



Signal passed at danger by XPT ST24

Henty, New South Wales
5 February 2011

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Abstract

At about 1328¹ on Saturday 5 February 2011, scheduled XPT (Express Passenger Train) ST24, travelling from Melbourne to Sydney, passed signal 09-6 at Henty while it was displaying a Stop (red) indication, an event commonly referred to as a Signal Passed at Danger (SPAD). The train stopped about 95 m past signal 09-6 with the front of the leading power car on the Yankee Road level crossing. The investigation concluded that notwithstanding a reported issue with the brakes on the leading power car, the driver of train ST24 did not apply sufficient braking effort to enable train ST24 to be stopped before passing the Up home signal (09-6) at Henty.

FACTUAL INFORMATION

Location

Henty is located on the main Melbourne to Sydney corridor and is part of the Defined Interstate Rail Network (DIRN) in south-western New South Wales. Henty is 580 track km from Sydney and 371 track km from Melbourne. The railway corridor is managed and maintained by the Australian Rail Track Corporation (ARTC).

Rail corridor management

Network controllers and managers/supervisors located at the ARTC Network Control Centre at Junee are responsible for the day to day operational management of the rail corridor between Tottenham Yard (Melbourne) and Glenlee (New South Wales). Network controllers are stationed at control boards that are allocated geographically according to distances and traffic density. Trains through Henty are managed by a network controller using the ARTC Phoenix control system. The Phoenix control system is a non-vital² CTC³ system that provides real time monitoring and control of field hardware including signals, points, track circuits and the associated management of train movements. Signal, points, track and train movement data is captured by the Phoenix event logger. This data can also be replayed to assist with the reconstruction of events and the examination of incidents. Voice communication between train drivers and the network controller is via the Victorian and NSW train to base radio systems. The primary responsibility of network controllers is to manage the allotted rail corridor to

- 1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time (EDT), as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) +11 hours.
- 2 Non-vital: Signalling equipment and circuits are considered non-vital where failure to function correctly would not cause an unsafe outcome of the signalling system. Non-vital equipment and circuits do not affect the safe operation of the signalling system. (Source: Engineering Standard - NSW Signalling SGS 01 Infrastructure Engineering Manual - Glossary of Signalling Terms)
- 3 Centralised Traffic Control (CTC): A safe working system of remotely controlling points and signals at a number of locations from a centralised control room. (Source: Glossary for the National Codes of Practice and Dictionary of Railway Terminology)

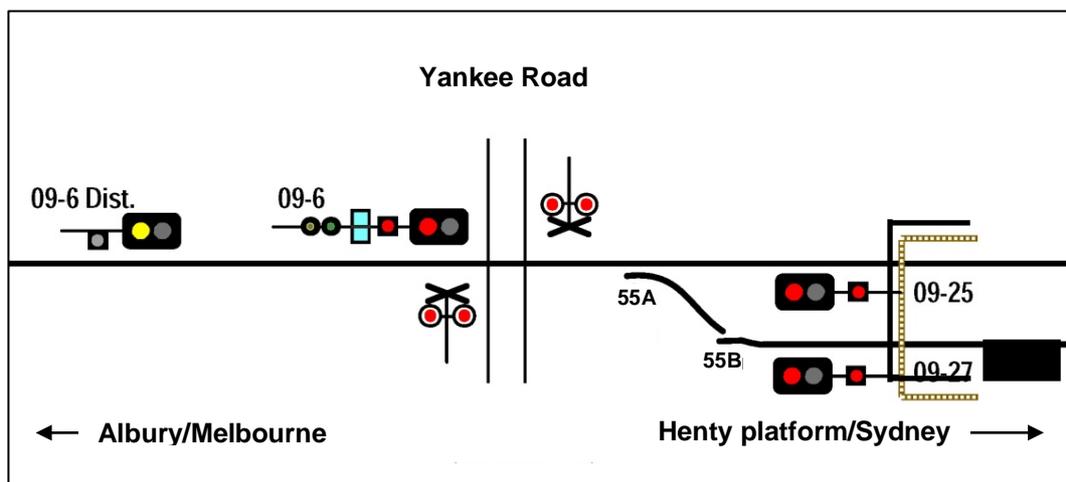
provide for the safe and efficient transit of rail traffic. In fulfilling this task, network controllers must set routes, plan, prioritise and manage train services, work on track authorities and contingency measures in times of incidents or out of course train running. These tasks often involve extensive liaison with operators, maintenance personnel and external services.

Track layout and signalling, Henty

The rail line from Melbourne to Henty and Henty to Junee⁴ comprised a single line bi-directional track, controlled by fixed colour light signals using Rail Vehicle Detection (RVD)⁵, remotely operated from the Junee Network Control Centre. The boundaries of Henty station yard were defined by Up home and Down outer home signals. Trains travelling in the Up direction, approaching Henty from the south, (the direction ST24 was travelling) encounter a location sign that indicates the approach to Henty station. About 500 m beyond the location sign was a two aspect colour light distant signal (09-6 Dist - Figure 1) that was capable of displaying either a Caution (yellow) or Clear (green) indication.

