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# Railway Level Crossing Safety Bulletin

## Overview

Since 1970 fatalities resulting from accidents between road vehicles and trains at level crossings have reduced by about 70 per cent. However, recently there has been an increasing number of accidents involving heavy road vehicles.

Between April 2006 and December 2007 the ATSB investigated 12 level crossing accidents. Of these 12 accidents, nine have involved heavy road vehicles, four of which have been collisions with long distance passenger trains. In addition, during the same period State authorities have investigated a further three significant accidents between heavy vehicles and passenger trains.

These accidents have cost the lives of 19 people, 13 on board the trains and six occupants of the road vehicles. In addition, over 60 people have been injured and the damage bill is estimated at well over $100 million.

Although fatalities and injuries resulting from accidents at railway level crossings are only a small proportion of the total fatalities and injuries that occur on Australian roads each year, railway level crossing accidents, particularly when they involve heavy road vehicles, have the potential to be catastrophic.

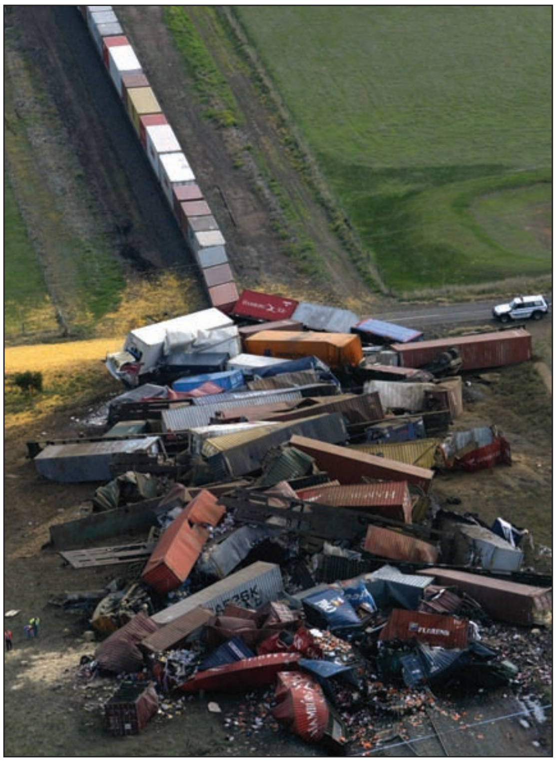
Heavy road vehicles such as road-trains and larger freight trains have become the norm in Australia for the good reason that they are an efficient way to transport goods over long distances between our metropolitan and regional centres. However, with the increased size comes an increased consequence in the event of a level crossing collision. It used to be somewhat rare to hear of a train derailing or of significant casualties on board the train as a result of a collision with a road vehicle. This is not the case today.

Some recent accidents have involved significant loss of life, the worst case being the tragic accident at Kerang when a semi-trailer collided with a Melbourne-bound passenger train on 5 June 2007. Eleven people were killed and 20 injured in this accident.

Another major collision between a B double truck and a freight train occurred at Lismore, Victoria on 25 May 2006. This accident resulted in the death of the truck driver and an estimated damage bill in excess of $30 million.

**Figure 1: Kerang accident site**

**Figure 2: Aerial view of Lismore accident site**



## Level crossings

### The basics

Level crossings are the physical interface between road and rail traffic. Both modes of transport are operated as entirely separate entities and have different rules, procedures, characteristics and operational limitations. Most importantly though, neither has advance knowledge of when the other will be encountered at the interface. Even at level crossings with active warning devices (eg. flashing lights and bells), the warning that a train is approaching is given to the motorist at, and not in advance of, the level crossing.

### Operational limitations of trains

Trains have far greater operational limitations than even the largest road vehicle. Interstate freight trains can be in excess of 1,500 m long and weigh upwards of 5,000 tonnes. Locomotive-hauled passenger trains can weigh 2,000 tonnes or more. Trains of this size are, by necessity, driven 'many kilometres in advance'. In routine operations, brakes are often applied kilometres beforehand to slow or stop a train. A train can also take many kilometres to accelerate to track speed.

When a road vehicle enters a level crossing in the path of the train, the only action that a train driver can take is to try to alert the driver with the train horn and apply emergency braking. If the collision is imminent, even under emergency braking, the train will not slow significantly, if at all, before the collision occurs. As basic as this may seem, this is a facet of operating a train that most motorists are simply unaware of.

### Level crossing traffic control

Given the limitations on braking and accelerating trains, by necessity, motorists must give way to trains at level crossings. While this may sound obvious, the data indicates that most level crossings accidents are the result of a failure by the motorist to abide by this simple rule.

Level crossing traffic control systems are intended firstly to alert an approaching motorist to the presence of the level crossing. Secondly they require the motorist to take appropriate action depending on the control system at the crossing, which may be a barrier, flashing lights and bells or a 'Stop' or 'Give Way' sign. It is critical that motorists are vigilant every time they approach a level crossing, regardless of how familiar they may be with it, and heed the approach signs and the warning system or signs at the crossing.

### Active control level crossings

Active control level crossings control the movement of vehicular or pedestrian traffic using devices such as flashing 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.

There are about 2,700 active control level crossings in Australia. They are mainly installed where there is a risk that has been judged sufficient to warrant the cost of installing active control devices. This judgement is based on the density of road and rail traffic, the limited ability for a motorist to sight a train at the crossing and the accident history at the site.

An active control system at a level crossing is designed to activate in sufficient time before the arrival of a train to allow approaching motorists to brake safely to a stop before the crossing. No attempt to 'make it over' if the protection system is operating should be made even if the train is sighted and appears to be distant. Trains at such crossings, even in metropolitan areas, can be travelling deceptively fast.

