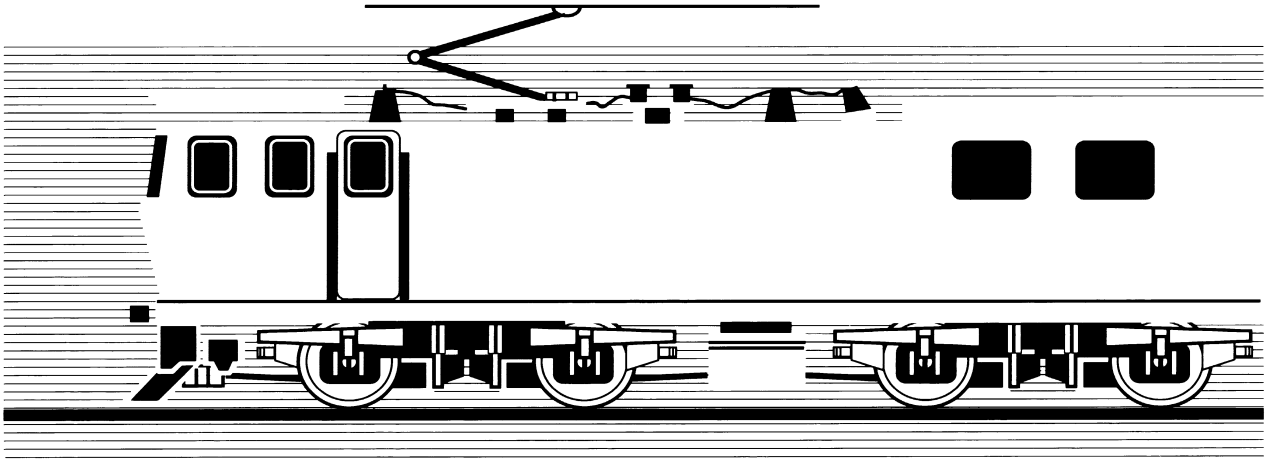
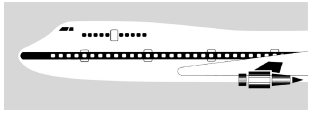
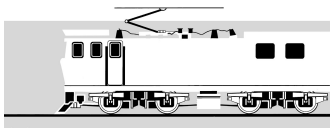


RAILWAY OCCURRENCE REPORT

01-111 Electric Multiple Unit Passenger Train 2621, door opening incident, Ava 15 August 2001


TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that 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 Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Report 01-111

Electric Multiple Unit passenger Train 2621

door opening incident

Ava

15 August 2001

Abstract

On Wednesday 15 August 2001 at about 0930 hours, Train 2621, an Upper Hutt to Wellington electric multiple unit passenger service, departed prematurely from Ava station with the doors on the passenger cars open. The train travelled about 200 m with the doors open before the Tranz Metro Driver became aware of the situation and brought it to a halt.

There were no injuries to passengers or staff.

The safety issues identified included:

- the training and certification of new entrant staff for guard duties
- the procedures for Tranz Metro Drivers to follow before departing stations
- the design of the right-of-way signal system on Tranz Metro trains.

Three safety recommendations were made to the operator.

Contents

Figures

Abbreviations

EMU	electric multiple unit
m	metre(s)
Tranz Rail	Tranz Rail Limited

Data Summary

Train type and number:	Electric Multiple Unit passenger Train 2621
Date and time:	15 August 2001 at about 0930
Location:	Ava
Persons on board:	crew: 3 passengers: about 150
Injuries:	crew: nil passengers: nil
Damage:	nil
Operator:	Tranz Rail Limited (Tranz Rail)
Investigator-in-charge	D L Bevin

1. Factual Information

1.1 Narrative

1.1.1 On Wednesday, 15 August 2001, Train 2621 was a scheduled Tranz Metro Ganz Mavag electric multiple unit (EMU) passenger service from Upper Hutt to Wellington, and consisted of 2 ET Class non-powered and 2 EM Class powered passenger cars.

1.1.2 Train 2621 was crewed by a Tranz Metro Driver (the driver), a guard who was working the front 2 passengers cars, and a passenger operator who was working the rear 2 passenger cars. This crew had taken the EMU from Wellington to Upper Hutt as Train 2620. The train had departed Wellington 15 minutes late, arrived in Upper Hutt 14 minutes late, and left Upper Hutt at 0842, 12 minutes late.