If the indication displayed by the home signal (09-6) was Clear for the main line, the distant signal also displays a Clear indication. The driver may then proceed at the permitted track/train speed until the home signal is sighted, then obey the indication of that signal.

Figure 1: Henty signalling layout



If the home signal displays a Stop or restricted indication the distant signal displays Caution. In this instance, the driver should slow the train, enabling it to be stopped at the home signal (09-6) as necessary. At Henty, the Up home signal was located about 2 km from the Up distant signal.

Henty station yard consists of a main line, a grain siding that branches off the main line and a loop capable of accommodating trains up to 912 m in length. Henty was a scheduled stop for all XPT services and because the station platform was located adjacent to the loop, all XPT services were routed into the loop. This meant that, unless an incorrect route was set, all XPT train movements encountered the Up distant signal at Henty at Caution and, once the route into the loop has been set and cleared a Low Speed indication on the Up home signal (09-6).

A Low Speed (restricted) indication gives the driver of the XPT authority to proceed into the loop, noting that the next signal (the starting signal beyond the station platform) may be at stop and that the line immediately beyond the signal may be occupied.

⁴ Junee is about 113 km north of Henty.

⁵ The portions of line where the system of Safe-working relies on track-circuiting or axle counters. (ARA Glossary for National Code of Practice and Dictionary of Railway Terminology).

Train and driver information

Train information

An XPT is a 'push-pull' configured train with a power car at each end of the consist. Each power car is powered by a turbo-charged diesel electric engine of 1492 kW (2000 horsepower). The XPT was introduced in 1982 and is based on the InterCity 125/Class 43 design used in Britain. Braking on the XPT's is achieved by using an electro-pneumatic (EP) brake as the operational (or principal) brake while a conventional air brake system is retained as a back-up. When operating in EP braking, the brake valves are activated electrically on each car by the driver's brake controller. EP brakes have the advantage of faster application and release when compared with the conventional air brake system because the electrical responses to brake commands are almost instantaneous. Whereas with air braking, there is a delay associated with the propagation of air along the train's brake pipe.

The XPT's are operated by CountryLink, which is an independent business under the NSW Government agency, Rail Corporation, New South Wales (RailCorp)⁶. Train ST24 departs Southern Cross station in Melbourne at 0830 and is one of two daily return XPT passenger train services that run between Melbourne and Sydney. Train ST24 is crewed by a single driver and four 'onboard' catering staff. The driver who signs on at Melbourne works ST24 through Henty to Junee where, after a scheduled arrival time of 1352, a driver change-over occurs. The driver who signs on at Junee then works train ST24 to Sydney, where it is scheduled to arrive at 1954 that evening.

On Saturday 5 February 2011, train ST24 consisted of lead power car XP2002 and trailing power car XP2000, with six passenger cars in between, including a buffet car. The train length was about 180 m and the weight about 266 t. The XPT has a maximum permitted speed of 160 km/h depending on track condition and posted speed limits.

Train driver

The driver of ST24 was based in Melbourne⁷. He had extensive train driving experience, was qualified as a driver in 1962 and appointed to a driver's position in 1963. In 1992 he became qualified to work XPT services and had been working the Melbourne to Junee sector since that time. In addition to driving XPT's he had driven other Victorian regional passenger services, both self-propelled and locomotive hauled, on a regular basis.

The occurrence

On Saturday 5 February 2011, XPT service ST21 arrived at Southern Cross Station in Melbourne after completing the journey from Sydney. The driver of ST24, the return XPT service to Sydney, was waiting on the platform when the train stopped. He noted that the trailing power car (XP2002) moved back and forth from the train carriages slightly and this indicated to him that the brakes on the power car had not been applied. He then boarded power car XP2002 (which would be the leading power car on train ST24) and started to carry out the pre-departure tests, which included checking water, engine oil, fuel levels and a radio check. In conjunction with these pre-departure checks, he checked his work diary and noted that he had booked power car XP2002 as having a 'defective EP valve' on Friday 31 December 2010. He then perused the power car log book and noted a number of entries from other drivers that referred to the same defect.

⁶ The body of this report refers to CountryLink in relation to the operation of XPT passenger train ST24. However, recommendations are directed to the accredited owner/operator, RailCorp.

