Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Rail Occurrence Investigation 2006/014
Final

Collision between

Rigid Tipper Truck/Tri-axle Trailer

and

The Overland Passenger Train, 4AM8

Wingeel, Victoria

15 November 2006

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ISBN and formal report title: see 'Document retrieval information' on page v.

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DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN
2006/014	24 October 2007	41	978-1-921165-37-5

Publication title

Collision between Rigid Tipper Truck/Tri-axle Trailer & *The Overland* Passenger Train, 4AM8

Prepared by

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

Reference No.

Oct2007/DOTARS50375

Acknowledgements

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The figures 10, 11 and 14 are based on AS1742.7 – 1993 and the Austroads standard AP-G1 03.

The ATSB is grateful to Interdynamics Pty Ltd (www.interdynamics.com) for the computer program, FAID 330E, which was used during the analysis of the fatigue factors.

Abstract

At 1653 on Wednesday 15 November 2006, a north-east bound tip truck towing a tri-axle trailer drove into the path of south-east bound passenger train 4AM8, *The Overland*, at the Barpinba-Poorneet Road level crossing, near Wingeel in southern Victoria.

As a consequence of the collision the driver of the truck was fatally injured. The train sustained only minor damage but was immobilised and this necessitated that all passengers had to be transferred by bus to Melbourne.

The ATSB investigation into the accident established that the truck entered the level crossing and did not come to a halt at the 'Stop' sign as required by the road rules while a train was approaching the level crossing. The driver of the truck was possibly distracted by the presence of the road-junction ahead and was probably unaware of the presence of the train until just before the collision. The investigation also found that when approaching the crossing from the south-west the advance warning signs did not comply with the then operational standard AS1742.7 – 1993. In addition, the viewing angle in the direction from which the train approached the crossing was poor. When coupled with the restricted visibility from the truck's cab, it would have been difficult for the truck driver to see the train without coming to the required stop at the crossing.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the Transport Safety Investigation Act 2003 and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

TERMINOLOGY USED IN ATSB INVESTIGATION REPORTS

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, risk controls and organisational influences.

Contributing safety factor: a safety factor that, if it had not occurred or existed at the relevant time, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

Other safety factor: a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report.

Other key finding: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which 'saved the day' or played an important role in reducing the risk associated with an occurrence.

Safety issue: a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

Safety issues can broadly be classified in terms of their level of risk as follows:

- **Critical safety issue:** associated with an intolerable level of risk.
- **Significant safety issue:** associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable.
- **Minor safety issue:** associated with a broadly acceptable level of risk.

EXECUTIVE SUMMARY

At 1653[1] on Wednesday 15 November 2006, a north-east bound Western Star tandem tip truck towing a tri-axle trailer loaded with large rocks drove into the path of the south-east bound passenger train 4AM8, *The Overland*, at the Barpinba-Poorneet Road level crossing, near Wingeel in southern Victoria. The driver of the truck was fatally injured as a consequence of the collision, the train crew and passengers were all uninjured. The level crossing was controlled by 'passive' advance warning signs, 'Stop' sign assemblies[2] and pavement markings. The speed limit for road traffic approaching the level crossing was 100 km/h but vehicles were required to stop at the crossing before proceeding.

Passenger train 4AM8, *The Overland*, had an overall length of 260.3 m with a gross weight of 617.5 tonnes, it was being hauled by one locomotive. At the time of the accident the train was being driven in accordance with prescribed operating procedures and was approaching the crossing at a speed of 115 km/h, the speed limit for this class of train in the approach to the crossing.

As the truck approached the crossing it was observed to slow down but it did not stop before proceeding over the crossing into the path of the oncoming train. When the train driver realised the truck was not going to stop, he sounded the whistle then made an emergency brake application. Approximately seven seconds later the locomotive collided at a speed of 110 km/h with the passenger side of the truck's cab. The force of the impact ripped the cab off the truck and carried it approximately 30 m beyond the point of collision. The rear part of the truck and trailer was left standing on the road. The train continued to decelerate and came to a stop with the front of the train 612 m beyond the point of collision.

There was only minor damage to the train. The train crew and passengers were all uninjured. The passengers were transferred by bus to Melbourne as the train had become immobilised as a result of the collision.

There was only minor damage to fixed infrastructure.

The emergency response following the accident was both timely and effective.

The investigation concluded that the accident occurred because the driver of the truck entered the level crossing while a train was on the approach and that the truck driver did not come to a halt at the 'Stop' sign as required. It is likely that the actions of the truck driver may have been influenced by a combination of factors, including that he was not expecting a train at the level crossing and that he may have been distracted by the road intersection immediately after the level crossing.

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time (EDT).

2 'Stop' sign and 'Stop' sign assembly – Throughout this report 'Stop sign' and 'Stop sign assembly' refers to the 'Railway level crossing stop assembly (RX-2)' as defined within AS1742.7-1993 at Clause 6.2.2. See Fig. 10.

The investigation also found that the Barpinba-Poorneet Road approach signage and road markings did not comply with the then operational standard AS1742.7 – 1993. It is, however, unlikely that this contributed to the accident as the truck driver was familiar with the route and would have been aware of the presence of the level crossing.

It was also found that the viewing angle for a road vehicle approaching the crossing from the south-west was poor and when coupled with restricted visibility from the truck's cab would have made it difficult for the truck driver to see the train without coming to a complete stop at the crossing.

The investigation established that neither the truck driver nor the company that he worked for had any history in terms of traffic offences or other non-compliances that would indicate an increased risk for this type of accident.

The investigation concluded that the train crew's actions were appropriate in the circumstances and that there was little effective action they could have taken to prevent or minimise the impact of the collision.

It has been noted that the Barpinba-Poorneet Road level crossing has been scheduled for upgrade from passive to active control during the 2009-10 financial year.

Safety actions recommended as a result of the investigation relate to:

- Measures to reduce the road/rail interface risk at the Barpinba-Poorneet Road level crossing.
- Development of a formal Level Crossing Interface Agreement.
- Expanding opportunities for level crossing education, in particular enhancing public awareness regarding the requirement to come to a complete halt at level crossings controlled by 'Stop' signs.

1 FACTUAL INFORMATION

1.1 Overview

At approximately 1653 on 15 November 2006, a north-east bound Western Star tandem tip truck towing a tri-axle trailer drove into the path of the Melbourne bound passenger train 4AM8, *The Overland*, on the Defined Interstate Rail Network (DIRN) at the Barpinba-Poorneet Road level crossing near Wingeel in southern Victoria. The level crossing was controlled by 'passive' advance warning signs, 'Stop' signs and pavement markings. The truck driver was fatally injured. There were no other injuries to the crew or passengers of the train.

1.1.1 Location

The accident occurred at the Barpinba-Poorneet Road level crossing which is located just off the Hamilton Highway between Cressy and Wingeel and adjacent to the Adelaide to Melbourne standard gauge rail corridor. The section of track is managed and operated by the Australian Rail Track Corporation (ARTC)[3]. The Barpinba-Poorneet Road links the Hamilton Highway with the Colac to Ballarat Road and passes through the town of Barpinba. The road serves as bypass for residents having local knowledge as it links the two main roads. It carries in excess of 100[4] vehicles per day.

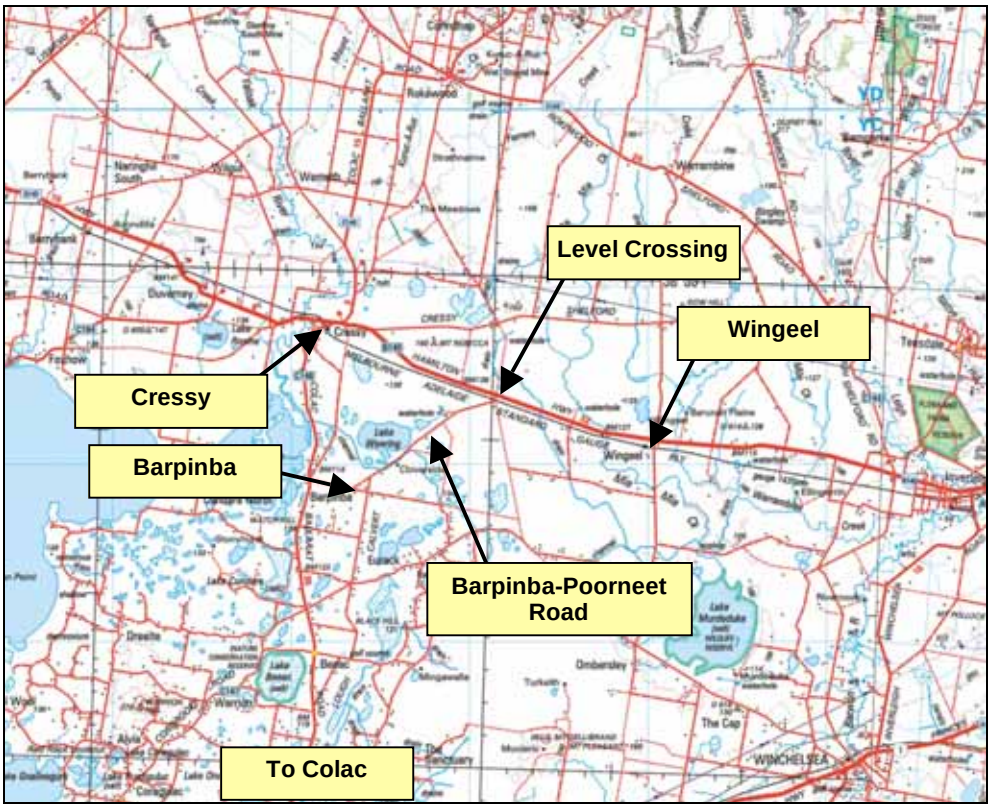
Figure 1: Location of Wingeel, Victoria.