1.1.3 Train 2621 stopped at all stations after departing from Upper Hutt. The driver said that after stopping at Ava he had received a doors closed light on the driving console in front of him (refer Figure 1) and a short blast on the right-of-way buzzer, so he departed. He was not sure how long the train had been stopped before he had received the right-of-way signal, nor how far he had travelled before he noticed that the door closed light had "gone out", but he immediately stopped the train when he noticed the light had extinguished.

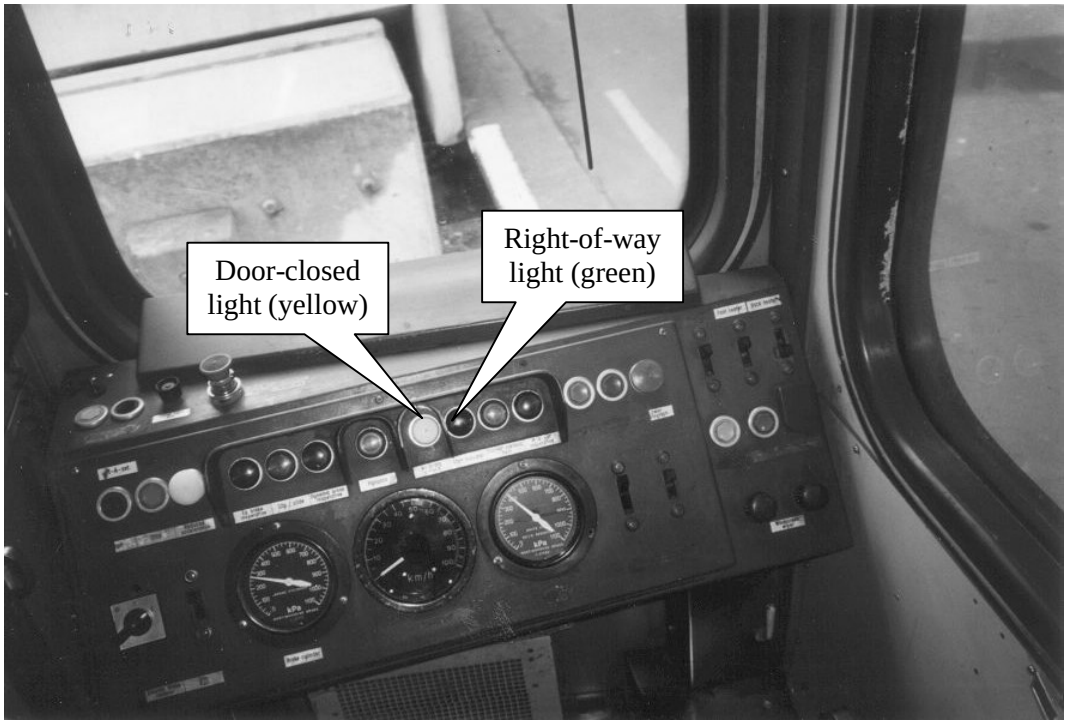


Figure 1
The console in the LE's cab

1.1.4 The guard said she had been standing at the first door (door 1) on the right side of the second passenger car in preparation for operating the doors at Ava. When the train had stopped she inserted her key into the door control box (refer Figure 2) and opened the doors for passengers to alight and board. While the doors were open she stood in the door well and looked back along the train. She saw one of the last boarding passengers step back from the train because it had started to move.

1.1.5 The guard initially thought the train was just creeping ahead and expected it to stop. She waved goodbye to the passenger operator, who had stepped on to the platform to check for any late passengers. As the train picked up speed, the guard became alarmed and tried to signal the

driver to stop the train with 3 quick pushes of the right-of-way signal button[1] from the door control box at door 1, but found that the signal button was stuck in the depressed position. She tried to release it by banging it but was unsuccessful, so she tried again to signal the driver, this time by turning her key off and on[2] three times while it was still inserted in the door control box.

1.1.6 The train continued to accelerate so the guard removed her key and ran to the next door (door 2) about 6 m further back in the same passenger car. Once there, she inserted her key into the door control box and tried again to signal the driver with three blasts on the signal button. She waited about 10 seconds then repeated the signal. She thought that the train had started to slow so she removed her key and ran to the driver's cab, about 30 m away at the front of the leading passenger car.