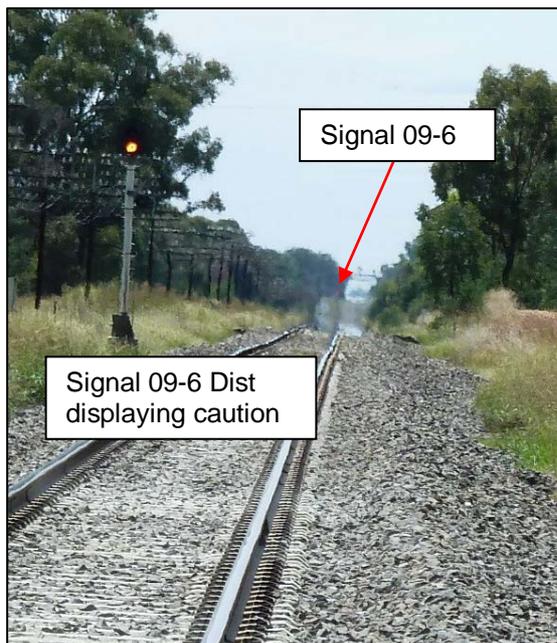
⁷ Although an employee of V/Line, the driver of ST24 was sub-contracted to RailCorp when working XPT services.

Departure from Southern Cross Station was at 0838, eight minutes late. The first application of the train brake was a couple of kilometres into the journey to slow for a 40 km/h section of track near Dynon. Upon making this brake application the driver noted that, while the brakes had applied on the rest of the train, the brakes on power car XP2002 were not applying until he made a full service application. Once a full service application was made an almost instantaneous full EP brake application on power car XP2002 occurred.

The driver was concerned that the defective braking on the lead power car (XP2002) would cause rough riding for the rest of the journey, so he decided to 'override' the sudden application by placing the brake handle in the full service position first and then quickly returning the brake handle to a lower step. By manipulating the train's brakes in this way he found that he was able to 'catch' the EP brake application and hold it in the lower brake steps to allow for a smoother deceleration. He also felt he was able to control the train in this manner without compromising his ability to brake the train safely.

As train ST24 approached Henty it was raining heavily. Although visibility was reduced, the driver had no problem seeing the yellow aspect (Caution) displayed by the Henty Up distant signal 09-6 Dist. Upon sighting the distant signal he applied the brake lightly and felt some retardation. At about this time he saw a road vehicle driving very fast along a flooded road not far from the rail line. The vehicle was travelling at such a speed that water was being sprayed out to the side in large quantities.

Figure 2: Up distant signal (09-6 Dist) at Henty



While continuing to observe the vehicle, the driver advanced the brake incrementally as he normally did at this location. When he looked back along the track he saw that the home signal was displaying a Stop (red) indication. The driver then looked down at the brake gauge and saw that the brake had not applied on power car XP2002. He immediately placed the brake handle in the emergency position whereupon the brake applied on power car XP2002. Train ST24 continued past the Up home signal and stopped with the nose of the leading power car on the level crossing; that is on the Henty side of the Up home signal approximately 95 m past the position at which train ST24 was required to stop.

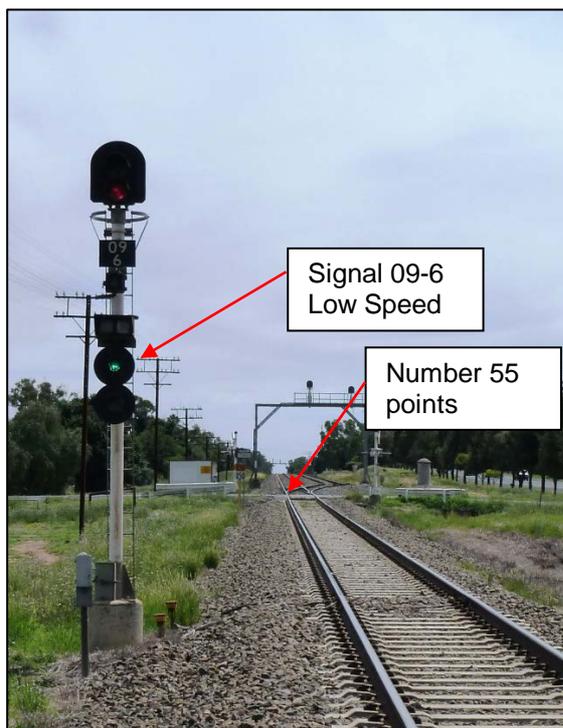
The train driver then contacted the Junee Network Control Centre to advise of the occurrence. After a short delay, the network controller gave the driver permission to set train ST24 back behind the

Henty home signal 09-6. The driver said he changed ends and positioned train ST24 behind the signal as instructed. He waited, and when the Up home signal (09-6) cleared to a Low Speed indication, to enter the loop, drove train ST24 to the Henty station platform, whereupon he was tested for the presence of alcohol by an officer of the NSW Police Force. The test produced a zero result. The Passenger Services Supervisor (PSS) that was on train ST24 then rode with the driver for the remainder of the journey to Junee as per RailCorp operations management instructions⁸.

The driver booked off duty at Junee before working his rostered return XPT service to Melbourne. On the return service he was re-assessed by a RailCorp line manager.

⁸ In accordance with the CountryLink Incident Response Plan, a checklist that endeavoured to determine if the driver was able to safely continue under PSS observation was successfully completed prior to this authorisation.