Map - Geoscience Australia. Crown Copyright ©.

3 ARTC – Responsible for access to and management of the Adelaide to Melbourne rail corridor; it is also responsible for the RX-2 and RX9 sign assemblies and the road surface extending 2.44 metres either side of the rails.

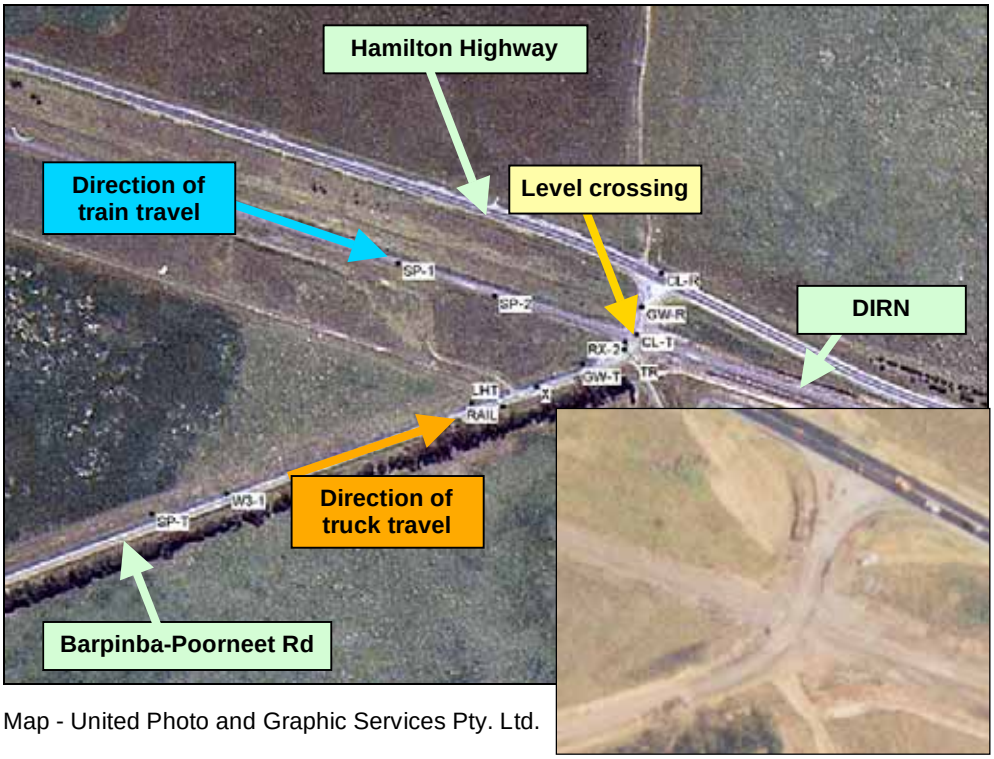
4 Source of information Department of Infrastructure, Victoria.

Figure 2: Location of Barpinba-Poorneet Road, Victoria.



Map - Geoscience Australia. Crown Copyright ©.

Figure 3: Satellite photograph - Approach to Barpinba-Poorneet Road level crossing. Inset – Expanded view of level crossing.



Map - United Photo and Graphic Services Pty. Ltd.

The Barpinba-Poorneet Road level crossing is located 50 m off the Hamilton Highway and approximately 11 km east of Cressy. When travelling in a north-east direction, the road converges towards the Adelaide to Melbourne rail line at an angle of about 38 degrees but turns sharply into the level crossing in the last 20 m (Fig. 3) to intersect the rail line at an angle close to 70 degrees. After passing over the level crossing it joins with the Hamilton Highway.

Figure 4: View of 'Stop' sign , approaching level crossing from south-west.

Photograph – Victoria Police Copyright ©

The Barpinba-Poorneet Road was constructed to a sealed road standard from an existing gravel road standard in 1967-68. The level crossing is controlled by 'Stop' signs that require road users to 'Stop and Give Way' to trains.

The speed limit for road traffic on the Barpinba-Poorneet Road is 100 km/h. The line speed limit for trains is 115 km/h.

There was no available history of previous accidents at this location.

1.1.2 Train information

Great Southern Railway (GSR) operates several interstate rail passenger services throughout Australia, including *The Ghan*, *The Indian Pacific* and *The Overland*. It provides the passenger cars and hospitality staff for these services. Motive power and the train driver/co-driver are provided by Pacific National Pty Ltd (PN).

At the time of the accident the train comprised one locomotive (NR118) hauling 10 trailer/passenger cars having a total length of 260.3 m with a gross weight of 617.5 tonnes. *The Overland* operates a regular service, three times a week between Adelaide to Melbourne (Monday, Wednesday and Friday) and return (Tuesday, Thursday and Saturday). Subject to minor variation, *The Overland* will pass over the Barpinba-Poorneet Road level crossing at approximately 1640 when travelling to Melbourne.

The maximum allowable speed for *The Overland* over this section of track was 115 km/h.

Crew of Train

The train driver and co-driver had passed initial certification with the Victorian Railways in May 1974, and July 1979 respectively. Both joined Pacific National on 5 April 2004 and were certified to drive the Adelaide to Melbourne route including the section of track where the accident occurred. Both received regular re-training and were certified to Pacific National's requirements.

Pacific National uses the National Transport Commission (NTC) *National Standard for Health Assessment of Rail Safety Workers*, as a basis for health assessment of its 'Safety Critical Workers'. Both drivers were assessed as 'Fit for Duty - Meets all relevant medical criteria' as prescribed in the National Health Standard.

The train crew were appropriately trained, qualified, and medically fit at the time of the accident.

GSR hospitality staff comprised a 'Train Manager' and four 'Hospitality Attendants', all were certified to GSR requirements.

1.1.3 Truck information

Rock Haulage Pty Ltd was the owner and operator of the truck involved in the accident. It was a privately owned and operated business engaged in the transportation of heavy rocks/earth works and frequently operated in the Colac area.

Figure 5: Western Star rigid tipper truck/ tri-axle trailer combination.

Photograph – Western Star Trucks Australia Copyright ©

The truck and trailer combination involved in the accident consisted of a Western Star 4870 tandem tip truck towing a Westside body tri-axle tip trailer having an overall length of 15.7 m. The statutory gross mass for a configuration of this type, ie six axle truck and trailer with steel spring suspension is 42.5 tonnes.

The truck was certified as roadworthy by VicRoads on 26 September 2006. The truck and trailer was regularly maintained and in good working order.

There were no identified deficiencies that related to the mechanical condition of the truck and trailer.

The operating history of the truck operator Rock Haulage Pty Ltd gave no indication of factors likely to have contributed to the accident.

Truck driver information

The driver of the vehicle was a 56 year old male from Dandenong, Victoria. He had been employed by Rock Haulage Pty Ltd for about five years but had previously driven trucks for at least 30 years.

Based on available information the driver had no known medical condition that would have precluded him from driving a heavy motor vehicle/truck. He was appropriately licensed and had extensive truck driving experience.

The truck driver had no known prior convictions or traffic offences that would indicate an increased risk for this type of accident.

The driving record of the truck driver gave no indication of factors likely to have contributed to the accident.

Figure 6: Photo of accident site, taken at approximately 1700. Train 4AM8 can be seen in the background.

Photograph – Victoria Police Copyright ©

1.2 The occurrence

At 0630 on Wednesday 15 November 2006 the truck driver involved in the collision at Barpinba-Poorneet Road started work from his home depot in Dandenong, Victoria. During the day he worked Dandenong to Werribee, Werribee to Sandringhan and Sandringham to Colac where his last job for the day involved collecting a load of large rocks from a property off Quinanes Road, Ondit.

The train drivers signed on at their home depot of Dimboola at 1326 to work train 4AM8, *The Overland*. The train departed Dimboola at 1346 with the two drivers onboard heading east for Melbourne.

The truck driver continued working throughout the day, he probably passed over the Barpinba-Poorneet Road level crossing 20 minutes before starting his last job, arriving at the Ondit property at 1530. The truck was loaded by 1615 after which the driver talked to the excavator operator for about 19 minutes. He departed at 1634 intending to return to his home depot in Dandenong. He travelled along the Colac-Ballarat Road before turning onto the Barpinba-Poorneet Road which intersects with the railway line near the Hamilton Highway.

