RAIL SAFETY INVESTIGATION REPORT

DERAILMENT OF CITYRAIL PASSENGER SERVICE 37-K

HOMEBUSH

7 JANUARY 2009
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Released under the provisions of
Section 45C (2) of the Transportation Administration Act 1988 and
Section 67 (2) of the Rail Safety Act 2008

Investigation Reference 04421
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ACKNOWLEDGEMENTS

The locality map on page 5 in this report was reproduced with the permission of Ausways Publishing Pty Ltd from their Sydways Street Directory.

The diagram of the Homebush Track and Signal Configuration on page 7 was provided by RailCorp.

The graph of NSW SPAD statistics on page 22 was provided by the Independent Transport Safety and Reliability Regulator.
## GLOSSARY OF TERMS

<table>
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<th>Term</th>
<th>Definition</th>
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<tr>
<td>Area Controller</td>
<td>A qualified worker who monitors and controls train movements from a signal box.</td>
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<tr>
<td>Catch-points</td>
<td>A set of points usually comprising a single switch or run-off lead, the normal position of which provides an open trap to a movement in the facing direction resulting in an enforced derailment thus avoiding a potential collision between movements.</td>
</tr>
<tr>
<td>Down and Up lines</td>
<td>Trains that travel away from Sydney are Down trains. The lines that carry them are Down lines. Trains that travel towards Sydney are Up trains. The lines that carry them are Up lines.</td>
</tr>
<tr>
<td>Foul</td>
<td>In a position to obstruct rail traffic on an adjacent line.</td>
</tr>
<tr>
<td>Points</td>
<td>A set of points is located at the position where one track separates into two tracks (or vice-versa) and generally includes moving rail components each called a point (alternatively called a switch).</td>
</tr>
<tr>
<td>Signal Passed at Danger (SPAD)</td>
<td>Unauthorised passing of a signal displaying a stop indication.</td>
</tr>
<tr>
<td>Train Stop</td>
<td>A trackside mechanical device normally linked to a signal. When the signal is not clear to pass, the trip is raised which activates a passing train’s brakes through contact with the air valve at the front of the train.</td>
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EXECUTIVE SUMMARY

At 4:43pm on 7 January 2009 at Homebush, a CityRail eight-car Tangara passenger service passed Signal ST265L at stop without authority (SPAD) and derailed on the catch-points. No injuries resulted directly from the derailment or subsequent detrainment of passengers. A minor injury was reported by a young man using crutches who sustained a suspected sprained wrist while climbing the stairs to exit the platform adjacent to the derailed train. The Office of Transport Safety Investigation’s (OTSI) Duty Officer was notified of the accident at 4:55pm by RailCorp. OTSI deployed two investigators to the scene.

The CityRail train, designated as 37-K, consisted of an eight-car Tangara Electric Multiple Unit train and was carrying an unknown number of passengers. It was proceeding Westbound at Homebush Station where it was scheduled to stop. As the Driver was travelling alongside Homebush Platform he misinterpreted which signal applied to his line and accelerated with the intention of proceeding through to the next station.

As the train passed the end of the platform its brakes were activated by the train stop. To prevent the train from continuing onto the adjacent line and potentially colliding with another train, a set of catch-points were positioned to derail the train into a safe area. As a result of the catch-points performing their intended function, the leading car of 37-K derailed all wheels and the leading bogie of the second car also derailed, while the remaining six cars remained on the track. 37-K came to a stand 41 metres past the catch-points with the leading three cars and part of the fourth car beyond the platform and the remaining four cars adjacent to the platform.

Under the direction of the train guard, all passengers on the train were able to exit onto the platform using the train doors. Those passengers in the front four cars moved back through the carriages in order to exit via the crew compartment in the fourth car. The damage caused by the derailment was limited to the bogies and bodywork of the two front passenger cars and to the infrastructure associated with the catch-points.
The investigation found that the SPAD and subsequent derailment was a consequence of an error by the Driver who misinterpreted which signal applied to his line. The Driver was relatively inexperienced and it is probable that his driving and situational awareness were adversely affected by fatigue brought on by insufficient quality rest and sleep. It was also found that the position of the two signals, ST265L and S261S, increased the probability of a driver misinterpreting which signal applied to the line.

Associated with the Signal ST 265L were two safety features: the first, a train stop which automatically applied the brakes as the train passed the signal without authority (this reduction in speed as the train derailed mitigated the consequences of the SPAD) and the second, catch-points associated with the signal operated correctly and derailed the train away from the adjacent line. However, the position in the track layout of these two safety devices resulted in the derailed train stopping foul of the adjacent line. It was also found that the formation and ballast adjacent to the catch-points was sufficient to stop the train turning onto its side but not sufficient to stop it tilting to a 10 degree angle.