1.1.7 By the time the guard arrived at the driver's cab the train had stopped and, after conversing with him, they returned to the passenger cars to establish the cause of the door-closed light becoming extinguished. All doors were then closed except for door 2 where the guard had attempted to send her last signals to the driver. The guard could not remember if she had closed the other doors of the passenger cars from the door control box at door 1 or door 2 before she went to the driver's cab. She closed the remaining door and, after the driver had confirmed that the door-closed light in the cab was illuminated, the train continued on to Wellington.

1.1.8 The passenger operator said that when the train stopped at Ava the doors had opened without any undue delay and he had alighted and walked across the platform to check for passengers coming off the overhead bridge. When he turned, he saw that the train had started to move away with the doors still open. He and 2 or 3 other passengers were left behind as the train departed.

1.1.9 A passenger who was travelling in the third car reported that the last passengers were boarding the train when it started to move off. As it accelerated away from the platform he heard some discussion amongst the passengers about how cold it was with the doors open while the train was moving. He did not notice any yellow light on the door control box next to the open door he was facing as the train started. After about 30 seconds he saw the doors close and at the same time the yellow light in the door control box illuminated. The train stopped shortly after. He estimated that the train had travelled between 200 m and 300 m with the doors open.

1.1.10 When the EMU arrived in Wellington it was inspected by mechanical staff who found no faults in the door-closed light in the driver's cab, but did find that the signal button in the door control box at door 1 of the second passenger car was faulty. This fault was fixed before the EMU was returned to service.

1.2 The train door system

1.2.1 A door control box was located at each set of doors in the passenger cars of the EMU (refer Figure 2). To open or close the doors the guard first had to insert a key into the door control box, which activated the door control system and allowed the doors to be operated. The door control box operated only the doors on the corresponding side of the car.

[1] The button on the control box which the guard uses to signal right of way to the driver after all the doors are closed. Three pushes was the signal for the driver to stop.

[2] The door controls are isolated and inoperative when the key is turned off or is removed from the control box.