The temperature at the time was about 10°C. The wind was from the south-west at an estimated speed of 43 km/h. The sun was approximately due west at an altitude of 38°, however the sky was heavily overcast with no apparent sun glare. Visibility was good.

At this time train 4AM8, *The Overland*, was approaching the Barpinba-Poorneet Road level crossing from the north-west. The trip from Dimboola during the afternoon had been uneventful. When it was at a distance of approximately 600 m, the train drivers observed a truck on their right hand side, approaching the crossing. The train driver sounded the whistle. The truck then appeared to be slowing down in preparation to stop, however at a distance of about 200 m it became apparent to the train driver that the truck might not stop and that a collision would then be imminent. The train driver made an emergency brake application, sounded the train whistle and pressed the radio emergency button.

As the truck and train continued towards the level crossing a motorist, who was a local resident, was driving in a north-westerly direction along the Hamilton Highway towards Cressy. As he approached the level crossing he began to slow down in preparation for a left hand turn into the Barpinba-Poorneet Road. At a distance of about 100 m from the crossing, he could clearly see the train and its headlight. When about 50 m from the road intersection the motorist noticed a truck towing a tri-axle trailer approaching the level crossing. The truck was travelling slowly, the motorist assumed that the truck driver had seen the train and was coming to a stop.

In the seconds just before the collision at 1653 the truck driver braked heavily, probably because he saw the train. However, the truck overran the ‘Stop’ sign and came to halt with the driver’s cab on the crossing and directly in the path of the oncoming train.

The train collided with the truck at an estimated speed of 110 km/h, striking the cabin on its left hand side shearing it off at the body. The cabin was then catapulted some 30 m beyond the point of collision, with small parts being scattered in the general direction of train travel for several hundred metres.

The motorist pulled over and headed towards the truck cabin. He located the truck driver lying fatally injured by the side of the track. There were no other persons in the truck. He attempted to call the emergency services on his mobile telephone but could not connect, he subsequently managed to contact a friend on his mobile telephone who then raised the alarm.

The train continued under the emergency brake application finally coming to a stop 612 m beyond the level crossing. The GSR 'Train Manager' established that there were no injuries to passengers or the train crew, and then went back to the accident site to determine what had happened. He ascertained that the driver of the truck was deceased and reported this to the train driver.

1.3 Post occurrence

Response

While stopping the train, the train driver talked to the Adelaide train controller who was responding to the emergency and notifying the Victoria Police, ambulance and fire services. The emergency services were on site by 1736. The Victoria Police took control of the accident site until all wreckage was cleared. The train drivers were breath tested by the Victoria Police at 1754, both returned zero readings.

Site recovery

There were no dangerous goods being carried by the train at the time of the accident however there was some spillage of diesel from the truck. This was cleaned up by emergency services personnel.

There was only minor damage to the lead locomotive of the train, however the locomotive air-compressor was destroyed. This meant the train could not be moved and as delays were expected to be significant, alternative road bus transport was arranged to convey passengers to Melbourne. The buses arrived at approximately 1846 with passengers transferring thereafter.

A relief train[5] was arranged and despatched from Melbourne at 1622. On arrival at the site (temporary repairs were made to the compressor and air line of 4AM8) 4AM8 was moved into the Wingeel crossing loop. After undertaking further repairs 4AM8 departed for Melbourne at approximately 0050 on 16 November 2006.

The truck and trailer was lifted/towed off site and removed. The truck was written off by insurers. Figures 7 and 8 are photographs of the truck and train following the collision.

1.3.1 Loss and damage

The ARTC incurred only minor damage associated with level crossing signage.

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5 'relief train' – Is a breakdown or other train, locomotive or locomotives coupled proceeding to clear an obstruction or assist a disabled train. (Source: Glossary for the National Codes of Practice and Dictionary of Railway Terminology)

Pacific National incurred minor damage to the drag box, air-compressor and various brake fittings on its locomotive.

Rock Haulage Pty Ltd incurred significant losses with the truck being written off.

Figure 7: Photo of truck cabin wreckage.

Photograph – Victoria Police Copyright ©

Figure 8: Photo of locomotive, NR118, showing extent of damage.

Photograph – Victoria Police Copyright ©

2 ANALYSIS

2.1 Evidence

On 15 November 2006, two investigators from the Australian Transport Safety Bureau (ATSB) were despatched to investigate an accident at the Barpinba-Poorneet Road level crossing near Wingeel in southern Victoria. The accident involved a tip truck/tri-axle trailer combination and *The Overland* passenger train. The level crossing was controlled by approach warning signs, 'Stop' signs and road markings.

Evidence was sourced from witnesses, the Victoria Police, the Victorian Department of Infrastructure (DoI), the ARTC, PN and GSR. Evidence included train control graphs, train control voice and data logs, locomotive data logs, guidelines for level crossing design, level crossing upgrade program, history of previous accidents, site drawings, maintenance records, truck and train driver/co-driver records. The investigators also examined and photographed the accident site, including the approaches to the level crossing to identify compliance against standards and observe first hand the approach sighting constraints and viewing angles that existed at the location.

A post-mortem examination of the truck driver subsequently established that he was not affected by alcohol or drugs at the time of the accident and had been in good health.

2.2 Sequence of events analysis

Passage of train

At the time of the accident, train 4AM8 was under the direction of the ARTC train controller located in Adelaide. The train drivers had the correct authority to occupy the section of track between the Berrybank Loop and the Wingeel Loop, the section where the accident occurred.

An event logger on locomotive NR118 captures time, speed, distance, brake, headlight, whistle and vigilance activation data. The speed recorded by the data logger was corrected for wheel diameter variation to accurately calculate the train speed. An examination of locomotive data was used to reconstruct events leading up to the collision. Based on this information the following was concluded:

- The train was travelling at the prescribed track speed of 115 km/h before the collision.
- The train headlight was on full beam before/at the time of collision, this is supported by witness observations.
- The train whistle was used in accordance with standard operating practice. At 1653:00, a distance of 467 metres from the collision, the train driver sounded the whistle for 5.9 seconds. The whistle was then 'Off' for 1.4 seconds. At 1653:07 a distance of 243 metres from the crossing the train driver again sounded the whistle, this time continuously until the collision occurred.

- The train brakes were applied 243 metres in advance of the level crossing when it became apparent to the train driver that a collision may be imminent. This is corroborated by the train driver who stated that he applied the brakes approximately 200 m in advance of the level crossing.
- The collision occurred at 1653:14.
- The speed of the train at the time of collision was 110 km/h; this was 5 km/h below the track speed for this class of train. The speed reduction is reflective of achievable braking effort from when the train driver reacted to the risk of a collision.

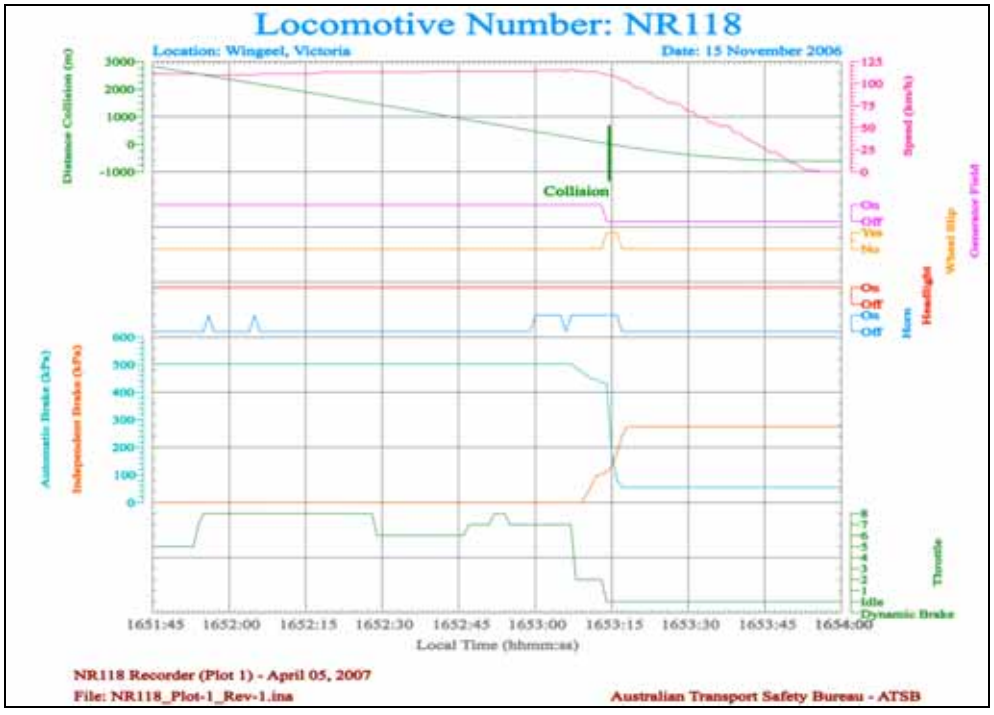
An inspection of the headlight and whistle of locomotive NR118 was conducted while the train was at the accident site. This inspection established that:

- The headlights and ditch lights were on and in good working condition, excluding the right-hand-side ditch light that had been damaged by the collision.
- The whistle was in good working order.