Figure 3: Up home signal (09-6) at Henty



Post interview contact

Advice was received from the driver who had worked train ST24 on 5 February 2011 that on Thursday 17 February he again worked train ST24 with the same power car XP2002 and experienced the same problem with the brakes on XP2002. He said he had notified staff at the Meeks Road XPT depot and had again booked the fault in the power car log book.

ANALYSIS

Investigators from the Australian Transport Safety Bureau (ATSB) sourced evidence pertaining to the SPAD incident at Henty on 5 February 2011 from the Australian Rail Track Corporation (ARTC), V/Line and the Rail Corporation, New South Wales (RailCorp). ATSB investigators examined signalling data and replays, undertook on-site signal sighting

inspections from both ground level and from the driver's cabin of the XPT, and interviewed the driver of train ST24. There was no evidence to indicate that direct environmental, track or signal issues were factors in the occurrence.

Notwithstanding the reported issue with the brakes on XP2002, the driver indicated that he became distracted and was not adequately monitoring the braking performance of ST24 as he approached the Up Home signal (09-6) at Henty on Saturday 5 February 2011.

The analysis has examined what occurred by reviewing available evidence, including train and Phoenix control system data, to determine: the braking performance of train ST24; the actions of the driver, including train handling; factors that may have influenced the driver's actions on the approach to Henty.

Sequence of events analysis

Track and train data

The time that the Phoenix control system recorded train ST24 passing Up home signal 09-6 at Henty on 5 February 2011 was used as the datum point for correlation between track and train data.

A Hasler recorder was installed on the leading (XP2002) and trailing (XP2000) power cars. Times between the two Hasler recorders were correlated with each other before being correlated with the data (time) obtained from the Phoenix control system.

Train handling

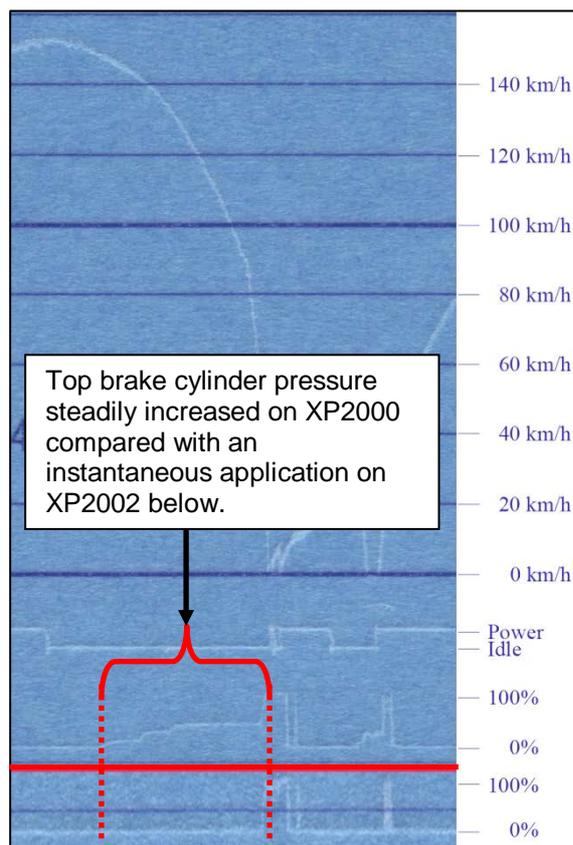
An examination of the Hasler data shows that train ST24 stopped at Culcairn⁹ (to board and alight passengers) and departed a short time later at 1319:14. On departing Culcairn, the train accelerated, reaching a maximum speed of 159 km/h about 4.7 km from Henty. At 1325:58, as train ST24 approached Henty, the driver initiated a brake application, about 275 m from the Up distant signal

⁹ Culcairn is about 16 km south of Henty station.

(09-6 Dist) at a speed of 152 km/h. The train was now 2274 m from the Up home signal, (09-6) where the SPAD event occurred. The brake application stabilised 4 seconds later before the train passed signal 09-6 Dist at 1326:05 displaying Caution. The subsequent deceleration rate indicates that the brake handle had been placed in step 1¹⁰, the lowest brake setting available.

At 1326:10, a brake application increase was recorded, about 1783 m from the Up home signal, with the train at a speed of 147 km/h. The deceleration rate indicates that the brake handle had been placed in step 2. At 1326:18 a further increased brake application was recorded, about 1406 m from signal 09-6 when the train was at a speed of 141 km/h; the subsequent deceleration rate indicates that the brake handle was in step 3¹¹. The braking of the train remained constant for 1183 m (step 3) until an emergency application of the brakes was initiated at 1327:02, about 223 m from signal 09-6, with the train at a speed of 92 km/h¹². Examination of Figure 4 shows that a stabilised brake cylinder pressure reading on both power cars was recorded 7 seconds after the initiation of the emergency brake application. At 1327:13, train ST24 passed the Up home signal (09-6) at Stop whilst travelling at a speed of about 50 km/h. The train continued before coming to a stand 8 seconds later, on the Up approach edge of the Yankee Road level crossing. The Up approach edge of the Yankee Road level crossing was 95m beyond the Up home signal.