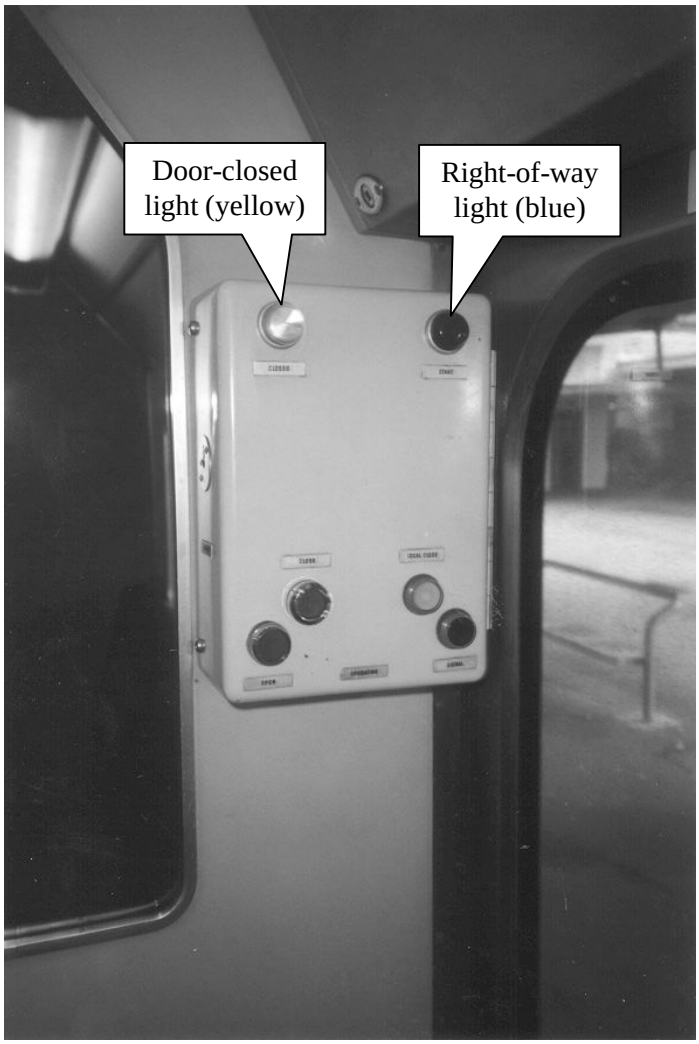


Figure 2
The door control box on an EMU

1.2.2 The door-close button closed all doors, except the door from which the guard was operating the controls (referred to as "local"), and a yellow light illuminated on the control box to indicate to the guard that all doors, with the exception of the local door, had closed. The guard then closed the local door by pressing the local door close button and, after visually checking that it had closed, pressed the signal button to authorise the driver to proceed. The signal button would not work unless all the doors were closed and there was a key inserted in that control box, which was a double defence against the guard giving right-of-way to the driver before all the doors were closed.

1.2.3 When a signal button was pushed, providing all doors were closed, a blue right-of-way light illuminated on the control box, and the driver received a green light on the console and an audible buzz until the signal button was released. The guard did not recall seeing a blue light on the door control box when she had inserted her key on arrival at Ava.

1.2.3 Once all doors were closed, a yellow light illuminated on the console confirming to the driver all doors were closed. This light remained illuminated until the doors were opened again.

1.2.5 Tranz Rail's rule for departing a passenger station after picking up and setting down passengers was:

> Rule 110 (a) Signals in connection with starting of trains – a Locomotive Engineer must not start the train until he has received authority to proceed either verbally or by a signal. On passenger trains the guards authority to start from passenger stops is also to be obtained.

Instruction 8.0 in Supplement R3.14 of the Rail Operating Code defined the guard's authority as:

> Blue Light (passenger compartment) Green Light (drivers cab) Buzzer (drivers cab). These indicate that all doors are closed and guard had given "right of way" to proceed. Clear Proceed one short (buzzer). Stop three short (buzzer).

1.3 The passenger emergency brake

1.3.1 Two emergency brake levers were located in each passenger car, either adjacent to or directly opposite each set of doors (refer Figure 3). This lever was connected directly to the air brake pipe of the train, and when it was pushed up it immediately effected an emergency brake application, and stopped the train.

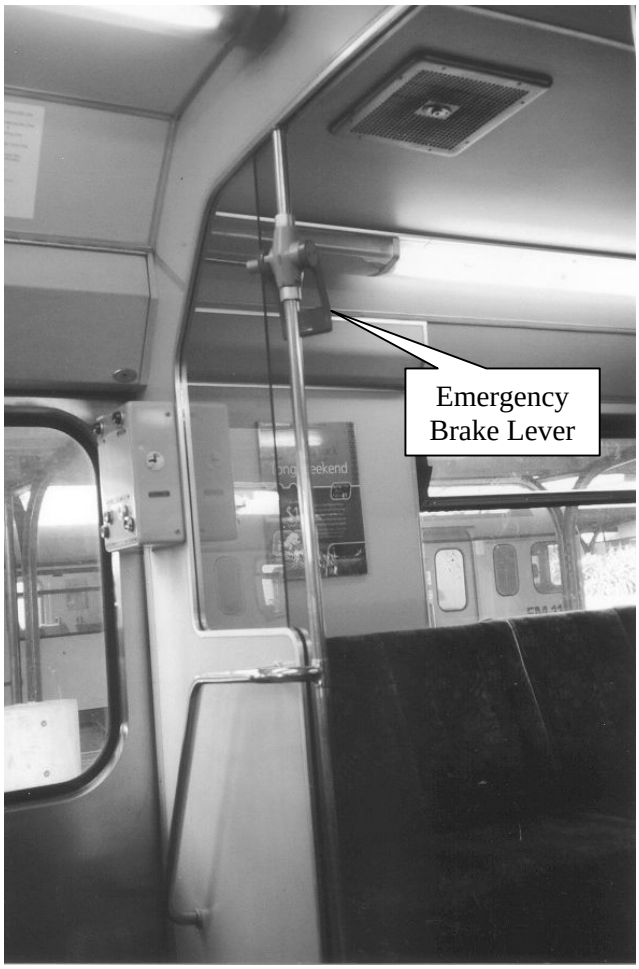


Figure 3
The passenger emergency brake lever in the normal or off position

1.3.2 There was an emergency brake lever located about 1.5 m away from, and immediately opposite, the door control box at door 1 and a second emergency brake lever located adjacent to the door control box at door 2.