Following the accident the Driver had difficulty in communicating with the Area Controller and the Guard. He did not hold down the emergency button on the MetroNet train radio for the required length of time to operate it successfully.

The key recommendations made as a result of the investigation are for RailCorp to:

- reassess the Driver’s suitability for the duties associated with driving a suburban passenger train;
- ensure that drivers’ rosters make adequate provision for quality rest and sleep to militate against the onset and effects of workplace fatigue;
- reassess the sighting and placement of Signal ST 265L taking into consideration how it is visually perceived from a driver’s perspective. [Planned changes to the track configuration and signalling which include the commissioning of the line adjacent to the ‘Down Local’ line may mean this sighting review should be conducted again when the changes are completed.]
• examine the effectiveness of the train stop and the catch-points to ensure that, in the event of a derailment, it will not be possible for any part of a derailed train to foul the ‘Down Suburban’ line;

• assess the formation and ballast level adjacent to the catch-points and if necessary, adjust the level to ensure that a train remains upright when it is derailed by the catch-points; and

• review the design of the activation mechanism of the emergency MetroNet radio button with a view to improving its operability and functionality as a piece of rail safety emergency equipment.
PART 1  FACTUAL INFORMATION

Overview

1.1 At 4:43pm on 7 January 2009, a CityRail eight-car Tangara passenger service designated as 37-K passed Signal ST265L at stop without authority (SPAD) at Homebush. This all-stations to Regents Park service started in Sydney’s CBD and was heading West on the ‘Down Local’ line\(^1\). The train had previously stopped at Strathfield Station and was scheduled to stop at Homebush Station. After passing Signal ST 265L, which was at stop, 37-K derailed on catch-points No. 618.

1.2 The leading car derailed all wheels and the leading bogie of the second car also derailed. After derailing from the track, the wheels became embedded in the ballast which halted the progress of the train. The train came to rest without striking any rail infrastructure. The last five carriages of the train were adjacent to Platform 6 of Homebush Station which allowed the passengers to exit the train onto the platform. The only reported injury was to a young man on crutches who sustained a suspected sprained wrist while climbing the stairs to exit the platform adjacent to the derailed train.

Incident Narrative

Before the Derailment

1.3 The Driver and Guard took over the eight-car Tangara train at Central Station at 3:59pm from another crew who reported the train to be free of any defects. From Central Station the train stopped at all the City Circle stations before again stopping at Central Station. The passenger service which is designated as 37-K from Circular Quay then headed West stopping at a further 10 stations before reaching Strathfield Station. The train was on schedule before stopping at Strathfield at 4:41pm. It travelled on the ‘Down Local’ line proceeding towards Homebush where it was scheduled to stop at 4:43pm. The distance from Strathfield to Homebush is approximately 1km and the

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\(^1\) The ‘Down Local’ line ends before Homebush Station at ST241. The line through Homebush platform is bidirectional and as the train in this incident was travelling in the Down direction, the line is referred to as the ‘Down Local’ line.
posted speed limit is 50km/h reducing to 25km/h as it approaches a signal before Homebush Station.

1.4 Between Strathfield and Homebush there are three signals: ST 133L, ST 233L and ST 241L. As the train departed Strathfield the Driver observed Signal ST 133L displaying a green over yellow indication. This meant that 37-K was to proceed and that the next signal would be displaying at least a caution indication. Further on, the Driver observed Signal ST 233L displaying a green over red indication. This meant that 37-K was to proceed but the next signal may be at stop. The last signal before Homebush Station was Signal ST 241L and the Driver observed Signal ST 241L displaying a red over red indication over a small green. This meant that 37-K was to proceed ready to stop at the next signal and at ST 241L a speed board indicated that a maximum speed of 25km/h applied.

1.5 The Driver of 37-K should have been preparing to stop at Homebush Station. All indications were there for the Driver to stop;
   a. the previous signal,
   b. his schedule,
   c. his stopping pattern at all the previous scheduled stations,
   d. passengers on the platform preparing to board, and
   e. the signal ahead displaying a stop indication.

1.6 As 37-K was travelling alongside Homebush Platform 6 the Guard left his seat and can be seen in the CCTV footage at the door of the crew compartment in the 5th position car as the train travels beside the platform.