Figure 4: Hasler comparison



During the interview with ATSB investigators, the driver said that he was braking the train as he always did while approaching the Up home signal (09-6). He also indicated that he was of the opinion that he would have stopped before the signal had the brakes worked normally. However, he acknowledged that he became distracted and failed to monitor the train's braking response against the selected braking input. He also acknowledged that when the route was set into the loop, for the Henty passenger platform, the distant signal 09-6 Dist always displays a Caution (Figure 2) and he would normally expect to find that the Up home signal (09-6) was displaying a Low Speed indication (Figure 3).

An extract from the Hasler recorder(s) from both power cars (Figure 4) supports the driver's account of his handling of the train on the approach to the Up home signal (09-6) at Henty. The extract clearly shows a difference in brake cylinder pressure between the two power cars, in that the leading power car XP2002 did not record brake cylinder pressure until making a full

service application towards the end of the SPAD sequence, while XP2000 recorded gradual increases in brake cylinder pressure before the full service application. The data validates the driver's

10 There are 7 steps/notches available to the driver of an XPT train. Step 1 is the lowest setting and step 7 is full service. An emergency application of the brake is attainable by pushing the brake handle past the step 7 position.

11 All braking to this point was recorded by the Hasler recorder on the trailing power car (XP2000) only.

12 This brake application was recorded by the Hasler recorder on both power cars.

observation that the brakes on the leading power car were not applying until a full service application of the brakes was made.

Phoenix control system – replay files

The movements of train ST24 for the previous 14 days were reviewed using the Phoenix replay files. All 14 movements show the route set up to and/or through Henty station platform. Of note was that 13 of the last 14 journeys were less than 20 minutes late, meaning that the path reserved for train ST24 had been maintained. On the day of the SPAD, train ST24 was almost 1 hour late, meaning that the train had lost its primary path and was relying on the forward planning of the network controller. In this instance, the network controller had set the route for train ST24 as far as the Up home signal (09-6), but not into Henty station platform. That is, signal 09-6 had not been cleared and was not displaying a Low Speed indication, and was therefore counter to what normally occurred.

A review of the voice logs from the network controller's board revealed that for several hours before the SPAD event the workload was heavy due to the network controller having to deal with extensive delays to traffic. This was largely due to signal failures, track failures and flooding events as a result of heavy rain. It is probable therefore that the workload affected the controller's ability for forward planning of train pathing. Although the network controller generally set the loop route through Henty (for the XPT), there was no obligation on the controller to do so. This meant that the onus always rested with the train driver to expect that the Up home signal (09-6) at Henty could be at Stop.

Braking performance of XPT ST24

Overview

As previously discussed, it was determined that the brakes on the leading power car were not working correctly.

Following the SPAD event and whilst en-route to Junee, at Wagga Wagga, RailCorp operations management contacted the driver of ST24 and asked him to assist with fault diagnostics by switching from EP braking to air braking. When the switch was moved to air braking, the air pressure in the brakes on power car XP2002 immediately fell to zero, releasing the brakes¹³. Following this, EP braking was again selected for the remainder of the journey. The driver of ST24 noted that the brakes on power car XP2002 then worked normally for the rest of the journey to Junee. This supported his earlier observations in that the brakes were not operating correctly.

Actual braking versus design standard

The driver of ST24 said that after he realised that no brake application was occurring in the lead power car at the lower settings, he manipulated the brake control so that he was able to 'catch' the EP brake application and hold it in the lower brake steps, thereby allowing for a smoother deceleration. He said that he was able to control train ST24 in this manner without compromising his ability to brake the train safely. On the approach to the Henty Up home signal however, he applied the normal braking method in lieu of his improvised method. Therefore, the investigation sought to determine whether the braking performance of train ST24 was below required RailCorp engineering standards and therefore an underlying cause for the SPAD event at Henty on 5 February 2011.

The minimum braking rate is specified in documented RailCorp Engineering and Planning GX4A and GX4M.

Between the Henty Up distant signal and the Yankee Road level crossing (where ST24 came to a stand) the track is on a slightly falling grade, ranging from 1 in 460 to 1 in 471. About 365 m from the

13 When changing from EP brake to air brake an existing brake application should not release.

Yankee Road level crossing, the grade changes to a slightly rising grade of 1 in 565. The gravitational affect in braking performance was calculated to be - 0.021 m/s² on the falling grades and + 0.017 m/s² on the rising grade.

RailCorp provided approximate deceleration rates for an XPT at each braking step on level track. Table 1 compares the achieved braking performance deceleration rate of train ST24, on approach to signal 09-6, against the theoretical performance. The achieved deceleration rate of train ST24 when in step 3 was calculated to be 0.31m/s². When compared with the theoretical deceleration rate in this step, including gradient effect, it was concluded that although the brakes on the lead power car were not responding as expected, the total train braking performance met the standard.

Table 1: Comparative XPT braking performance.