It is concluded that:

- There were no deficiencies that relate to the mechanical condition of the locomotive. Train speed, braking, headlight illumination and the sounding of the whistle were appropriate.
- There were no factors identified that relate to the performance of the train crew in their handling of the train. The train crew were unable to take any avoiding action other than sounding the whistle and braking.

Figure 9: Locomotive NR118 'loco log data' extract



Passage of truck – truck speed

The truck did not have an on-board data recorder that could be used to provide information regarding its speed.

However the truck's average speed[6] was calculated as 85 km/h from the time it left Ondit through to its arrival at the Barpinba-Poorneet Road level crossing, a journey of approximately 27 km. This indicates that the truck driver probably drove responsibly in accordance with posted speed limits.

Dual tyre skid marks were found on the road surface on the south-western side of the level crossing, these were made by the truck. The skid marks were measured as being four metres in length and support the observations of the train drivers and a witness who all state that the truck was travelling slowly as it entered the level crossing. The train drivers both observed that the truck appeared to brake heavily in the last moments before the collision but stopped on the rail line.

The witness who saw the accident was unable to estimate the speed of the truck at the time of the collision but stated that it did not come to a stop at the crossing and was travelling slowly when it fouled the rail line.

Following the accident, VicRoads used portable scales to weigh the truck, trailer and remaining parts. The gross weight was determined to be 40.6 tonnes, the truck was therefore not overweight.

Based on available evidence it was concluded that the truck did not come to a halt at the 'Stop' sign and that the truck driver probably did not see the train until the last moments before the collision.

2.3 Level crossing signage standards

Australian Standard 1742.7-1993[7]

Railway level crossings in Victoria generally comply with the requirements of the Australian Standard AS 1742.7: *Manual of uniform traffic control devices - Railway crossings*. This Standard is one of a series of 13 prepared by the Standards Australia Committee on Road Signs and Traffic Signals. The Standard describes the configuration of signage to be used to control and warn road traffic at, and in advance of, railway crossings and the manner in which signage is to be displayed.

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6 The average speed was based on the distance travelled (27 km) and time to travel from Quinanes Road, Ondit (1634) to the time of the collision at the Barpinba-Poorneet Road level crossing (1653) ie 19 minutes.

7 At the time of this accident a new version of the Australian Standard AS1742.7 was in draft form but had not been publicly released. The new standard came into force on 20 February 2007. AS1742.7-1993 was used in assessing compliance of signage, positioning of signage, etc, but does not include guidelines for stopping distances, sighting distances and viewing angles. The sighting requirements specified within Austroads *Rural Road Design - A Guide to the Geometric Design of Rural Roads* AP-G1 03 have been used in making this assessment and are consistent with guidelines contained in the newly published version of AS1742.7-2007.

For example, a passive level crossing with 'Stop' sign control is required to have a specific configuration of approach warning signs and pavement markings. These warning signs are displayed in a specific order (Fig. 10) for an approaching motorist as detailed here-under:

- The advance warning sign - 'Railway level crossing ahead', (symbolic train) W7-7(L), on the left-hand side of the road and optionally a W7-7(R) sign on the right-hand side of the road.
- The 'Stop Sign Ahead', W3-1, sign is positioned 70 m after the W7-7(L) sign and 180 – 250 m before the 'Railway level crossing stop assembly' (RX-2) sign.
- The 'Railway level crossing stop assembly' (RX-2) sign is located not less than. 3.5 metres from the nearest rail.

Passive and active level crossing control - AS1742.7 defines:

- a passive control level crossing as:

> The control of movement of the vehicular or pedestrian traffic across a railway level crossing by signs and devices, none of which are activated during the approach or passage of a train, and which rely on the road user detecting the approach or presence of a train by direct observation.

- an active control level crossing as:

> The control of the movement of vehicular or pedestrian traffic across a railway level crossing by devices such as flashing light signals, gates or barriers, or a combination of these, where the device is activated prior to and during the passage of a train through the crossing.

AS1742.7-1993 did not prescribe which type of level crossing control (passive or active) is to be used. Nor did it prescribe the level of control used, for example, whether the traffic control should be by way of a 'Stop' or 'Give Way' sign at a passive crossing or whether boom gates are to be installed at an active crossing. The standard simply states:

> The type of control used at a railway level crossing will depend on the requirement of individual locations taking into account safety, traffic volume, geometry and other considerations.

In making a determination regarding the type of control, sighting distance and approach viewing angle are important factors requiring consideration. Although sighting warrants vary from State to State they are generally consistent with that documented in Austroads *Rural Road Design - A Guide to the Geometric Design of Rural Roads* AP-G1 03[6]. This code is also largely consistent with the newly published Australian Standard, AS1742.7-2007 which includes information on sighting distances and driver viewing angles. The new standard, AS1742.7-2007 now prescribes:

> Where the sight distance available to a road vehicle is less than that required for stop sign control, regardless of whether it meets the requirement for give-way sign control, passive control shall not be used at the crossing. If the crossing is to remain open, alternative measures shall be applied. These may include the restoration of sight distance by sight benching in cuttings, clearing, geometric alteration of the crossing or changing to active control.

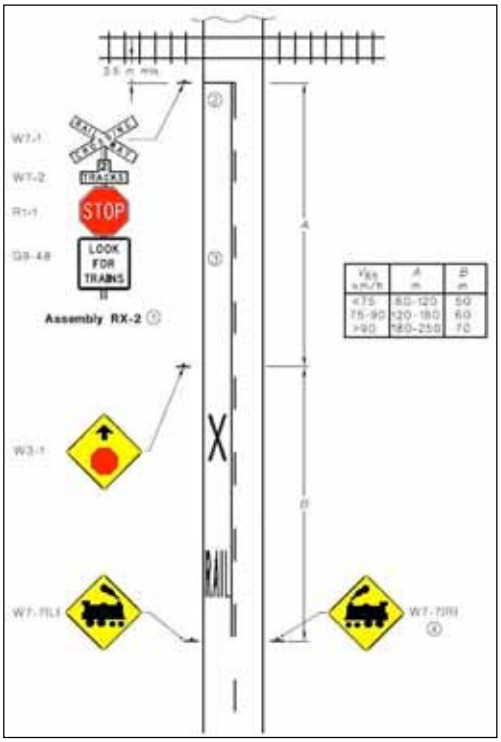
Conformance with AS1742.7-1993[6]

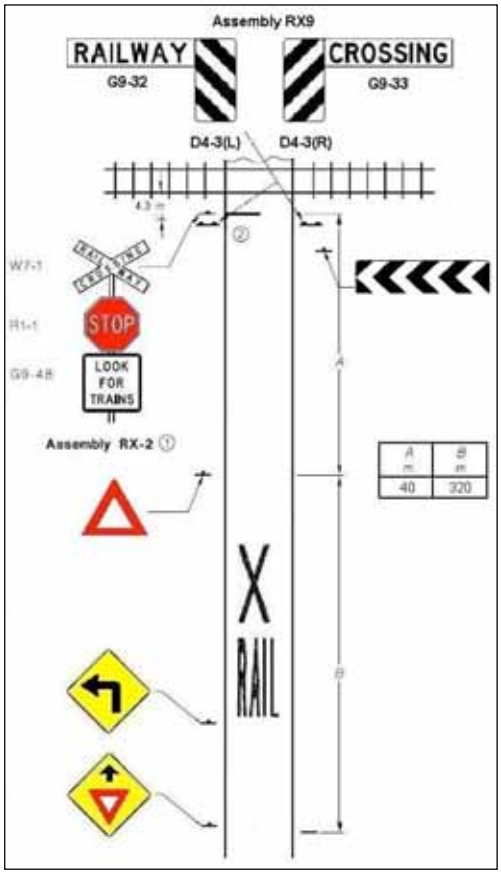
Although the RX-2 and RX9 assemblies (Fig. 12) on the south-west side of the Barpinba-Poorneet Road level crossing were compliant and in good condition the approach warning signage (Fig. 13) and road pavement markings, maintained by the Colac Otway Shire Council (COSC) did not comply with AS1742.7-1993 and were in poor condition. A motorist who was unfamiliar with the local topography would have been unaware of the presence of the level crossing until almost upon it.

Figure 10: AS1742.7-1993, Standard signage and road marking layout for 'level crossing with straight approach controlled by 'Stop' signs (Passive Control)'.

Figure 11: Signage as observed approaching the Barpinba-Poorneet Road level crossing from the south west. Note 'Give Way' approach signs.

