following the collision, the tram stopped in 15.5 m but the bus turned ninety degrees and travelled 100 m at a high speed (due to the collision, damage to the bus driver's accelerator pedal and linkage caused the throttle to be stuck permanently open), until it hit a parked car and came to rest against the front of a shop.
- 3 Evidence obtained from Closed Circuit Television, including cameras onboard both the bus and the tram, shows the following (see Figure 1):
 - when approaching the stop line, four sets of traffic lights at 'B' were showing red and were visible to the bus driver; and
 - whilst the bus was stationary at traffic lights 'B', the traffic lights at 'K' turned to green. One of the green traffic lights at 'K' was visible to the bus driver because the louvres on that signal were damaged.
- 4 The reason for the bus driver passing the red traffic lights at 'B' is still the subject of an on-going police investigation. However, it is possible that the appearance of a green traffic light at 'K', on the other side of the road junction, was a factor.
- 5 The On Tram Data Recorder analysis showed that the tram was being driven correctly. The tram was travelling within the maximum speed for the junction of 30 km/h (18.6 mph). Following the collision, the tram came to a rest in 5.5 seconds.
- 6 The traffic lights (including the tram signal 'A') at the road junction have six separate stages and operate when actuated by motor vehicles, trams and pedestrian push button demands.
- 7 The maintenance of the traffic lights is undertaken by a contractor working for the traffic authority for traffic signals. According to the traffic authority's analysis of the road junction controller, the traffic lights were operating correctly on the morning of the accident.

Events prior to the accident

- 8 The highway authority¹ had requested an alteration to the method of control at the junction to enable an improvement for the provision of pedestrians at one part of the junction.
- 9 Consequently, the traffic authority developed a revised method of control which also had the effect of altering the sequence of lights that could be experienced by road traffic approaching the lights at 'B'.
- 10 On the morning of the day before the accident, traffic signal engineers from the traffic authority replaced an Erasable Programmable Read Only Memory processor in the controller for the junction to implement the modifications.