1.7 At the end of the platform there are two Gantry Signals, ST 265L and ST 261S (see Photo 1). The signal on the left, ST 265L, is the designated signal for the ‘Down Local’ line and ST 261S is the designated signal for the ‘Down Suburban’ line. Signal ST 265L was displaying red over red which indicated that 37-K was to stop at the platform. Signal ST 261S was displaying green over green, a proceed indication for any train on this adjacent line.
The Derailment

1.8 The Driver of 37-K did not to stop at the platform and failed to register that Signal ST 265L, which was showing red over red, was the signal that applied to his train. He became aware of a problem when he sighted the open points of the track ahead, so then moved the Master Controller to the off position. Before the Driver could make a brake application, the train stop tripped a lever under the front of the train, initiating a loss of air pressure and a full brake application. The Driver made a brake application 1.1 seconds after the train stop activated. However, 37-K was travelling at 35km/h, significantly above the 25km/h speed limit, when the train hit the train stop and the train did not slow before the first carriage and part of the second carriage travelled over the open set of catch-points (No. 618) and derailed.
1.9 At 4:43pm 37-K came to rest in loose ballast on the ‘Down’ side of the track approximately 66 metres beyond the end of Platform 6 (see Photo 2). The catch-points are positioned so that the train is derailed away from the adjacent line and towards the rail corridor fence. The fence is 5.7m from the catch-points.

1.10 The front two carriages derailed off the tracks and the train remained upright though the front carriage was tilted at approximately 10 degrees. The front of the first carriage was foul of the ‘Down Suburban’ line, albeit marginally. The front three and a half carriages were past the platform while the rear four and a half carriages were next to the platform, making access to these rear carriages straightforward.

Photo 2: 37-K derailed on catch-points past Homebush Platform 6
(Red arrow indicates direction of travel)

After the Derailment

1.11 The Driver of 37-K was uninjured and attempted to contact the Area Controller using the MetroNet train radio. He was unable to do so but was able to contact the Guard using the train intercom system. The Driver informed the Guard of the derailment who then contacted the Train Controller using his
After advising passengers in the front four cars to alight through the crew compartment door, the Guard walked back to the rear of the train and used the emergency door release mechanism to allow the passengers in the rear four cars to exit the train. The Guard also proceeded through the inside of the front four cars to locate the Driver and check the train for any injured passengers and to assist in their exit. Shortly thereafter, Police officers and additional RailCorp staff arrived at the scene to assist with the incident.

**Derailment Location**

1.12 Homebush is a suburb located 13km by rail West of Sydney’s CBD (see Figure 1). Homebush Station is located between Strathfield and Flemington on the main Western rail corridor in suburban Sydney.
Track and Operations Information

1.13 RailCorp is responsible for track maintenance and train control functions in this corridor. Train movement within the Sydney suburban network is monitored via a Rail Vehicle Detection System. The track is circuited, and the related signalling functions in this area are controlled from Strathfield Signalling Complex. Train operation on this line is bi-directional at Homebush.

1.14 There are a number of lines that go through Homebush, six that are functional and, at the time of the incident, one that is waiting completion before being brought into operation. When the new line is brought into operation it will service a new Platform 7 (see Photo 3) and the signalling arrangements will be changed.

![Photo 3: New Platform 7 and track](image)

1.15 The configuration of the tracks and signals at Homebush, together with the route of 37-K (shown in red), is shown in Figure 2.
Figure 2: Track and signal configuration at Homebush
Train Information

1.16 CityRail service 37-K consisted of an eight-car Tangara Electric Multiple Unit train (see Photo 4). It consisted of two 4-car units with a total train length of 162m and a total weight of 370t.

Injuries and Damage

1.17 The damage caused by the derailment was limited to the bogies and bodywork of the two front passenger cars and to the infrastructure associated with the catch-points.

1.18 The train contained an unknown number of passengers, although from one station CCTV camera there appears to be over 100 passengers. No Injuries resulted directly from the derailment or subsequent detrainment of passengers. A minor injury was reported by a young man using crutches who sustained a suspected sprained wrist while climbing the stairs to exit the platform adjacent to the derailed train.
**Employee Information**

1.19 37-K was crewed by a Driver and a Guard. The Driver operated the train from the front driver’s compartment and the Guard was located in the crew compartment in the 5th carriage. The Driver of 37-K was a newly appointed RailCorp train driver who had completed his driver training and had been driving independently for 10 weeks. He was based out of the Central Station Depot and was qualified for the route.

1.20 Following the incident, the Driver was stood down pending further assessment of his suitability to resume driving duties. As at the end of August 2009, the necessary assessments had not been undertaken.

1.21 The Guard had six years rail experience, four of which had been spent as a Guard. Both crew members were within their respective medical and competency assessment periods. Approximately 25 minutes after the incident both crew members were breath-tested by Police and both returned a negative result. The crew were also tested for the presence of prohibited substances by a RailCorp contractor and both returned a negative result.