Ref. AS1742.7 – 1993





NOTES:

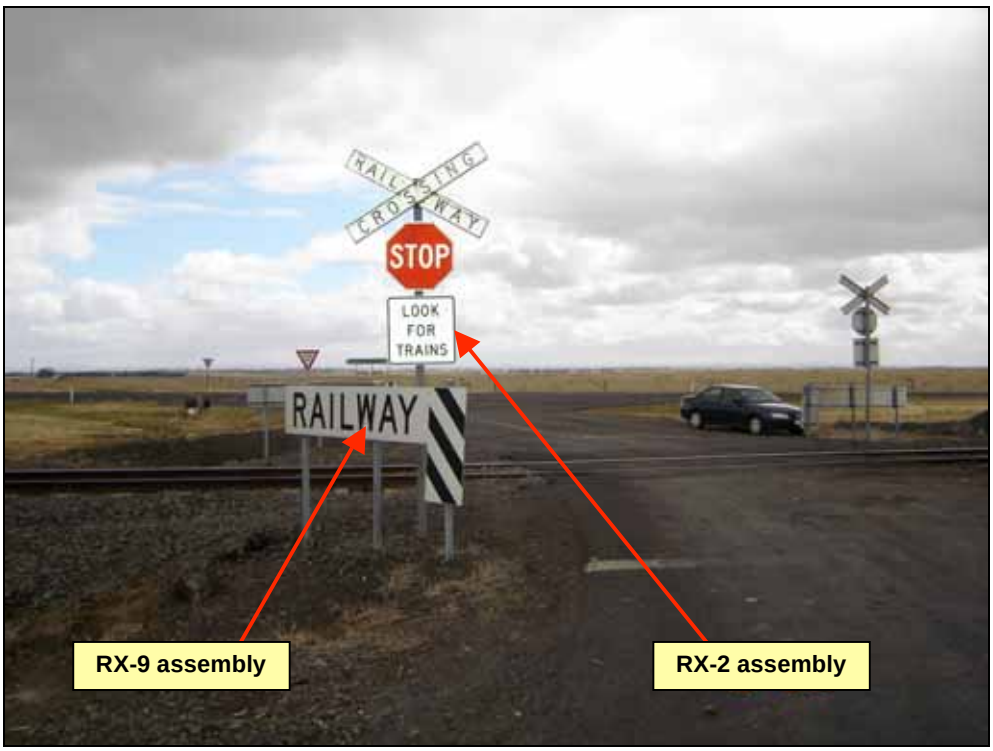
1 If more than one track, the TRACK sign W7-2 is added below W7-1. The alternative RAILWAY CROSSING position sign *with target board*, W7-6, may be required (see Clause 6.2.1).
2 Stop lines (see Clause 7.3) are required on sealed roads at level crossings controlled by STOP signs.
3 The barrier line (see Clause 7.5) should extend at least to the W7-7 sign.
4 The right-hand side sign, W7-7, is for optional use on busy roads (see Clause 6.2.3)

The following specific non-conformances were identified with the type and positioning of signage/road markings on the south west approach to the Barpinba-Poorneet Road level crossing:

- The W7-7 'Railway level crossing ahead - Passive control' was not in place as prescribed. The sign at the approximate location of the W7-7 was a W3-2A 'Give Way Sign Ahead' (See Fig. 10 and Fig. 11).

- The W3-1 ‘Stop sign ahead’ was not in place as prescribed. A position marker/inverted triangle, peak facing upwards was located at a distance of approximately 40 m from the ‘Stop’ sign. There was some evidence of a sign below the triangle, it was probably vandalised and had not been replaced.
- Road markings were not as prescribed, in particular there was no evidence of a ‘barrier line’[8] and the ‘Stop line’ at the south west approach was heavily faded.
- The inner approach warning sign was in a poor condition.

Figure 12: Photograph of RX-2 and left hand side of RX9 assembly at the Barpinba-Poorneet Road level crossing.



Based on documentation provided by the COSC it is likely that their understanding of level crossing maintenance responsibilities was deficient.

8 Barrier lines - A barrier line consists of a pair of longitudinal lines which replace the normal single separation line. It prohibits overtaking movements in one or both directions (Reference AS1742.7 – 1993).

Figure 13: Left photograph shows a non compliant 'Give Way Sign Ahead'. Right photograph shows a position marker with an indication of a missing sign below.

Photograph – PTSV Copyright ©

Warrants, passive level crossing

Australian Standard 1742.7-1993 requires that when making a determination regarding the type of level crossing control, sighting distances and approach viewing angles shall be considered.

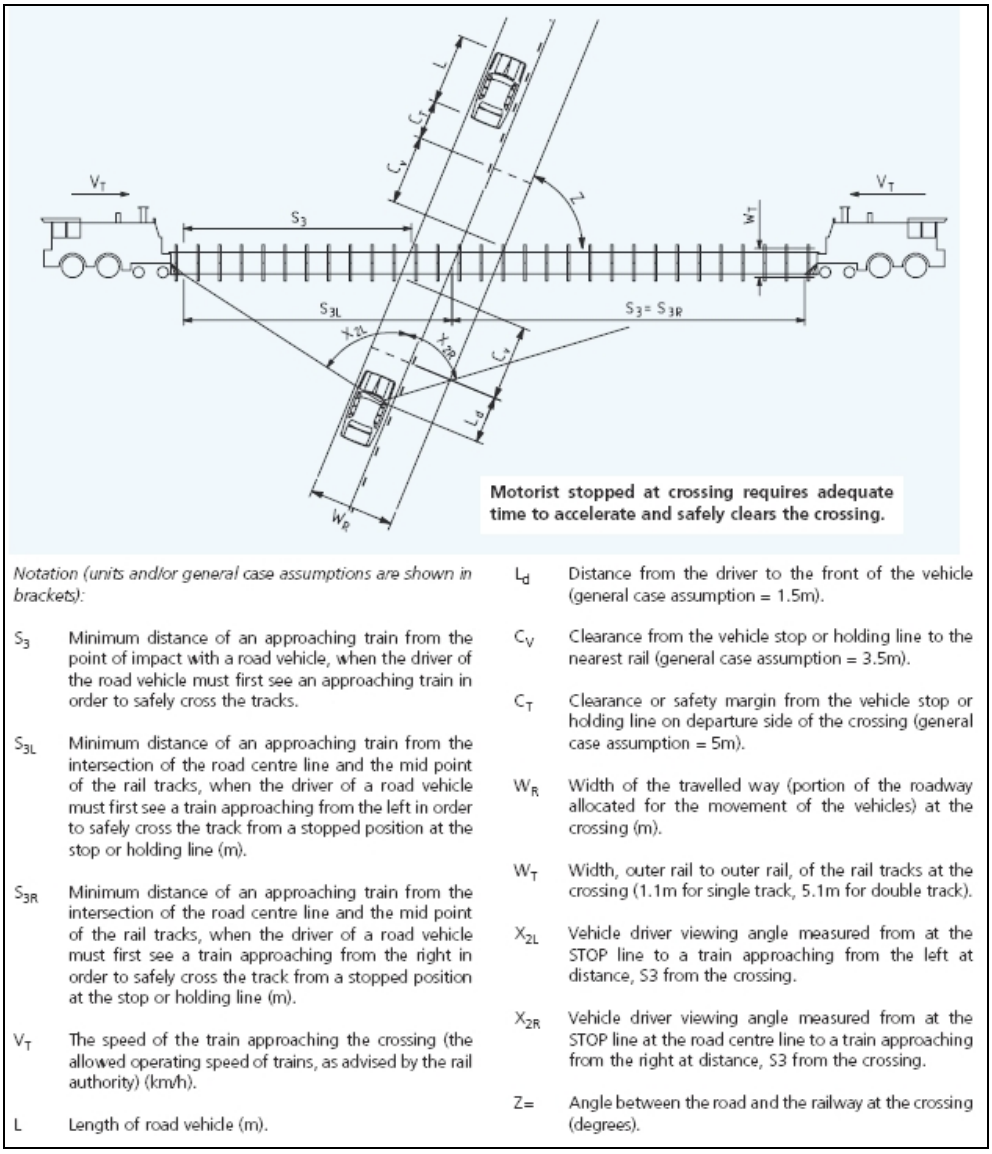
'Stop' sign control at a level crossing requires that the driver of a motor vehicle has sufficient sighting distance (including viewing angles) along the track when stopped to see an approaching train and then be able to accelerate clear of the level crossing before the train arrives.

Austroads *Rural Road Design - A Guide to the Geometric Design of Rural Roads* AP-G1 03 provides guidelines for the calculation of sighting distances and viewing angles at level crossings.

Travelling in a north-easterly direction along the Barpinba-Poorneet Road, (Fig. 3) the visibility of the rail line is fairly good, however the road converges towards the Adelaide to Melbourne rail line at an acute angle, approximately 38 degrees and only turns sharply into the level crossing over the last 20 m. The angle of approach is such that the driver of a motor vehicle must turn their head sharply to the left and their vision is likely to be obscured by the 'A' and 'B' pillars of the vehicle. Further, the cab design of trucks is visually restrictive when compared with a passenger car and vision to the left, adjacent the 'B' pillar[9] is quite constrained. This is a common characteristic of many trucks and restricts the viewing angle.

9 The roof of a truck is supported by pillars. They are known as 'A' pillars and 'B' pillars, see Fig. 5. The 'A' pillars are at the front. They are located where the windshield meets the front side windows/doors. The 'B' pillars, are located between the back of the front side windows and the rear of the cab of the truck.

Figure 14: Approach distances and viewing angles



Notation (units and/or general case assumptions are shown in brackets):

S_3 Minimum distance of an approaching train from the point of impact with a road vehicle, when the driver of the road vehicle must first see an approaching train in order to safely cross the tracks.