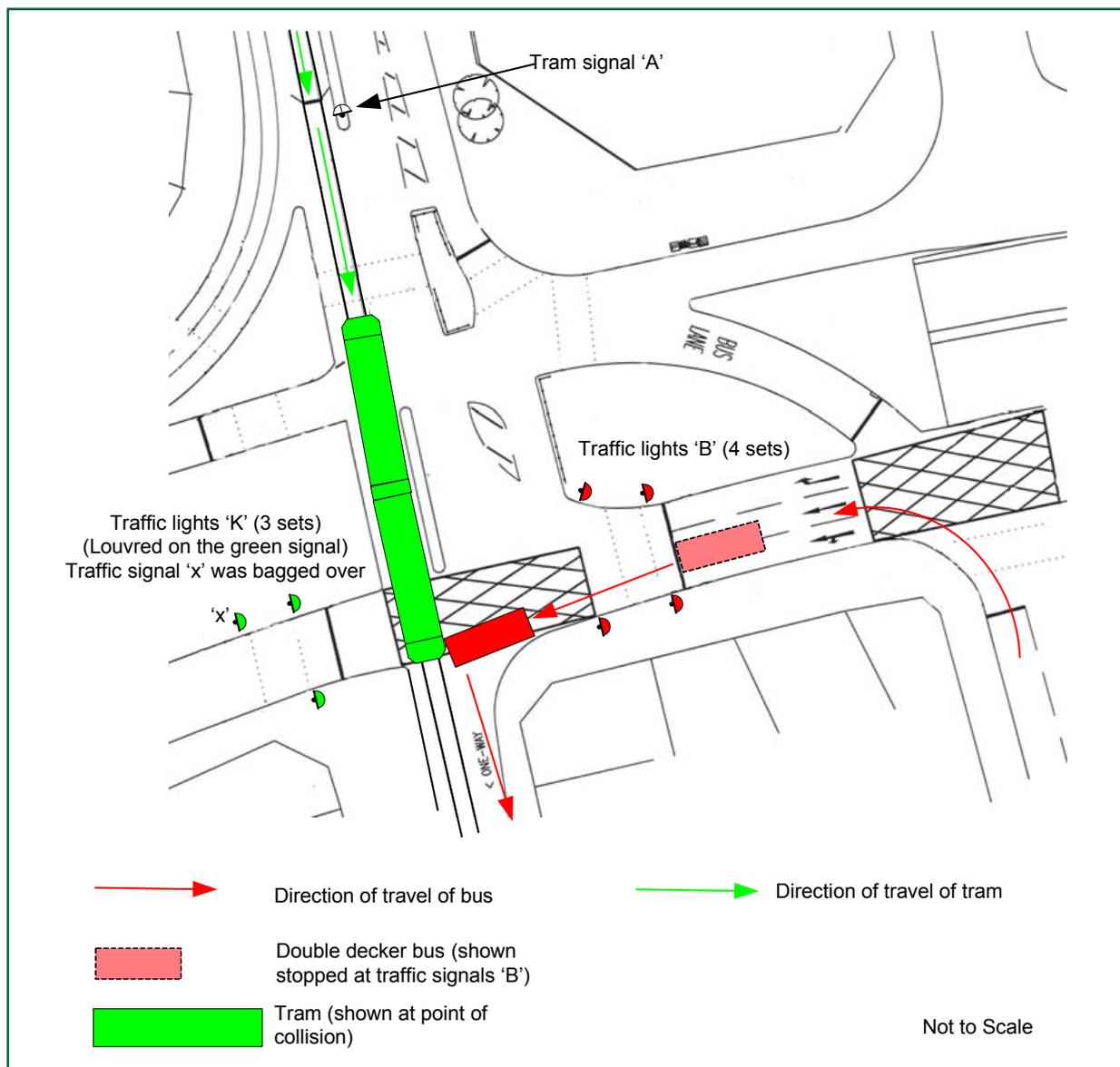


Figure 1: Diagram of road junction showing positions of the tram and bus and the relevant traffic lights

¹ The highway authority (the local council) is responsible at this junction for the highway (including road and drainage maintenance) and is also the traffic authority for items such as lane markings and stop lines. The traffic authority is responsible for traffic signals throughout the urban area in which this accident occurred (as set out in the Road Traffic Regulation Act 1984 [c.27]).

- 11 Before modification, vehicles following the same route as the bus involved in the accident would always encounter the four sets of traffic lights at 'B' showing red. In these circumstances the lights at 'K' (protecting the pedestrian crossing) would remain at red while tram signal 'A' was showing 'proceed' for a tram to pass through the junction. As soon as the traffic lights at 'B' turned to green, then the lights at 'K' would also turn to green.
- 12 After modification, it was possible for lights 'K' to change to green while the tram signal 'A' showed proceed and lights 'B' remained at red. The louvres fitted to the green signal of lights 'K' were intended to prevent this signal being seen by drivers of road vehicles standing at lights 'B', but prior to the accident these had been damaged and were not effective.

Events after the accident

- 13 Following the accident, traffic signal engineers undertook testing of the controller and the traffic and tram signals at the junction. There was no evidence to suggest any malfunction of the traffic lights at the time of the accident.
- 14 Following the RAIB's on-site investigation, the lamps in the green signal of the 'K' lights were disconnected by the traffic authority's contractor until repairs had been carried out on the louvres.
- 15 Immediately after the accident, tram drivers were instructed to drive their trams through the junction at a reduced speed of 20 km/h (12.4 mph). This was to allow initial investigations to be carried out on the traffic lights and the junction controller.
- 16 Two days later, the tram infrastructure manager placed a 10 km/h (6.2 mph) speed restriction through the junction. This was due to a crack being found in the 'keeper' rail and was unrelated to the accident. This rail was subsequently repaired and the speed restriction was reset to 20 km/h (12.4 mph) in late December 2008.
- 17 The speed restriction was instigated without the traffic authority. The effect of this was that the traffic lights at 'B' would change to green while the rear of the tram was still slowly moving through the junction (as reported in the local press). The timings in the controller of the junction were extended (within twenty four hours of the traffic authority being made aware of the incident) to cater for the slow running of the trams. This prevents the next stage being operated and the green lights being displayed to road traffic until the tram is clear of the junction.

Other Matters

- 18 Although the RAIB had been informed that testing of the junction's traffic controller was to be carried out, and had requested that this testing did not start until they were present, testing by the traffic signal engineers (paragraph 13) began before the RAIB were on site. This action was contrary to the requirements of Regulation 9 of the Railways (Accident Investigation and Reporting) Regulations, 2005; it is an offence to interfere with evidence on the site of a serious accident (as defined in the regulations) without the express permission of the RAIB.

Learning Points

- 19 Following a review of the evidence, the RAIB has decided not to conduct a full investigation as it does not believe that such an investigation would lead to the identification of any further significant lessons that would improve the safety of tramways or prevent tramway accidents and incidents. However, there are some learning points which may be of benefit to other tram operators, infrastructure managers and organisations with a responsibility for road traffic management in urban areas where trams operate.
- 20 These learning points are:
- the need to carry out regular checking, maintenance and timely repair of road traffic lights and in particular ones fitted with louvres;
 - the need to brief relevant staff on the role of the RAIB and in particular the need to preserve evidence and not to undertake testing until permission is given; and
 - although not directly related to the accident, it is observed that there is a need to ensure effective liaison between the tram operator, the tram infrastructure manager and the highway and traffic authorities on matters related to road junction operational changes and alterations to traffic controllers.
- 21 The RAIB has also noted that the side windows on the upper deck of the bus appeared to offer little protection to persons sitting on a front seat in case of a collision of this type. The RAIB has written to the Department for Transport and the organisation who manages the bus services to express its concern.

The events described above took place at the junction of George Street and Park Lane (slip road) in Croydon on 7 September 2008.

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