**Meteorological Information**

1.22 The Driver of 37-K described the conditions at the time of the incident as being fine. The Bureau of Meteorology recorded a temperature of 31°C at 3pm at Sydney Olympic Park, some 4km away. The maximum temperature reached that day was 32°C and the previous two days were 35°C and 34°C.
PART 2 ANALYSIS

Causal and Contributory Factors

Introduction

2.1 Following the incident, a number of mechanical and electronic tests were conducted to determine if they played any role in the SPAD and subsequent derailment. The brakes of 37-K were examined by a Brake Systems Engineer and no faults were found. The signalling equipment was not damaged as a result of the incident and the points and signals were also tested by a Signal Systems Engineer and found to be fully functional. The signals between Strathfield and Homebush were checked; all are the new LED type signals and were operational at the time of the incident.

2.2 At interview, the Driver of 37-K acknowledged that he did not observe that Signal ST 265L was at stop as he approached it. He said he was focussing on the adjacent signal which was displaying a green over green indication. Having mistaken the signals, he passed Signal ST 265L at danger and derailed at the catch-points. Accordingly, OTSI’s investigation concentrated on matters that may have affected the Driver’s decision-making and actions.

Driver’s Actions

2.3 As the Driver approached Homebush Station, where he was scheduled to stop, the RailCorp passenger service 37-K was travelling at 18km/h. The Driver stated that he observed the two signals on the gantry at the end of the platform and that Signal ST 261S to the right was displaying green over green and Signal ST 265L to the left was displaying red over red. The train progressed alongside the platform at this speed when, at a point approximately half-way along the platform, the Driver moved the Master Controller to notch 3 and accelerated the train to 35km/h.

2.4 There is a newly built, but incomplete, track and platform to the South of the ‘Down Local’ line which were not commissioned for use at the time of the incident (see Photo 5). The Driver of 37-K thought that Signal ST 265L applied to the non-commissioned track to the South. There was no signal that applied at the time of the incident to this new, incomplete non-commissioned track.
Instead of slowing to a stop at the Homebush Station Platform 6, the Driver started powering with the intention of travelling through the station. As 37-K reached the end of the platform he observed that the catch-points ahead were in the open position which meant that his train would be derailed by this safety mechanism (see Photo 6). The Driver stated that, on realising this, he moved the Master Controller to the off position. According to the train’s data logger about 0.24 seconds later the train stop associated with Signal ST 265L tripped the device at the front of the train and caused the brakes to automatically apply. The Driver then made a brake application 1.1 seconds after the train stop activation. This action was redundant as the train stop had already tripped the mechanism to activate the brakes.

The action by the train stop 20m before the catch-points, or 2 seconds with the train travelling at 35km/h, played a part in slowing the train to reduce the effects of the train derailing. According to RailCorp, when the train stop activates the brakes, a Tangara will begin decelerating about 3.5 seconds later. Though the train would not have decelerated before the catch-points, the effect of the train’s brakes fully applied to its remaining carriages would have reduced the distance the train travelled off the rails.
Experience
2.7 The Driver of 37-K was not an experienced train driver having only completed his driver training 10 weeks earlier. The Driver was qualified for the route and he had travelled over this ‘Down Local’ route on seven occasions previously. He said that he had travelled the ‘Down Suburban’ route more often. When he had travelled on the ‘Down Suburban’ route he had driven only no-stopping services. He said that, as he travelled from Central, he knew that this was an all-stopping route but, as he came into Homebush, he had a temporary lapse in concentration and thought he was on a no-stopping service. This lack of experience of train driving may have contributed to his actions and to his misinterpretation of the signals.

Driver Training
2.8 Training records show that the Driver had completed all aspects of the driver training course and was deemed competent to undertake driving duties. It was noted, however, that his driver training had been interrupted for seven months as a result of severe injuries he sustained in a motor vehicle accident. He had passed his most recent medical in 2007 without any restrictions being placed on his train driving.
Previous Errors
2.9 The Driver admitted to having already made errors on this run at Lewisham and Newtown. The data logger download confirmed that, on approaching both stations, he had unnecessarily made an emergency brake application by moving the brake controller past the service zone. This exemplified poor concentration on the Driver’s part in that no brake related faults were found on the train and the event recorder showed satisfactory braking performance at the time of each incident.