S_{3L} Minimum distance of an approaching train from the intersection of the road centre line and the mid point of the rail tracks, when the driver of a road vehicle must first see a train approaching from the left in order to safely cross the track from a stopped position at the stop or holding line (m).

S_{3R} Minimum distance of an approaching train from the intersection of the road centre line and the mid point of the rail tracks, when the driver of a road vehicle must first see a train approaching from the right in order to safely cross the track from a stopped position at the stop or holding line (m).

V_T The speed of the train approaching the crossing (the allowed operating speed of trains, as advised by the rail authority) (km/h).

L Length of road vehicle (m).

L_d Distance from the driver to the front of the vehicle (general case assumption = 1.5m).

C_V Clearance from the vehicle stop or holding line to the nearest rail (general case assumption = 3.5m).

C_T Clearance or safety margin from the vehicle stop or holding line on departure side of the crossing (general case assumption = 5m).

W_R Width of the travelled way (portion of the roadway allocated for the movement of the vehicles) at the crossing (m).

W_T Width, outer rail to outer rail, of the rail tracks at the crossing (1.1m for single track, 5.1m for double track).

X_{2L} Vehicle driver viewing angle measured from at the STOP line to a train approaching from the left at distance, S3 from the crossing.

X_{2R} Vehicle driver viewing angle measured from at the STOP line at the road centre line to a train approaching from the right at distance, S3 from the crossing.

Z= Angle between the road and the railway at the crossing (degrees).

Ref. Austroads AP-G1 03

Based on a train speed of 115 km/h approximately 580 m available sighting is required for a loaded truck (19 m in length) when stopped at the Barpinba-Poorneet Road level crossing to see a train, safely accelerate and then clear the crossing. An examination of the Barpinba-Poorneet Road level crossing established that there was adequate sighting distance along the track in a north-westerly direction.

AP-G1 03 also prescribes that the maximum viewing angle measured at the 'Stop' sign when looking for an approaching train. This angle should not exceed 110 degrees, when looking to the left. Using the guidelines within AP-G1 03 revealed that a viewing angle as large as 141 degrees was possible dependent on the final position of the truck when stopped.

Figure 15: View of track from the level crossing looking north-west, the direction from which *The Overland* approached.

This indicates that the amount of head twist required of the truck driver was excessive. This coupled with the sighting constraints imposed by the 'B' pillar of the truck involved in the collision, would have made it very difficult for the truck driver to see and appreciate the presence of the train without coming to a halt at the 'Stop' sign. All available evidence indicates that the truck did not come to a halt at the 'Stop' sign and did not intend to stop until he saw/detected a train, he was probably unaware of the presence of the train until the last few seconds before the collision.

2.4 Driver of the truck

Safe driving and proper observance of road rules by drivers of motor vehicles when traversing level crossings is essential to rail safety. 'Road Rules – Victoria' at Part 10, Section 123, Clause (c) and (d) stipulates:

> A driver must not enter a level crossing if –
>
> (c) a train or tram is on or entering the crossing; or
>
> (d) a train or tram approaching the crossing can be seen from the crossing, or is sounding a warning, and there would be a danger of a collision with the train or tram if the driver entered the crossing; …..

Further, Section 121, Clause (a) and (b) stipulates:

> A driver at a level crossing with a *stop sign* must –
>
> (a) stop at the stop line or, if there is no stop line, at the *stop sign*; and
>
> (b) give way to any train or tram on, approaching or entering the crossing.

The road rules, together with effective motorist education, the design of level crossings, road alignment and the provision of correct signage are all defences that help to prevent road and rail systems coming into conflict. However, prima facie, a driver of a motor vehicle errs if they enter a level crossing when a train is approaching the crossing or where there is a risk of a collision with the train.

Route experience

A review of the truck driver's roster established that he had regularly worked the Colac area. It was also ascertained that he had relatives who live/work in the Colac area. Based on available information it was concluded that he knew the road well and should have been aware of the presence of the level crossing.

It was noted that the road approach from the south-west made for a difficult viewing angle when looking to the north-west. This when coupled with the truck driver not coming a halt at the 'Stop' sign meant that there was little opportunity for him to see and react to the imminent presence of the train.

Previous hours of work and toxicology

The driver's roster for the 14 days before the accident contains no breach in terms of allowable driving hours as prescribed by the National Driving Regulations. The driver was rostered to work a nominal eight hour day commencing at 0630. He had adequate break periods including weekends off. Roster related fatigue is therefore not considered to be a factor in this collision. The post-mortem examination of the truck driver established that he was not affected by alcohol or drugs.

Presence of road-junction

The junction of Barpinba-Poorneet Rd and the level crossing in relation to the Hamilton Highway was only 50 m apart. Intersecting roads and other road traffic can distract a motorist from looking for a train or indications of an oncoming train. Research by the National Transportation Safety Board (NTSB) in 1998 has established that roads which intersect with a level crossing, closely followed by a road junction, require an increase in the number of decisions a motorist must make and that this can distract the motorist from looking for a train. In fact a nearby road intersection may become a significant distraction for the motorist simply because the motorist is aware of it. The NTSB found that if on the departure side of a level crossing a road intersection is visible to an approaching motorist, the motorist's attention may be drawn towards that intersection and away from the crossing. The ATSB's recent investigation of level crossing accidents at Horsham, VIC, Tailem Bend, SA and Elizabeth River, NT concluded that in each of these cases involving a motor vehicle and train, the close proximity of an intersecting road may have resulted in motorist distraction and had probably been a factor in the accident.

Looked but did not see

Research by Green, M. & Senders, J. (2004) has shown that in road accidents critical/important information may have been detectible but the motorist did not attend to or notice it because their mental resources were elsewhere. Furthermore, research by Mack, A. & Rock, I. (1998) into a phenomenon known as 'inattentional

blindness' has shown how a person may fail to detect an object even though they were looking directly at it.

The human mind has limited resources for perceptual and memory processing. To cope with this limitation, a mechanism called 'attention' acts as a filter to focus this resource on specific tasks. Research suggests that inattentional blindness can occur when attention is mistakenly filtered away from important information and can be affected by mental workload, expectation, conspicuity and capacity.

It is quite possible that the truck driver's attention was focused in the direction of highest perceived risk, ie the junction of Barpinba-Poorneet Rd and the Hamilton Highway and that his attention may have been focused on the oncoming road traffic, eg the witness's car. This action may have drawn his attention away from the railway line which has relatively infrequent traffic compared to the Hamilton Highway. An ATSB investigation involving a truck and train at Elizabeth River NT concluded that 'inattentional blindness' may have been a factor in that accident.

Expectation

A factor which also influences the behaviour of road users at level crossings is their expectation of encountering a train (NTSB 1998). If the motorist does not expect to encounter a train they may simply not look for one and behave accordingly.

The road user's perception that a train is unlikely to be at a crossing is reinforced every time the motorist uses the crossing without seeing a train. Research has found that an individual's response to a possible hazard is influenced by both the perceived probability of the adverse event occurring and of that individual's understanding of the severity of the consequence of the event. A person's perception of the probability of a given event is strongly influenced by past experience (Schoppert and Hoyt, 1968 cited in NTSB, 1998), and the frequency with which they encounter a train at a level crossing will influence the likelihood of the motorist stopping (NTSB, 1998).

It is known that the truck driver used the crossing regularly and on occasions may have traversed it as often as eight times a week. Approximately 100 trains use the line weekly, ie 14 per day or about one train every 100 minutes. The probability of seeing a train is relatively low. Had the truck driver previously seen little or no rail traffic passing over the crossing he may not have expected to see a train and this may have led to complacency and the development of a pattern of not looking for trains and failing to come to a halt at the 'Stop' sign. ATSB investigations at Horsham, VIC, Tailem Bend, SA and Elizabeth River, NT concluded that in each of these cases, expectation may have been a factor in the collision at the level crossing.

Summary

The truck driver had regularly driven the route and should have been aware of the 'Stop' sign controlling the level crossing. Available evidence established that he did not stop and was probably unaware of the presence of the train until just before the collision.

The difficult viewing angle imposed by this site and failing to stop meant that there was only limited opportunity for the truck driver to see and react to the imminent presence of the train.

It is likely that the actions of the truck driver, ie failing to stop, may have been influenced by a combination of internal and/or external factors.

Internal factors may have included:

- familiarity with the crossing, and
- the expectation that a train would not be present.

Potential external factors may have included the presence of an intersection on the other side of the crossing and the difficulty in seeing a train based on the approach viewing angle and the constraints imposed by the B pillar of the truck. Viewing angle was also found to be an issue of concern for the collision at Tailem Bend, SA involving a prime-mover/low loader combination and a ballast train.

2.5 Road/Rail interface

Level crossing assessment - Victoria

As at 30 June 2007 there were 3125 public road and pedestrian level crossings (estimated) on active rail lines and Heritage/Tourist rail lines in Victoria.