1.4 Personnel

The driver

1.4.1 The driver had been driving EMUs in Wellington for 25 years and had been employed by Tranz Rail and its predecessors since 1970.

1.4.2 The driver had observed passengers standing on the platform as the train arrived at Ava. He said that he could not remember how long he had been stopped at Ava before he received the right-of-way signal on the buzzer, but thought it was "just normal time I suspect. Just the same as I stopped everywhere else along the way from Upper Hutt, all stations, I didn't notice anything abnormal happening". He thought normal time was "roughly about 30 seconds or more, by the time they got on and off, all depends on the amount of people there." When asked how much time had elapsed from when he first heard the right-of-way signal to when the train started to move, he answered "as per normal time."

1.4.3 The driver was initially unsure how far his train had travelled before he noticed that the door closed light had gone out but later thought it was probably about the length of his train. He had not received any stop signals on the buzzer from the guard before he stopped the train.

The guard

1.4.4 The guard had joined Tranz Metro 3 months prior to the incident. She had started as a passenger operator, but had continued her training, and had become certified as a guard about one week prior to the incident.

1.4.5 The guard could not remember when she had last used the door control box at door 1 of the second passenger car, as the train had stopped at 12 platforms on the right side in the direction of travel before it arrived at Ava. She said the defective signal button could have been last used at any of those. She had been working the front 2 passenger cars and so had the choice of 4 door control boxes to use whenever the train stopped.

1.4.6 The guard could not remember how long it was after the train stopped at Ava before she inserted her key, turned it and pressed the doors open button. She also could not remember how long the doors had been open before the train had started to move, but she did recall seeing the passenger operator standing on the platform and waving goodbye to him.

1.4.7 The guard thought that if the train was moving then the driver must have "got a signal of some sort" and she, therefore, focused her efforts on trying to get the train to stop by signalling the driver with the signal button.

The passenger operator

1.4.8 The passenger operator was employed on a part-time basis, to assist on those services with heavy passenger loadings. He initially thought that the driver had released the brakes and that the train was "just drifting" and would stop again, but as he watched, it slowly increased speed and travelled around the curve at the south end of Ava before coming to a stop. Because of his position he could not see if all the doors on the train were open, but confirmed that they were on passenger cars 3 and 4.

1.4.9 The passenger operator estimated that 20 to 30 seconds had elapsed from the time he alighted to the time the train moved off, as there had been sufficient time for disembarking passengers to walk away from the train, along the platform to the ramp at the northern end of the platform near where he was standing.

1.5 Training

1.5.1 The guard had started training as a passenger operator on 13 June 2001 and was certified for the role on 15 July 2001. She started her guards' training on 19 July 2001 and was certified for that role on 8 August 2001.

1.5.2 The guards' training in emergency procedures and equipment had included a requirement to locate, identify and use on board emergency equipment such as the passenger emergency brake, and on 13 June 2001 she was signed off as competent in this aspect of her course. From then, until her certification as a guard, her knowledge of emergency procedures was signed off at least 12 times as meeting requirements, by various tutoring and supervisory staff.

1.5.3 Tranz Rail advised that the use of the passenger emergency brake was demonstrated to trainees during passenger operator and guard training. The guard confirmed that she had received such training and was aware of the procedure for stopping trains in an emergency.

1.5.4 Tranz Rail advised that the guards' training module required the trainer to discuss and demonstrate the principles of door operation. In doing this it was normal for the trainer to discuss and explain that the signal button did not operate until all doors were closed. However, the training documentation did not specify an explanation of this technical feature. The emphasis was on demonstrating correct use and operation. The guard confirmed that she fully understood how the doors operated.

1.5.5 Tranz Rail's procedures for stopping a train in an emergency required the use of the passenger emergency brake. There was no specific action plan for a guard to follow when a train departed with the doors open, however, Tranz Rail advised that procedures and training taught that the doors must be closed before the train moved. Staff were expected to take appropriate action to prevent this, or stop the train, should it occur.