Fatigue
2.10 The training that drivers undertake in relation to fatigue management is included as a core module in RailCorp’s induction training for new staff. It covers topics such as circadian rhythms, the effects of fatigue on health, fatigue management tools, strategies for shiftwork, lifestyle management and employee responsibilities. If employees believe they are unfit for work due to fatigue, they are encouraged to report to their supervisor/manager the circumstances in which fatigue and lack of sleep are impacting on their well being and workplace safety. Employees who do self-identify are asked to take sick leave for that shift. If this continues, then management discusses the issue with the employee to try to find the cause of the problem. Following this initial training, there are ongoing employee awareness sessions.

2.11 The SPAD and subsequent derailment occurred during an afternoon after a period of elevated day and night-time temperatures. The Driver admitted that he was tired and had not been sleeping well due to the heat and the effects of some late shifts that he had worked in the days prior to the incident. Two days before the incident the Driver had completed a shift at 2:00am, and was only able to catch a train home at 3:25am which took about one hour and 45 minutes to reach his home station. He went to bed at 6:00am but found it difficult to sleep as it was a hot day and his home did not have air-conditioning. He awoke at 11:00am and had to start his next shift at Central at 2:00pm. He travelled into Central and worked an eight hour shift which was completed at 10:00pm. He travelled home again and was in bed after midnight. From these times it is probable that the Driver had no more than six or seven hours sleep that night. Notwithstanding individual differences, it is generally recognised that on average adults require seven to eight hours sleep per night. “Less sleep than required can lead to ‘sleep debt’ which can...
adversely affect fatigue and reaction times, concentration and judgement and decision making. Sleep debt is accumulative and over several days the effects can be compounded.” A sleep period of less than seven hours would not have allowed sufficient opportunity to recover from the sleep deficit that occurred the day before, where the Driver slept for approximately five hours.

2.12 On the day of the incident the Driver awoke around 7:00am. He arrived at the station to catch the 1:30pm train to Central Station. He said that he had to wait in the sun on the station and that the air-conditioning on the train was poor. His journey time was one hour and 45 minutes and he started his shift at Central Station at 3:39pm. The Driver stated that he was tired when he began his shift. This is despite his roster conforming to RailCorp’s fatigue guidelines. A fatigue analysis using Fatigue Audit Interdyne (FAID) shows that his fatigue score on the day of the incident was 37. A score in this range would indicate, according to FAID, that he was in the normal range and able to commence his shift.

2.13 The time of day when the incident occurred is also in a known period of performance degradation. Research has shown that there are certain periods during the day when performance levels fall. “Fatigue engendered by sleep loss and circadian disruption can degrade all aspects of human capability. Significant reductions in operator performance can affect judgement and decision-making, attention, reaction time, alertness, memory and mood. These degraded performance factors can increase fatigue-related risks and reduce the operational safety margin. A second period of known sleepiness occurs at about 3pm to 5pm. These windows of circadian low are associated with decreased performance, alertness and mood and are especially relevant in an incident investigation when a critical phase of operation occurs during one of them.”

Dehydration
2.14 The afternoon of the incident was hot, about 30°C. However, the driver’s compartment was cooled by an operational air-conditioner. The Driver said that the cabin was at a comfortable temperature. The Driver did not leave the

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cabin of the train between Central and Homebush. He had a water bottle with him in the cabin, yet he stated immediately after the incident that although he felt dehydrated he did not drink from it as he did not want to have frequent toilet breaks when he was driving. It is difficult to determine if the Driver was dehydrated to an extent that it would have affected his performance especially taking into account that he was working in an air-conditioned environment. However, it should be noted that research shows that dehydration can lead to poor decision-making as well as increasing the effects of fatigue.4

Distractions
2.15 The Driver of 37-K was issued with a RailCorp mobile phone. According to the phone record and the Driver’s testimony, he was not distracted by any mobile phone calls during his trip or around the time of the incident. The Driver stated that, while he was driving, he had a transistor radio turned on in the cab. This is normal for drivers and is not thought to have been a distraction to the Driver. There was no other person in the cab at the time and there was no communication with the Guard during the journey prior to the incident.

2.16 The Driver was due to go on an extended holiday later in the week. He stated that he had not had any annual leave for quite a while and that he was looking forward to the break.

Sun-glare
2.17 The train was travelling in a westerly direction but the altitude of the sun was 40 degrees which is sufficiently high to eliminate glare as a factor. Examination of the Driver’s window after the incident showed it to be clean and relatively free from scratches. The Driver had the blind pulled half-way down as the train entered Homebush Station and this was confirmed by the CCTV footage.

2.18 The Driver stated that he had lost his sunglasses the previous week and had not replaced them. It is known that the use of sunglasses can reduce eye strain or eye fatigue due to glare. In this case it is difficult to determine if this increased his level of fatigue.