Braking step	Theoretical BCP (kPa)	XP2000 BCP (kPa)	RailCorp deceleration rates tangent track (m/s ²)	RailCorp deceleration rates with gradient effect (m/s ²)	Achieved deceleration rate (m/s ²) ST24
1	49	42	0.04	0.06	0.12
2	99	107	0.18	0.16	0.23
3	148	153	0.33	0.31	0.31
Emergency	375	375	0.996	1.02	1.27

Braking performance with a defect and isolation

RailCorp has a maximum limit regarding brake system isolation without imposing operational restrictions. RailCorp document TWP 124 *Defective Brakes* from the Train Operations Manual specifies that a maximum of 1 in 8 (12.5 per cent) bogies may be isolated, thus having no braking effort on 12.5 per cent of the train. Up to this limit trains may operate without restriction.

While the brakes on the lead power car XP2002 were not physically isolated, they were applying intermittently depending on driver input and stage of braking selected. They were not applying normally. Train ST24 consisted of 16 bogies; two bogie sets were not braking normally. Based on a scenario that the brakes on the lead power car were not working, the train was still permitted to operate without operational restrictions being applied.

Maintenance

The XPT passenger train fleet was regularly inspected and maintained in accordance with RailCorp's engineering procedures. Inspection frequencies were divided into four categories:

- Running Inspections done while at the depot between runs
- Trip Inspections done on a distance travelled basis
- 45 Day Traction Motor Inspection
- Major Inspections (A to H) carried out on a 90 day to 2 year cycle.

In-service faults were logged by the driver in the power car log book(s) and, if deemed necessary, the CountryLink operations section and XPT maintenance depot were also notified. Where possible, faults were fixed en route by the driver or isolated until the train returned to the depot located at Meeks Road, near Sydenham in Sydney, whereupon maintenance workers inspected the train and carried out repair work.

In this instance, power car XP2002 had a number of previous driver logged faults regarding brake anomalies that virtually mirrored those experienced by the driver of ST24 on 5 February 2011. However, during inspection and testing of the braking system, on XP2002, maintenance staff were unable to replicate the fault and this resulted in the train being returned to service without the fault being identified and repaired.

The ATSB communicated with RailCorp on this issue and was advised as follows:

Fault finding in response to the drivers log books first involves trying to replicate the problem the drivers are having. As the most common complaint (regarding XPT 2002) was EP unreliable or not applying until notch 3, our technicians would apply the brakes in the lower notches. In possibly all cases the problem could not be replicated at the depot. After changing different components of the braking system the problem wasn't fixed until the bogies (8 brake cylinders) were changed on the 18/2/11.

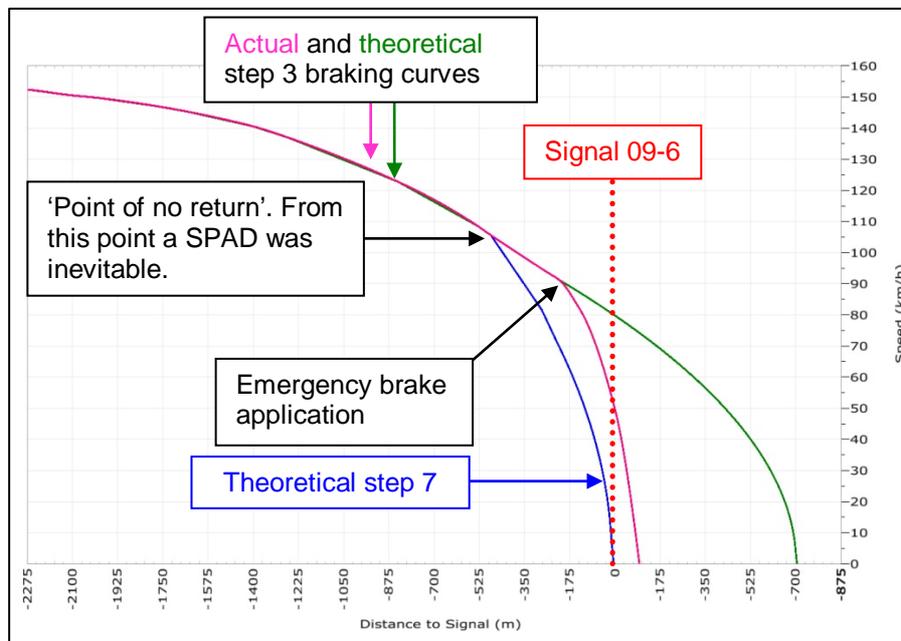
Upon removal of the brake cylinders, some were found to have movement between the slack adjusters and brake cylinder body causing an intermittent misalignment between the cylinders and pistons. It seems that if a small application is made in this situation air can pass the piston seal. If a large application is made, the volume of air will expand the seal, correct the misalignment and apply correctly. In the depot, if the alignment was correct the brakes would apply correctly in all notches every time.

This communique supports the driver's observation in that the brakes on the lead power car (XP2002) were not applying until making a full service application and importantly advises that RailCorp has now rectified the fault.