2. Analysis

2.1 The guard had used the doors on the right side of the train 12 times between Upper Hutt and Ava. She had the choice of 4 door control boxes in the front 2 cars, depending on where she was positioned when the train stopped at each station. Therefore, it was not possible to establish when she had last used the door control box at door 1 of the second passenger car, if at all. It is possible that the button in question had not been used by the guard during the trip, but had instead become stuck after being used on an earlier trip and was in a defective state when she took the service over prior to departing from Wellington.

2.2 After the doors had been closed the last time, either by this or a previous guard using the door 1 control box, the signal button had been pressed, authorising the driver to proceed but had not returned to its normal position. Therefore, when the key was removed from the door control box, the signal button became isolated and ceased to operate, remaining that way while the guard worked from any of the other 3 door control boxes on the right hand side of the front 2 passenger cars.

2.3 On arrival at Ava the guard had again inserted her key in the door control box at door 1. When she turned the key, the faulty signal button would have immediately sent a right-of-way signal to the driver until the doors were opened, effectively isolating the buzzer again. This unintentional right-of-way signal to the driver would have happened only seconds after the train had stopped at the platform.

2.4 The train departed Ava with all of its doors open. Therefore, the driver could not have had a door-closed light or received a right-of-way signal from the moment the doors were opened on arrival to immediately prior to moving. The time period between the right-of-way signal and the train's departure was longer than normal. Tests carried out on an EMU following the

incident confirmed that a right-of-way signal could not be sent while any of the doors were open.

2.5 The driver could see as the train approached the platform at Ava that there were a number of passengers intending to board. He obviously had enough presence of mind not to depart immediately on receiving the erroneous right-of-way signal from the faulty pushbutton, but the reason he subsequently departed without a current right-of-way signal, or door-closed light, some 30 seconds later is unclear. The driver may have been distracted by some other task or event, and, once over that distraction, may have subconsciously recalled having been given right-of-way, and then departed without checking his instrument console in front of him. The train was sometime behind schedule and the driver's desire to catch up, or at least not lose any more time, may have been a factor influencing his actions.

2.6 Tranz Rail's procedures for trains departing from passenger stations did not mention the doors-closed light on the console in the driver's cab, because a right-of-way signal could not, in theory, be sent or received until all the doors were closed. However, the light was a defence against the train departing without a right-of-way signal or, as in this case, when an unintentional right-of-way signal was received. Although there was no documented requirement for him to do so, had the driver referred to the doors-closed light on the console when starting the train he would have noticed that the light was not illuminated and probably would not have departed. A safety recommendation covering this issue is included in Section 5 of this report.

2.7 If the guard had been looking at the door control box at door 1 when she inserted her key she may have seen the blue light illuminate briefly as the right-of-way signal was sent but she was not expecting it and her focus would have been on opening the doors for passengers to alight and board the train. An audible signal from the door control box when the right-of-way signal was given would seem logical to alert the guard that a signal had been sent. The presence of such a buzzer may have alerted her to the situation much earlier and possibly enabled her to take quicker action to prevent the train from departing. A safety recommendation covering this issue is included in Section 5 of this report.

2.8 When the train started to move, the guard thought that it would stop again almost immediately, as can happen on rare occasions when the brakes are released before departure. However, her only action was to wave to the passenger operator. This showed that she had not recognised a potentially dangerous situation had arisen, although this should have been obvious when she saw an intending passenger step back from the train rather than attempt to board as it moved off. When she eventually realised that the train was not going to stop, she acted in haste and attempted to signal to the driver by using the signal button instead of immediately applying the passenger emergency brake, which was located opposite her on the other side of the carriage. Although she maintained that she had a knowledge of the operation of the doors, it appears she was either unaware or had forgotten that all the doors had to be closed before the signal button would operate.

2.9 The guard's actions in running from door 1 to door 2, then to the driver's cab, indicated that the use of the passenger emergency brake was not considered in her response to the situation. The guard had completed her training only one week before this incident, so whatever she had been taught should have been fresh in her mind. It is not unusual for inexperienced operators in any mode of transport to forget their emergency training procedures in the heat of an emergency or unsafe situation, but in this case the guard's actions indicate that her training had, firstly, not resulted in her recognising the potential seriousness of the situation and secondly, fully appreciating when to use the emergency brake lever, and how effective it would be in bringing the train to a stop.