Communications

2.19 After the incident the Driver was unable to perform basic safety critical functions such as correctly operating the radio. He said that, as the train derailed, tilted and then finally stopped, he was showered by glass debris from above (remaining from a previously vandalised destination sign) which caused him to experience a flashback to a recent serious motor vehicle accident he was involved in. This previous accident experience and his reaction to it may have been a factor in unsettling the Driver and cause him to become confused and not correctly operate the emergency communication devices available to him.

2.20 The Driver stated that he tried to communicate using the train radio and pushed the train radio emergency button a number of times without it activating. In order to operate the train radio a button needs to be depressed on the side of the handset. The button needs to be pressed for 1.5 seconds for it to operate and it is likely that the driver failed to hold the button for a sufficient time. He had tried to contact the Area Controller without success. He said he could hear the Area Controller but the Area Controller could not hear him.

2.21 The Driver also tried to find a number in his mobile phone but was unable to find any numbers due to his confused state of mind immediately following the incident. He was finally able to speak to the train’s Guard using the train intercom system and relay the information to him that 37-K was derailed. He stated that it was as though he was in the car accident again, his heart was racing and he was sick in the stomach. He remained in the crew compartment for some time.

2.22 The Guard was able to use his mobile phone to contact the Train Controller and inform him of the derailment. This occurred about 2 minutes after the incident. The Train Controller then informed the Area Controller that 37-K had derailed. The Area Controller had previously noticed that the track circuit was indicating a failure of some sort at this location.

2.23 Once the Area Controller was informed of the derailment, he placed blocks on the signals to prevent other rail traffic from colliding with the derailed train and then contacted Homebush Station staff in order to gather information from
persons on site. RailCorp initiated a major incident management process at 4:48pm and emergency services and RailCorp response teams were notified.

2.24 The Guard used the public address system to inform the passengers of the derailment and also opened the doors of the crew compartment of the fourth car to allow the passengers on the first four cars to exit onto the platform. He then went to the rear of the train and used the external door release to allow the passengers in the rear four cars to exit onto the platform. He met the Driver walking through the train and they both went to the Driver’s compartment and put the pantographs down to cut the power to the train. The actions of the Guard following the incident enabled the passengers to exit quickly and safely.

Guard’s Actions

2.25 The Guard of 37-K was a qualified and experienced guard. He signed on that day at 11:18am and joined 37-K at Central Station at the same time as the Driver. He was positioned in the crew compartment of the 5th car from the front. He said that there were no apparent train management issues and he had no need to speak with the Driver between Central and Homebush. The Guard stated that 37-K stopped, as scheduled, at all stations prior to Homebush Station and that, as 37-K travelled alongside Homebush platform, he got out of his seat and stood at the open door of the crew compartment. He said that he watched the train along the platform and was always cautious at Homebush due to platform curvature and platform structures.

2.26 The Guard said that he knew that the ‘Down Local’ line ended at Homebush and 37-K was required to crossover to the ‘Down Suburban’ line, so he looked for the Guard’s indicator light on the platform to see if it was illuminated. It was not. (An illuminated indicator tells the guard that the departure end signal is not at stop.) Knowing that the train was scheduled to stop, that the end signal was at stop, and that people on the platform were moving in anticipation of boarding the train, the guard had every reason to expect the train to be slowing before coming to a stop at the end of the platform.

2.27 The Guard said that, by the time he realised the train was not stopping, there was no time to do anything to warn the Driver before it had passed the signal and derailed on the catchpoints. One immediate audible warning would be for the Guard to twice press the bell button located above the door of the crew
compartment which would then sound in the Driver’s compartment. This is the customary warning that a guard would give to a driver and is reinforced in training. If the Guard had indicated using ‘two bells’ at any time along the platform then it is possible that the Driver may have applied the brakes in time to stop before the catchpoints. The Guard could have also activated the emergency stop handle located in the crew compartment.

2.28 This reaction by the Guard would have needed to occur in an 8 second timeframe, and would have been an unlikely response considering the normal expectation that the Driver would stop just as he had done at every other stop on this journey. An occurrence such as this happens only a few times in the career of a Guard, compared to the many normal stops where there is no need to react. Research indicates that human reaction time to a visual signal is normally in the order of 1.5 seconds, but that this can vary depending on a number of factors such as age, visual conditions, information load and expectation.\(^5\)

2.29 The Guard was questioned about the adequacy of his training and his ability to feel confident enough to activate the emergency stop handle. The Guard said that he was fully trained in emergency procedures and in responding to an incapacitated driver. He said that he was confident that his training was adequate and he would be able to respond in any emergency situation. He said that during his time as a guard he had on two occasions communicated with drivers about speeding. However, on this occasion, he was of the opinion that there was too little time for him to comprehend that there was a problem before the derailment occurred.