Of these 3125 crossings 2267 are road level crossings on the Victorian main line rail network, of which 824 (or 36%) are actively controlled 362 (or 16%) are boom barrier controlled and 462 (or 20%) are flashing light controlled. A total of 1441 road level crossings, (or 63.6%) are passively controlled, with one set of interlocked gates at Ballarat (Lydiard Street) and one set of hand operated gates at Brighton Beach (New Street).

An initiative of the Victorian Government, aimed at reducing the risk to road and rail users at level crossings, is the Level Crossing Upgrade Program. Under this program the Victorian Government will provide significant additional funding to upgrade level crossings in Melbourne and provincial Victoria, including grade separation at some level crossings. This additional funding will provide for over 100 crossings to be upgraded over the next 10 years bringing the total number of upgrades to 240. The Department of Infrastructure manages the program on behalf of the Government and VicTrack manages the implementation of the program on behalf of the Victorian DoI.

The manner in which level crossings have been selected for upgrade has varied in recent times. Historically, the order in which level crossings were selected for upgrade was based (primarily) on an assessment of a particular level crossing's accident history, the frequency of road and rail traffic and cost of upgrade. In essence, these criteria originated from when Victoria's Public Transport Corporation was responsible for the operation of the State's railways. The level crossings currently identified for upgrade in the Level Crossing Upgrade Program were assessed in this manner. The Barpinba-Poorneet Road crossing was listed as 104th on this original level crossing upgrading program.

There is now an industry transition to a comprehensive assessment model known as the Australian Level Crossing Assessment Model (ALCAM). The ALCAM is essentially a risk assessment tool that takes into account over 70 factors for each level crossing site including the characteristics and the controls present. The model identifies all of the characteristics at a railway level crossing which are then scored

by the ALCAM program. The scoring process allows identification of individual or multiple proposed risk mitigation measures to determine the optimum treatment for each individual level crossing, in order to reduce risks in so-far-as-is reasonably-practicable, as defined pursuant with the Victorian *Rail Safety Act 2006*. The model also allows agencies to prioritise level crossing major upgrade works on a State-wide risk management, highest to lowest ranked basis, for the State Level Crossing Upgrade Annual Works Program. All Victorian crossings are currently undergoing assessment using the ALCAM.

To manage the process, the Victorian Railway Crossing Safety Steering Committee (VRCSSC) has been established. This committee has two working groups that report to it. These groups comprise of representatives from a range of stakeholders, including road and rail infrastructure managers, operators and local authorities. The role of the VRCSSC is to advise the Minister for Public Transport on issues of policy, management and standards for vehicles and pedestrian traversing railway lines in the State of Victoria.

The Barpinba-Poorneet Road level crossing was selected for upgrade from passive to active control, before the occurrence of this accident, with work scheduled for completion during the 2009-10 financial year.

2.6 Safety at level crossings

In a report tabled at the Australian Transport Council (ATC), *National Railway Level Crossing Safety Strategy* dated August 2003, the ATC identified a series of 'Strategic Actions' (Appendix 5.1) aimed at the cost-effective improvement of level crossing safety. In its report, the ATC cited an ATSB report that identified that 46% of fatalities at railway level crossings are as a result of 'Unintended driver error'.

The level crossing accident at Barpinba-Poorneet Road involves a number of the issues identified in the ATC report; in particular, truck driver response, site assessment, stakeholder education, enforcement, and coordination.

The Government of Victoria established the VRCSSC to advise the Minister for Public Transport on issues regarding railway crossings. The committee has a clear mandate to review issues arising from accidents such as occurred at the Barpinba-Poorneet Road level crossing and consider strategies proposed in the ATC report to mitigate ongoing risk.

Train Conspicuity

The National Railway Level Crossing Safety Strategy's strategic action to address the issue of train conspicuity is:

> Ensure that road users can see either an approaching train (locomotive or carriages), or a train that is already on the railway level crossing.

The train head light was on and in good working condition at the time of the accident and should have been clearly visible to the truck driver, however, the witness suggested that the greyish silver colour of *The Overland*'s carriages blended into the colour of the day (grey and cloudy) and made it difficult to see. Although conspicuity may not have been an immediate factor in this collision, enhancing the visibility of trains may assist motorists in seeing them.

Car and Truck Driver Responses

The strategic action to address the issue of car and truck driver responses is:

> Ensure that drivers identify railway level crossing sites, and respond appropriately.

Since the tabling of the ATC report, there have been a number of initiatives by the Victorian Government aimed at improving public awareness regarding level crossings safety, mainly involving media campaigns. This is valuable work that should continue.

Site Assessment, Prioritisation and Treatment

The strategic action to address the issue of site assessment, prioritisation and treatment is:

> Ensure that railway level crossing sites, including pedestrian crossings separate to road crossings, are designed and constructed to an appropriate standard.
>
> Close level crossings where appropriate.

The ALCAM model should continue to be used in developing a risk profile for all level crossings in Victoria.

Opportunities exist at the Barpinba-Poorneet Road level crossing for reducing interface risk by realignment of the road and/or upgrading the crossing to active control.

Stakeholder Education and Information

The strategic action to address the issue of stakeholder education and information is:

> Develop awareness and understanding through participation amongst the public, engineers, the police and others to improve responses, engineering and enforcement (may be similar to U.S. 'Operation Lifesaver')

Australian state/territory transport authorities have been working with stakeholders to improve level crossing safety. For example, working with local government to ensure compliance with AS1742.7. Consideration should be given to providing ongoing assistance to road and rail authorities in coming to an understanding of design and construction requirements for safe level crossing management/strategies and to guard against degradation of these strategies. Opportunities exist for providing ongoing education and auditing of road and rail authorities to better oversight and improve the effectiveness of risk mitigation strategies employed at level crossings.

Legislation, Regulation and Enforcement

The strategic action to address the issue of legislation, regulation and enforcement is:

> Ensure that laws and penalties are clear, understood, appropriate and enforced.

The day after the collision when investigators were at the accident site, they consistently observed motor vehicles traversing the crossing without coming to a halt at the 'Stop' signs as required. It is quite possible that familiarity with the crossing and a low expectation of seeing an approaching train has resulted in this behaviour and that some level of education and enforcement is probably necessary to reverse this trend.

Coordination

The strategic action to address the issue of coordination between jurisdictions is:

> Develop consistency in information, assessments, standards and practices between States.

The ARTC and the COSC did not have an 'Interface Agreement' covering their respective maintenance responsibilities for this level crossing. The establishment of consistent standards/practices is necessary to ensure that all parties are aware of their responsibilities and accountabilities. For example approach warning signage is necessary and is generally provided by road authorities. However it has not always been clear who is responsible and who should fund the capital cost and maintenance of approach warning signage. The lack of a formal agreement potentially exposes organisations to risk, particularly where items are not provided/maintained in accordance with mandated standards because the responsibilities between the parties are ill-defined.

3 FINDINGS

3.1 Context

At 1653 on Wednesday 15 November 2006, a north-east bound Western Star tandem tip truck towing a tri-axle trailer loaded with large rocks drove into the path of the south-east bound passenger train 4AM8, *The Overland*, at the Barpinba-Poorneet Road level crossing, near Wingeel in southern Victoria.

From the evidence available, the following findings are made with respect to the collision and should not be read as apportioning blame or liability to any particular individual or organisation.

3.2 Contributing factors

1. The driver of the truck did not come to a halt at the 'Stop' sign as required by the road rules and entered the level crossing while a train was approaching.
2. The difficult viewing angle imposed by the site (coupled with the truck not stopping and the restricted visibility from the truck driver's cab) meant that there was little opportunity for the truck driver to see and avoid a collision with the train. *[Safety issue]*
3. It is likely that the actions of the truck driver, ie not stopping, may have been influenced by familiarity with the crossing, and the expectation that a train would not be present.
4. The truck driver may also have been distracted by the presence of the road intersection immediately after the Barpinba-Poorneet Road level crossing.

3.3 Other safety factors

1. The approach warning signage on the south west approach of the Barpinba-Poorneet Road level crossing was not compliant with AS1742.7-1993 and in poor repair. A motorist unfamiliar with the road would probably be unaware of the level crossing until they could directly sight it. *[Safety issue]*
2. It is likely that motorists who traverse the Barpinba-Poorneet Road level crossing regularly fail to come to a halt at the 'Stop' signs. *[Safety issue]*
3. During the investigation it was noted that the Australian Rail Track Corporation and the Colac Otway Shire Council did not have an 'Interface Agreement' covering their responsibilities with respect to the maintenance of level crossing signage. Maintenance responsibilities need to be clearly defined. *[Safety issue]*
4. Under certain lighting conditions the greyish/silver colour of *The Overland* carriages may make it difficult for an approaching motorist to see the train. *[Safety issue]*

3.4 Other key findings

1. Train 4AM8 was in possession of the necessary safeworking authority to occupy the Berrybank to Wingeel section of track, it was travelling at the prescribed track speed and being operated in accordance with the relevant rules and procedures.
2. There were no deficiencies that relate to the mechanical condition of the locomotive. Train speed, braking, headlight illumination and the sounding of the whistle were appropriate in the circumstances.
3. There were no defects with the track or signalling system.
4. The train crew were appropriately trained, qualified and medically fit at the time of the accident.
5. The investigation concluded that the train crew's actions were appropriate in the circumstances and that there was little effective action they could have taken to prevent or minimise the impact of the collision.
6. Breath testing of the train driver and co-driver by the Victoria Police returned zero readings.
7. There were no deficiencies that relate to the mechanical condition of the rigid tipper truck/tri-axle trailer.
8. The history of the truck operator Rock Haulage Pty Ltd and the driving record of the truck driver gave no indication of factors likely to have contributed to the accident. Driver fatigue was not considered an issue.
9. The post mortem examination of the truck driver established that he was not affected by alcohol or drugs at the time of the accident. He was in good health.
10. At the time of the accident the sky was overcast, general visibility was good.
11. The Australian Level Crossing Assessment Model (ALCAM) can be used to develop mitigation strategies for determining the optimum treatment for each level crossing and thereby allow agencies to prioritise level crossing upgrade works.