Driver actions

In his statement, the driver indicated that if the brakes were operating correctly he would have brought the train to a stand at or before signal 09-6.

Figure 5: Braking curve



Examination of the Hasler data shows that the driver selected step 3 braking 1406 m in advance of Up home signal 09-6. The train was travelling at a speed of about 141 km/h. Based on the achieved and the theoretical braking rates (Table 1), the driver could have remained in step 3 until the train was about 480 m from signal 09-6. At this

'point of no return' (Figure 5) the driver needed to make a step 7 or emergency brake application to stop short of signal 09-6. In this instance, the driver remained in step 3 braking until about 223 m from signal 09-6, when he initiated an emergency brake application. A SPAD of signal 09-6 was inevitable from this point.

Factors influencing driver actions

Expectation

Train ST24 almost always encounters the Up distant signal (09-6 Dist) at Henty at Caution. This is because the Up home signal (09-6) is set and cleared into the loop (Low Speed) to allow passengers to board/alight the train at the Henty Station platform. However, on occasions the Up home signal (09-6) may be retained at stop due to operational requirements as was the case on this occasion.

The Low Speed aspect on signal 09-6 is located below the main aspect and is physically smaller in size than the main signal aspect. Drivers must therefore 'close up' on the Low Speed indication before it can be seen, thereby slowing the train as if they were approaching a signal at stop.

The SPAD driver said he previously worked ST24 on 27 January 2011 and had regularly worked the XPT service before that. During the 19 years he had been driving the XPT service he estimated that the Henty Up home signal (09-6) displayed a Low Speed indication at least 95 per cent of the time.

Research has shown that a person's perception of the probability of a given event is strongly influenced by past experience and the frequency with which they encounter the event.¹⁴ In effect, a person's performance is better if the event is expected and worse if it is unexpected. Furthermore, the user's perception that an event is likely to occur is reinforced every time the user encounters that event.

For example, a train driver's expectation that a signal will show a specific aspect, in this case a Low Speed indication, is reinforced every time the driver approaches the signal and it displays that specific aspect. If the driver's attention was focussed/distracted on a task other than the signal, then they may not correctly perceive the signal indication, especially if the indication was not that which was expected.

In this instance, the driver was distracted by a vehicle travelling at high speed on the adjacent road. It is therefore probable that in his mind, signal 09-6 was displaying a Low Speed indication and therefore he did not initially perceive the indication displayed by signal 09-6 as at Stop.

Distraction and work demands

Distraction and conflicting work demands are an example of something which can divert attention from tasks such as perceiving a signal aspect. Distraction has been defined for automobile drivers by the American Automobile Association Foundation (AAAF) as occurring:

...when a driver is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object or person within or outside the vehicle compelled or tended to induce the driver's shifting attention away from the driving task.¹⁵

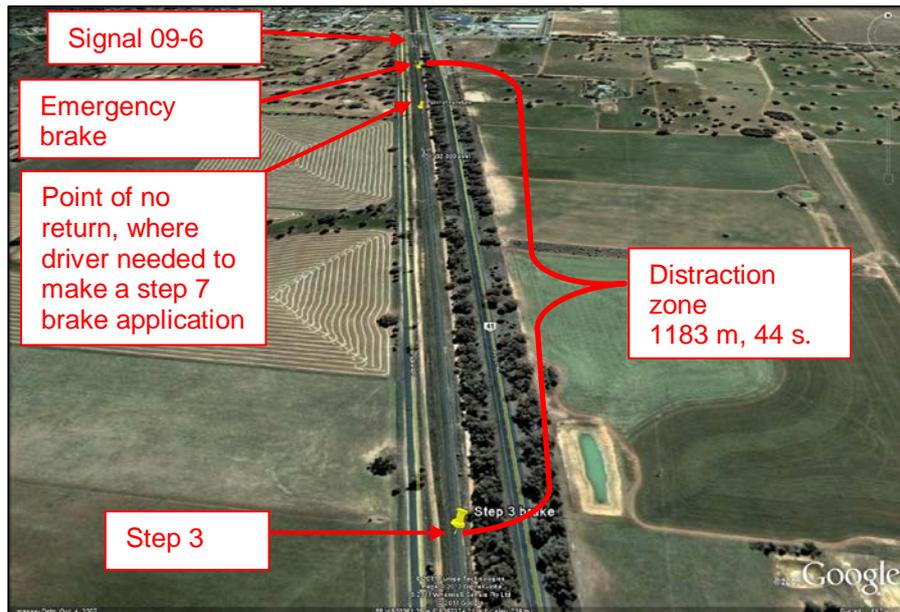
Driver distraction and conflicting work demands can include a range of factors either inside or outside a vehicle, that draws on the limited physical, visual and cognitive resources, resulting in a degradation of the driver's performance. For example, eating, drinking, operating devices integral or brought into the vehicle, smoking, and conversing with another occupant are all factors that may reduce the amount of attentional resources available for the driving task. While the AAAF research was conducted in the context of driving road vehicles, the findings are equally applicable to the operators of other machinery, including trains.