2.30 When the train started accelerating, he initially thought that the signal had cleared and that the Driver responded to the signal indication, forgetting to stop at the platform. When the train stopped, he thought that the Driver had finally remembered to stop but had overshot the platform by a few carriages.

2.31 When the Guard realised that 37-K was not stopping, he tried to contact the Driver by using the internal intercom, by which time the train had stopped. When the Driver finally contacted him using the intercom he said he heard the Driver say: “we are derailed”. It was the last thing he was expecting and went

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across to the other side of the crew compartment, opened the door and
looked forward along the side of the train to check. He could see that the first
carriage of the train had derailed and was tilted to the side. The Guard then
used his mobile phone to contact the Train Controller and report the
derailment, and to ask if the train was protected from any other trains entering
the section. The Train Controller assured him that the train was protected by
signals.

Signalling Aspects
2.32 The two signals which the Driver of 37-K confused are located on a gantry just
past the end of Homebush platform. These signals are fully visible to a Driver
approximately 100m away; beyond this they are obscured by a footbridge
(see Photos 3 and 7).

Photo 7: Gantry Signals from Homebush Platform
(Red arrow indicates direction of travel)

2.33 RailCorp’s Infrastructure Engineering Standard on Signalling states that:
“Fixed signals shall be correctly located to avoid misunderstandings as to their
purpose, and in particular confusion between signals on adjacent lines, or
between successive signals on the one line.” Next to Homebush Platform 6 the track takes a left-hand turn near the end of the platform which, at first appearance, makes the left-hand signal to appear above the non-commissioned track and the right-hand signal appear above the ‘Down Local’ line. Despite this the Driver should not have confused these two signals even though they are adjacent to one another. His training should have made him aware of which signal applied to the ‘Down Local’ line.

2.34 The RailCorp Infrastructure Engineering Standard on Signalling also stipulates that: “Fixed signals shall be correctly located to give a clear sighting distance for approaching trains, equivalent to a minimum of 6 seconds at line speed.” At 100m from the signal a driver travelling at the stipulated line speed of 25km/h would have a 14 second sighting of Signal ST 265L which is well within the specified standard.

2.35 RailCorp conducted a signal sighting test in August 2008 which found no problems with the signals in the Homebush vicinity. The track configuration in the area of the derailment is being changed as part of the RailCorp Clearways project. This will result in changes to Signal ST 265L and the track configuration.

Train Stop and Catch-points
2.36 The placement of the train stop on this running line signal assisted in slowing the train but only after the train had derailed on the subsequent catch-points. The trip arm was correctly raised as the associated signal (Signal ST 265L) was at stop. It provided a secondary visual indication along with the open catch-points that the signal was at stop. In interview, the Driver mentioned that these visual cues caused him to make the decision to make an emergency brake application.

2.37 The catch-points positioned past the train stop were correctly in the open position to cause the train to derail into a safe area away from any oncoming or through trains. The train came to rest in the ballast away from any major infrastructure and was tilted at an angle of approximately 10 degrees. A greater build up of ballast and formation may have caused a less degree of tilt to the front carriage. The front carriage was directed away from, but still was

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6 ‘Infrastructure Engineering Standard on Signalling’, RailCorp Standards, Version 1.0 6 March 2006
foul of, the adjacent ‘Down Suburban’ line. The Area Controller placed all signals at stop and applied blocking facilities once the derailment was confirmed.

2.38 The catch-points (No. 618) were previously examined in July 2007 by RailCorp. Their risk assessment recognised that a worst-case scenario would be the catch-points not functioning effectively, and a derailed train running foul of the ‘Down Suburban’ line being hit by another train. In this incident the train derailed at 35km/h and became foul of the ‘Down Suburban’ line only to the extent that the lower corner of the first carriage entered the envelope of the adjacent ‘Down Suburban’ line due to the tilting of this carriage.

**Previous Occurrences at this Signal and SPAD trends in NSW**

2.39 There was a record of one other SPAD at Signal ST 265L since 2004. In February 2006 a hi-rail maintenance vehicle passed Homebush Signal ST 265L when a Protection Officer directed the maintenance vehicle to proceed without the authority of the Homebush Area Controller.

2.40 According to the Independent Transport Safety and Reliability Regulator’s (ITSRR) Rail Industry Safety Report⁷, there were 226 driver-related SPADs in NSW in 2007-2008. These are SPADs where the driver has misjudged the signal or completely missed the signal as was the case in this incident. Approximately 65% of these SPADs were on the Sydney Metropolitan Network which has the highest number of signals.