4 SAFETY ACTIONS

The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety actions, rather than to issue formal safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Depending on the level of risk of the safety issue, the extent of corrective action taken by the relevant organisation, or the desirability of directing a broad safety message to the rail industry, the ATSB may issue safety recommendations or safety advisory notices as part of the final report.

4.1 Safety actions taken

Following the accident the Victoria Police directed that the Colac Otway Shire Council upgrade the Barpinba-Poorneet Road level crossing south-west approach warning signs before they would allow the level crossing to be re-opened. This work was completed on 16 November 2006, however it was observed that the signage was still not in compliance with AS1742.7-1993 and/or AS1742.7-2007.

Based on current advice it is understood that the Colac Otway Shire Council has taken steps to enhance its level crossing inspection regime and that signage at level crossings is maintained in compliance with AS1742.7-2007.

4.2 Victorian Department of Infrastructure

Safety Issue

It is likely that motorists who traverse the Barpinba-Poorneet Road level crossing regularly fail to come to a halt at the ‘Stop’ signs.

ATSB safety recommendation RR20070023

The Australian Transport Safety Bureau recommends that the Victorian Department of Infrastructure[10] take action to address this safety issue.

10 The Victorian Rail system operates on the principle of ‘co-regulation’. The state regulatory body, Public Transport Safety Victoria (PTSV), a separate statutory office within the Department of Infrastructure (DoI), accredits all rail owners/operators in Victoria, subject to satisfying the accreditation criteria set out in the *Transport Act 1983*.

Safety Issue

The difficult viewing angle imposed by this site (coupled with the truck not stopping and the restricted visibility from the truck driver's cab) meant that there was little opportunity for the truck driver to see and avoid a collision with the train.

ATSB safety recommendation RR20070024

The Australian Transport Safety Bureau recommends that the Department of Infrastructure examine opportunities with the Australian Rail Track Corporation and the Colac Otway Shire Council and take action to address this safety issue[11].

4.3 Australian Rail Track Corporation

Safety Issue

During the investigation it was noted that the Australian Rail Track Corporation and the Colac Otway Shire Council did not have an 'Interface Agreement' covering their respective maintenance responsibilities. Maintenance responsibilities need to be clearly defined.

ATSB safety recommendation RR20070025

The Australian Transport Safety Bureau recommends that the Australian Rail Track Corporation take action to address this safety issue.

4.4 Colac Otway Shire Council

Safety Issue

The approach warning signage on the south west approach of the Barpinba-Poorneet Road level crossing was not compliant with AS1742.7-1993 and in poor repair. A motorist unfamiliar with the road would probably be unaware of the level crossing until they could directly sight it.

ATSB safety recommendation RR20070026

The Australian Transport Safety Bureau recommends that the Colac Otway Shire Council take action to address this safety issue.

Safety Issue

During the investigation it was noted that the Australian Rail Track Corporation and the Colac Otway Shire Council did not have an 'Interface Agreement' covering

11 The ARTC and the COSC should liaise with the DoI regarding design and maintenance strategies that are available for reducing the road/rail interface risk at level crossings and to gain assistance with the assessment of options using the ALCAM.

their respective maintenance responsibilities with respect to the maintenance of level crossing signage. Maintenance responsibilities need to be clearly defined.

ATSB safety recommendation RR20070027

The Australian Transport Safety Bureau recommends that the Colac Otway Shire Council take action to address this safety issue.

4.5 All rolling stock operators

Safety Issue

Although train conspicuity may not have been a significant factor in this collision, rollingstock operators should examine opportunities to enhance train visibility to ensure that road users can better see approaching trains (locomotives or carriages), or trains that are already on a railway level crossing.

ATSB safety advisory notice RS20070002

The Australian Transport Safety Bureau advises that all rolling stock operators should consider the implications of this safety issue and take action where considered appropriate.

APPENDIX A : NATIONAL RAILWAY LEVEL CROSSING SAFETY STRATEGY

Strategic Response

Issue	Strategy
Train Conspicuity	Ensure that road users can see either an approaching train (locomotive or carriages), or a train that is already on the railway level crossing.
Car and Truck Driver Responses	Ensure that drivers identify railway level crossing sites, and respond appropriately.
Pedestrian Responses	Ensure that pedestrians identify railway level crossing sites, and respond appropriately. Ensure that people with disabilities are provided with appropriate information by way of site design and other initiatives.
Site Assessment, Prioritisation and Treatment	Ensure that railway level crossing sites, including pedestrian crossings separate to road crossings, are designed and constructed to an appropriate standard. Develop appropriate Australian design standards for railway level crossing protection equipment including the operation and timing of flashing lights, boom barriers, pedestrian signals and gates, and active advance warning signs. Develop uniform criteria for the establishment of the level of protection for road vehicle and pedestrian crossings. Ensure that designs are appropriate for people with disabilities and other vulnerable road users. Close level crossings where appropriate. Investigate low cost treatments including active warning signs, beacons, strobe lights and other alerting devices at railway level crossings.
Stakeholder Education and Information	Develop awareness and understanding through participation amongst the public, engineers, the police and others to improve responses, engineering and enforcement (may be similar to U.S. 'Operation Lifesaver').
Data Collection	Enable effective national data comparisons.
Funding	Seek additional funds for railway level crossing safety. Allocate funds for railway level crossing treatments within the context of broader transport infrastructure priorities.
Rail Industry Involvement	Industry involvement in engineering, education and enforcement programs. Ensure appropriate train standards and operation.
Legislation, Regulation and Enforcement	Ensure that laws and penalties are clear, understood, appropriate and enforced.
Coordination	Develop consistency in information, assessments, standards and practices between States. Implementation of the Strategy should be well managed, co-ordinated, monitored and reviewed.

APPENDIX B : SOURCES AND SUBMISSIONS

Sources of information

Australian Rail Track Corporation:

Bureau of Meteorology

Colac Otway Shire Council

Department of Infrastructure (Victoria)

Great Southern Railways

Pacific National

Rock Haulage Pty Ltd

VicRoads

Witnesses

References

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Submissions

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

A draft of this report was provided to:

a) Australian Rail Track Corporation

b) Pacific National

c) Great Southern Railways

c) The train driver/co-driver of 4AM8

d) Colac Otway Shire Council

e) Rock Haulage Pty Ltd

f) Department of Infrastructure (Victoria)

g) Witness.

Submissions were received from:

The Australian Rail Track Corporation, Colac Otway Shire Council, the Department of Infrastructure (Victoria), Pacific National and a witness have made a number of comments and observations on the draft report issued to directly involved parties.

The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

APPENDIX C : MEDIA RELEASE

ATSB Level Crossing Fatality Findings

The ATSB has found that a fatal collision between *The Overland* passenger train and tip truck towing a tri-axle trailer occurred because the truck driver probably did not see the train and entered the level crossing after braking too late to stop at the 'Stop' sign.

The Australian Transport Safety Bureau has today released its final report on the investigation of the collision which occurred at the Barpinba-Poorneet Road level crossing, near Wingeel in southern Victoria, on 15 November 2006.

At the time of the accident the crossing was controlled by passive 'Stop' signs and approach warning signs. The investigation established that the truck did not come to a halt at the 'Stop' sign controlling the crossing and concluded that the driver was possibly distracted by the presence of the road-junction ahead. The truck driver was probably unaware of the presence of the train until just before the collision.

The investigation also found that the viewing angle in the direction from which the train approached the crossing was poor. When coupled with the restricted visibility from the truck's cab, it would have been difficult for the truck driver to see the train without coming to a complete stop at the crossing. The investigation also found that when approaching the crossing from the south-west the advance warning signs did not comply with the operative Australian Standard AS 1742.7: *Manual of uniform traffic control devices - Railway crossings*.

The investigation established that in the circumstances there was nothing that the train crew could have done to prevent the accident.

In the interest of enhancing future road/rail safety the ATSB has made a series of recommendations to address safety issues including the poor viewing angle at the crossing and the non-compliance of the level crossing signage with the relevant standard.

Collision between Rigid Tipper Truck/Tri-axle Trailer and the Overland Passenger Train, 4AM8 Wingeel, Victoria, 15 November 2006