14 Schoppert and Hoyt, 1968 cited in National Transportation Safety Board (1998a). *Safety at passive grade crossing*. Volume 1: Analysis. Safety study NTSB/SS-98/02. Washington DC.

15 Young, K., Regan, M., & Hammer, M. (2003) *Driver distraction: A review of the literature*. Monash University Accident Research Centre. Report No. 206.

In this instance train ST24 was nearly 1 hour late at the time of the SPAD; the driver nevertheless indicated that he felt no pressure from either network control or management to make up this lost time. However, he was distracted by events external to the rail corridor; a vehicle being driven at speed on an adjacent flooded road. He said that as he was watching the vehicle he applied the brakes 'automatically', but did not monitor the train's progress by scanning the gauges at his control console, nor did he look in the direction of travel.

Figure 6: Distraction zone diagram



An examination of the Hasler data log shows that between the time the driver made the step 3 brake application and the emergency application, about 44 seconds elapsed and the train travelled about 1183 m (Figure 6). This positioned the train past the calculated 'point of no return' by about 10 seconds, or 223 m from the Henty Up home signal (09-6), from which point the train could not stop before passing the signal.

Fatigue, drugs, alcohol, medical condition

Based on analysis of the driver's rostered hours and interview, there was no evidence to suggest that fatigue contributed to the SPAD event.

The driver of train ST24 was tested for the presence of alcohol and drugs immediately after the incident; the results were zero. There was no evidence (or suggestion) that he was in any way affected by alcohol or drugs.

There was no evidence to suggest that medical or physiological factors affected his performance or that he was unfit for his duties.

Summary

The ATSB has investigated a number of occurrences¹⁶ where train driver distraction has been identified as a contributing factor to the occurrence. Distraction at a critical point can lead to an error, particularly when paired with expectation.

16 RO-2006-005 Derailment of Train 5MB7, Benalla, Victoria, 2 June 2006. RO-2009-008 Signal Passed at Danger by Train ST24 Junee, NSW, 9 September 2009.

Even though the train driver was highly experienced, it is probable that an expectation that signal 09-6 would be displaying a Low Speed indication, combined with distraction, contributed to this SPAD event.

History of SPAD events – Henty Up home signal (09-6)

An examination of occurrence records revealed that a SPAD had occurred at the same signal (Henty Up home 09-6) with the same train (ST24) involving a different driver on 24 November 2010, about 6 weeks before this SPAD event. The RailCorp investigation concluded that:

The driver held an expectation bias based on the fact that he was conditioned to the signal indications prior to entering Henty station. The driver's expectation that signal 09-6 would be displaying a Low Speed indication was further reinforced by the information he received from Junee Network Control that no trains would be crossing in front of him.

RailCorp concluded that the train driver's expectation that the Henty Up home signal 09-6 would display a Low Speed indication was a reflection of the driver's perception that signal 09-6 would generally display a Low Speed indication. This perception was indirectly strengthened by information, supplied by the Network Control Officer, that no trains would cross his movement at Henty. This reinforced his perception that signal 09-6 would display a Low Speed indication.

What was evident in both occurrences is that both drivers had become pre-conditioned to expect that signal 09-6 would display a Low Speed indication and drove the train accordingly.

SPADs - Physical risk controls

Currently there is no system in place to alert drivers when approaching critical phases of train operation, such as braking cues or signals, other than previous signal indications and driver attention. The ARTC is currently trialling a system called Advanced Train Management System (ATMS), an automatic train protection system, which will provide enforcement of authorities on each locomotive if a train is at risk of exceeding its authority.

FINDINGS

Context

At about 1328 on Saturday 5 February 2011, scheduled XPT service ST24, travelling from Melbourne to Sydney, passed Up home signal 09-6 at Henty while it was displaying a Stop (red) indication.

From the evidence available, the following findings are made with respect to the SPAD by train ST24 at Henty and should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- The driver of train ST24 anticipated and perceived that the Up home signal (09-6) at Henty was displaying a Low Speed indication.
- The driver of train ST24 was distracted at a critical point when approaching the Up home signal (09-6) at Henty.
- The driver of train ST24 did not apply sufficient braking effort to enable train ST24 to be stopped before passing the Up home signal (09-6) at Henty.

Other key findings

- The brakes on the leading power car were not applying until a step 7 or emergency application was made, however based on information supplied by RailCorp this safety issue was identified/rectified shortly after the SPAD event. Although the brakes on the leading power car were not applying normally, the train braking performance was within the standard set by RailCorp.

SOURCES AND SUBMISSIONS

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the Transport Safety Investigation Act 2003, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the Australian Rail Tack Corporation, Independent Transport Safety regulator of New South Wales, VLine, RailCorp, the driver of train ST24, and a number of individuals.

Submissions were received from the Australian Rail Tack Corporation, Independent Transport Safety Regulator of New South Wales, VLine, and RailCorp. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.