2.41 According to ITSRR’s latest published data on signals passed at danger in NSW, the trend for SPADs caused by ‘Driver Misjudged’, ‘Completely Missed While Running’ and ‘Starting Against Signal’ since 2006 has seen a small annual rise (see Figure 3). This rise is consistent with a change in passenger train movements on the Sydney Metropolitan Network which has had an annual increase of about 5% from 2006, and may also reflect increased automated SPAD reporting.⁸

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⁷ Independent Transport Safety and Reliability Regulator’s Rail Industry Safety Report

⁸ Independent Transport Safety and Reliability Regulator’s Signals Passed at Danger (SPAD) Report
Emergency Response

2.42 Emergency services and RailCorp response teams were notified four minutes after the derailment. A passing Police officer from the Flemington Local Area Command arrived at the site soon after the derailment and a tender from Concord Fire Brigade arrived on site at 4:52pm. RailCorp’s Network Operations Superintendent arrived at 4:53pm. At 5:00pm an ambulance arrived on site and transported a young man to hospital with a suspected sprained wrist. The emergency response following the incident was rapid and effective.
PART 3  FINDINGS

3.1 In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. **Causation**
   The derailment was the result of the standard operation of catch-points in response to Signal ST265L being passed at danger by service 37-K. The driver of 37-K responded in error to Signal ST261S on an adjacent line which displayed a proceed indication instead of Signal ST265L which governed his line and was at stop.

b. **Contributory Factors**
   The following factors contributed to the incident:
   
i. The Driver was relatively inexperienced which may have led to a misinterpretation of which signal applied to his track.
   
   ii. It is likely that the Driver was not sufficiently rested to enable him to effectively perform his duties.
   
   iii. Signal ST265L is sited in a manner and location that meets the required technical parameters. Yet the position of the two signals, ST265L and ST261S, increased the probability of a driver misinterpreting which signal applied to which line.

c. **Effectiveness of Measures in place to control effects of Infrastructure initiated derailment**
   
i. The Signal ST265L was fitted with a train stop which automatically applied the brakes as the train passed the signal without authority. This reduction in speed as the train derailed mitigated the consequences of the SPAD.
   
   ii. The train stop and catch-points associated with Signal ST 265L operated correctly but their location in the track layout still resulted in the derailed 37-K stopping foul of the ‘Down Suburban’ line.
   
   iii. The formation and build up of ballast adjacent to the catch-points was sufficient to stop the train turning onto its side but not sufficient to stop it tilting to a 10 degree angle.
d. **Effectiveness of the Emergency Actions**
   i. The Police and Ambulance Services responded in a timely manner.
   ii. The Driver of 37-K did not hold down the emergency button on the MetroNet train radio for the required length of time to operate it successfully.

e. **Other Safety Matters**
   i. The track configuration and signalling arrangements in the area of the derailment are being changed as part of the RailCorp Clearways project.
PART 4 RECOMMENDATIONS

4.1 It is recommended that the following remedial safety actions be undertaken by RailCorp.

i. Reassess the Driver’s suitability for the duties associated with driving a suburban passenger train.

ii. Ensure that drivers’ rosters make adequate provision for quality rest and sleep to militate against the onset and effects of workplace fatigue.

iii. Reassess the sighting and placement of Signal ST 265L taking into consideration how it is visually perceived from a driver’s perspective. [Planned changes to the track configuration and signalling which include the commissioning of the line adjacent to the ‘Down Local’ line may mean this sighting review should be conducted again when the changes are completed.]

iv. Examine the effectiveness of the train stop and the catch-points to ensure that, in the event of a derailment, it will not be possible for any part of a derailed train to foul the ‘Down Suburban’ line.

v. Assess the formation and ballast level adjacent to the catch-points and if necessary, adjust the level to ensure that a train remains upright when it is derailed by the catch-points.

vi. Review the design of the activation mechanism of the emergency MetroNet radio button with a view to improving its operability and functionality as a piece of rail safety emergency equipment.
APPENDIX 1 SOURCES AND SUBMISSIONS

Sources of Information
• Bureau of Meteorology
• Crew members of 37-K
• ITSRR
• RailCorp

Submissions
The Chief investigator forwarded a copy of the Draft Report to the Directly Involved Parties (DIPs) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:
  • Independent Transport Safety and Reliability Regulator
  • RailCorp

Submissions were received from both the Directly Involved Parties.

The Chief Investigator considered all representations made by DIPs and responded to the author of each of the submissions advising which of their recommended amendments would be incorporated in the Final Report, and those that would not. Where any recommended amendment was excluded, the reasons for doing so were explained.