2.10 The guard thought that the driver must have received a right-of-way signal to depart from Ava or he wouldn't have done so, and her actions indicate that she believed that she must have sent it somehow. Therefore, she thought that she could signal him to stop the train by again using the

signal button. Her actions in switching the key on and off to simulate three buzzers when she found the signal button was defective showed some presence of mind in the situation, and if she had closed all of the doors at the same time she may have been successful. However, while the doors remained open, the door control box was isolated and ineffective. Simply closing the doors would at least have reduced the potential seriousness of the situation.

2.11 The guard's training and certification programmes should have recognised her lack of previous rail experience and ensured that she remained in the role of passenger operator for a longer period to benefit from more on-the-job training, and to gain more experience before starting training for the role of guard. The recruitment of people without previous railway experience for passenger operator and guards' duties on EMUs is unavoidable, but it is essential that the training and promotion processes reflect this. A recommendation covering this issue has been made in section 5 of this report.

3. Findings

Findings are listed in order of development and not in order of priority.

3.1 A faulty signal button at the door control box for door 1 of the second carriage sent an unintentional right-of-way signal to the driver of Train 2621 within a few seconds of stopping at Ava platform. At the time of receiving the signal, the driver would have had a door-closed light illuminated on his driver console.

3.2 An audible signal to accompany the right-of-way signal at the door control box in the passenger cars would increase the awareness of guards to potential faults and would be a useful defence against similar occurrences in the future.

3.3 When Train 2621 departed Ava platform the driver had neither a right-of-way signal, nor a door-closed light illuminated on his console, but acted on the unintentional right-of-way signal received on arrival about 30 seconds earlier.

3.4 A procedure requiring the driver to check that the doors-closed light on his console is illuminated before departing from a platform, would be a useful defence against similar occurrences in the future.

3.5 The driver of Train 2621 had the presence of mind not to depart his train from Ava platform seconds after stopping, despite having received an unintentional right-of-way signal to do so. Why he subsequently moved the train away from the platform with the doors open, 30 seconds after receiving the unintentional right-of-way signal, was not conclusively established, but may have been due to a combination of a sub-conscious recollection of having received such a signal, a degree of automation with the train having been stopped for the normal period of time, and the driver's desire to regain the current schedule.

3.6 Once the guard realised the train was departing prematurely with the doors open, she could have made the situation safer by either closing the doors, using the emergency brake lever to stop the train, or both. The actions the guard took instead showed that either her training had not fully equipped her to deal with emergency procedures, she had forgotten her training in the heat of the moment, or she was not sufficiently experienced to recognise or deal with the situation.

4. Safety Actions

4.1 On 30 April 2002 Tranz Rail advised that:

- all Ganz Mavag EMUs were being fitted with firmer springs on door control buttons to prevent sticking
- the colour of the "door closed" status light had been reviewed by staff but it was concluded that a change was not necessary
- The Rail Operation Code had been enhanced to confirm requirements for EMUs to be stopped when door status lights are extinguished

5. Safety Recommendations

5.1 On 30 July 2002 the Commission recommended to the Managing Director of Tranz Rail that he:

5.1.1 introduce changes to the existing staff training and promotion process, to ensure that prospective guards complete a predetermined length of time in a passenger operators' role, before progressing on to training and certification as a guard (030/02)

5.1.2 include in procedures for departing from stations a confirmation check by the Tranz Metro Driver that the doors are closed, by referring to the door-closed light on the console in the EMU cab (031/02)

5.1.3 install an audio system, similar to that available to the Tranz Metro Driver, as an additional advice to the guard when a right-of-way signal is sent (032/02).

5.2 On 26 August 2002 the Managing Director of Tranz Rail replied:

5.2.1 030/02 – Tranz Rail intend to implement this recommendation. A period of 80 hours is currently in place as a predetermined period that prospective Guards must complete in a passenger operator's role.

5.2.2 031/02 – Tranz Rail intend to implement this recommendation. It is anticipated that this recommendation will be incorporated into the Rail Operating Code by October 2002.

5.2.3 032/02 – Tranz Rail requires to carry out further work before deciding whether to implement this recommendation. In light of the safety actions taken to eliminate the root cause of this incident, Tranz Rail need to establish how this recommendation might add significant improvement to transport safety.

Approved for publication 07 August 2002

Hon. W P Jeffries
Chief Commissioner

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