Similarly, motorists should never queue across a level crossing at an intersection even when the barriers, lights and bells are inactive. There have been many instances of trains colliding with vehicles which have become 'trapped' on a crossing in a traffic queue or when boom gates have lowered for an approaching train (eg. the ATSB Salisbury report 2002/002).

### Passive control level crossings

Passive control level crossings control the movement of vehicular or pedestrian traffic using signs and devices (including 'Give Way' or 'Stop' signs), none of which are activated during the approach or passage of a train, and which rely on motorists (and pedestrians) detecting the approach or presence of a train by direct observation. There are over 6,000 passive level crossings in Australia. This type of protection is generally installed where the volume of road and rail traffic makes the risk of a collision relatively low.

'Give Way' traffic control is used at level crossings where the sighting distance is sufficient for a motorist approaching the crossing to see a train also approaching the crossing and there is the time to make a decision whether to stop and give way to the train or whether it is safe to proceed across the rail line before the train's arrival. The critical decision is whether or not there is time to safely clear the crossing. There have been a number of collisions as a result of motorists 'cutting it too fine'. If in doubt STOP.

'Stop' sign traffic control is used at level crossings where the sighting distance is such that a motorist is unable to see an approaching train in time to stop before its arrival at the crossing. This method of traffic control requires a motorist to stop at the crossing, visually search in both directions and, if no train is seen or heard then the motorist can proceed. If a train is seen or heard, the motorist must remain stationary at the 'Stop' sign until it is safe to proceed.

There have been many accidents at 'Stop' sign protected crossings as a result of the motorist's failure to stop.

## ATSB investigations

ATSB investigations do not apportion blame or liability. Rather, they focus on finding why the accident occurred and recommending action aimed at reducing or eliminating the chance of a recurrence. Therefore, even though the primary cause of most level crossing accidents is a failure by the motorist to stop and give way to the train, underlying factors that influenced these actions are examined.

These factors include failing to drive according to the conditions, fatigue, familiarity, sighting, expectation, distraction, operational aspects of heavy road vehicles and driver impairment. The following examples from recent ATSB investigations of level crossing collisions highlight some of these factors.

### Freight train, Lismore, 25 May 2006

The investigation found that environmental conditions and fatigue were factors in this accident.

Visibility at the time of the accident was reduced to between 20 and 50 metres due to thick fog. Yet, the calculated speed of the B double truck at impact was up to 78 km/h. It is clear that the truck was not being driven according to the environmental conditions at the time and, tragically, the truck driver saw the train at the crossing too late to stop.

**Figure 3: Fog at Lismore accident site**

Fatigue can have a profound effect on driver performance. It can reduce attention, increase reaction times and affect memory. It can also affect a person's ability to judge distance, speed and time.

The truck driver involved in the Lismore accident had been working long hours with early start times. The ATSB's investigation found that, although his hours were within the legal limits for driving hours, fatigue could have affected his driving performance.

### The Ghan, Ban Ban Springs, 12 December 2006

There were several underlying factors that contributed to the truck driver's failure to stop at the level crossing in this instance. These factors related to expectation, familiarity, medical issues and the operation of heavy vehicles.

The truck driver had been engaged in road building which involved using the level crossing about 30 times per day for the previous month. He was very familiar with the road and the crossing. During the month, he had only seen four trains. He did not have to slow his road-train for any of these, so on the day of the accident he was not expecting to stop for a train at the crossing. The truck driver also had severe hearing loss which compromised his ability to hear the train horn. The train horn was sounded by the train driver three times as the train approached the crossing. However, the truck driver only heard the last blast when it was too late to avoid the collision.

The truck driver stated that he did not stop at the level crossing 'Stop' sign. Indeed, it was found to be common practice for the drivers of other road-trains in the area to conduct 'rolling stops'. It is acknowledged that in certain situations a 'rolling stop' is good driving practice as it reduces the stresses on the prime mover's transmission. However, a 'Stop' sign at a level crossing means that motorists must stop to be able to adequately sight a train and thus avoid a collision.

**Figure 4: The Ghan accident site**

### XPT, Albury, 5 June 2006

This accident occurred when a sedan was driven into the path of an XPT passenger train at an active level crossing. Although not a heavy vehicle accident, the underlying factors of distraction and driver impairment are common in level crossing accidents.

The deceased driver of the sedan was found to have a cannabis concentration to a level where his driving performance was almost certainly impaired. It is a fact that alcohol, illicit drugs, and certain medications can exacerbate the effects of fatigue, reduce the ability to concentrate and impair the ability to judge distances and speed.

Motorist distraction can be attributed to many things such as the operation of mobile telephones, checking paperwork on the run, tuning a radio, selecting a music track, a conversation with a passenger in the vehicle, or just plain boredom. In this instance, phone records indicated that the car driver's mobile rang just as he was approaching the level crossing.

**Figure 5: Burning wreckage of sedan at Albury**

## Conclusion

While there are many underlying factors which have led to recent collisions at level crossings, almost every time the primary factor in the accident was the failure of the motorist to abide by the traffic control measures at the crossing. Given the operational limitations of trains, the onus to avoid a collision is primarily on the motorist. It is imperative that motorists remain alert, drive to the prevailing conditions and obey the road rules.

In addition, road and rail regulators in every State need to ensure unnecessary level crossings are eliminated and those that remain are as safe as possible and in compliance with the relevant Australian standards.

A number of recent ATSB investigations have found deficiencies in regard to compliance with standards and train sight distance limitations. Although none of these deficiencies were found to be directly causal to the particular accident investigated, this may not always be the case. Cooperation between road and rail stakeholders and regulatory authorities is necessary to fully examine these issues.