Rail Safety Investigation
Report No 2010/08

Tram-to-Tram Collision
Yarra Trams
Intersection of Flemington Rd and Abbotsford St
North Melbourne
03 September 2010
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The Chief Investigator

The Chief Investigator, Transport Safety is a statutory position under Part 7 of the Transport Integration Act 2010. The objective of the position is to seek to improve transport safety by providing for the independent no-blame investigation of transport safety matters consistent with the vision statement and the transport system objectives.

The primary focus of an investigation is to determine what factors caused the incident, rather than apportion blame for the incident, and to identify issues that may require review, monitoring or further consideration. In conducting investigations, the Chief Investigator will apply the principles of ‘just culture’ and use a methodology based on systemic investigation models.

The Chief Investigator is required to report the results of an investigation to the Minister for Public Transport or the Minister for Ports. However, before submitting the results of an investigation to the Minister, the Chief Investigator must consult in accordance with section 85A of the Transport (Compliance and Miscellaneous) Act 1983.

The Chief Investigator is not subject to the direction or control of the Minister in performing or exercising his or her functions or powers, but the Minister may direct the Chief Investigator to investigate a transport safety matter.
EXECUTIVE SUMMARY

At about 2200 on 3 September 2010, a tram travelling out-of-service as a ‘transport car’ was proceeding along Flemington Road toward the city. At the intersection with Abbotsford Street the driver mistakenly altered the setting of the points ahead. When the traffic lights permitted him to proceed across the intersection, his tram took the route set for the turn into Abbotsford Street and was struck by an oncoming tram crossing the intersection from the opposite direction.

The incident resulted from the incorrect action of the driver of the transport tram in changing the setting of the points.

There was significant damage to both trams and reported minor injuries to two passengers.

The report makes recommendations to Yarra Trams relating to;

- An administrative process to manage operating staff members who may require leave due to personal reasons.
- The possible provision of interlocking between the operation of points and traffic signals at intersections.
- The standard of presentation of instructional material to operating staff.

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1 A tram that is operated ‘Not-in-Service’ for the purpose of ferrying a driver or drivers between the depot and a distant point on one of the tram routes served by that depot in order to effect a driver change.
1. **CIRCUMSTANCES**

Tram 154 from the Essendon Depot was proceeding out-of-service along Flemington Road towards the city and had stopped at the intersection with Abbotsford Street where a previous tram had turned several minutes before. Tram 154 was operating with the purpose of transferring a relief driver to meet and change over with the driver of a Route 55 service at the № 19 tram stop at this intersection. The driver thus relieved was rostered to operate the transport tram back to the Essendon Depot.

![Location diagram – tram-stop 19, Flemington Rd and Abbotsford St.](image_url)

Figure 1: Location diagram – tram-stop 19, Flemington Rd and Abbotsford St. (Copyright Melway Publishing 2007. Reproduced from e-Way Electronic Street Directory with permission.)

Tram 2030 on Route 59 was running an outbound service away from the city toward Airport West and was stationary at the № 19 tram stop on the adjacent track on the other side of the intersection. The Route 55 tram—whose driver was to be relieved—was also stationary at the № 19 tram stop, behind the Route 59 service (see Figure 2).
Figure 2: Incident location diagram
The intended procedures for the driver change was for the transport tram to remain on Flemington Road and run directly across the intersection and beyond tram stop № 19 before reversing through a crossover onto the opposite track behind the Route 55 service.

The driver of the transport tram stopped and alighted at the facing points and manually altered their setting for the turn into Abbotsford Street. When the lights changed, both trams moved away from their stationary positions and the transport tram turned into the curve and across the path of the Route 59 tram which collided with it just to the rear of its mid-point.

Both trams sustained significant damage - the transport tram to its side panelling and the Route 59 tram to its left-hand front (driver's cab) corner. There were about 30 passengers aboard the Route 59 tram and only the driver on the transport tram. Two passengers reported minor injuries but there were no reported injuries to the tram drivers.

The driver of the transport tram subsequently conceded that the points had probably been set for the straight at the time the tram arrived and, in fact, had not required to be manipulated.
2. **FACTUAL INFORMATION**

2.1 **Personnel**

2.1.1 **Tram driver – transport tram**

At the time of the incident the driver of tram 154 had been with Yarra Trams since early 2002. At the time of this incident he was approximately half-way through a shift that was rostered from 1800 Friday 3 September to 0215 Saturday 4 September. His roster through the week leading up to the incident is depicted at Figure 3.

![Figure 3: Driver’s roster](image)

The driver stated that his sleep had been disturbed that morning at 0600 by traffic noise in the street, and that he was currently awaiting specialist advice regarding a potentially serious medical condition.²

He said that as he approached the intersection—requiring a compulsory stop—he was aware there was an Airport West tram waiting at the opposite tram stop. The West Coburg tram, whose driver he was rostered to relieve, was standing behind the Airport West tram.

He recalled that as he approached the facing points ahead of him (providing the diversion from Flemington Road onto Abbotsford Street in the city-bound direction) he observed they were set for the turnout for Abbotsford Street. When he arrived at the compulsory stop he alighted and manually changed them. At this point, his tram had passed beyond the points indicator (so he was no longer able to reference it) but he was still able to sight the traffic light mast for the intersection. When the lights changed to green, the driver reacted instinctively to the white 'straight-ahead' tram priority arrow and moved ahead, but his tram turned unexpectedly into the path of the opposing tram that was also proceeding on a tram priority arrow.

The driver reported the weather conditions as being wet with a strong wind at the time of the incident. He stated that the visibility of the trackage at this location and of these particular points at night in wet weather (with the attendant reflection of puddles) tended to be degraded.

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² Details have been supplied to the investigation.
³ Triple Aspect Points Signal Lantern – see Figures 2 and 6.
⁴ Tram priority signals are traffic signals that operate in the same way as—or together with—traffic lights but that apply only to trams. They display a white ‘T’ (if the tram can only proceed in one direction) or a white arrow (if there is more than one direction in which the tram can proceed). Trams may proceed on a T-light or proceed in the direction indicated by the arrow despite a red traffic light being displayed.
2.2 The trams

Tram 154 is a Z3 Class, and tram 2030 a B Class. Neither of these vehicles is equipped with an event recorder. Post-incident testing of tram 154 showed no evidence of equipment or system fault or deficiency. The investigation was advised by Yarra Trams engineering personnel that it was their view that the incident had been caused by driver error, and for this reason neither of the trams was subject to a wheel shunt test\(^5\). This test is costly and time-consuming, and Yarra Trams’ decision was that in this case, as a purely precautionary action, it was not warranted.

Tram 154 sustained a derailed trailing bogie and extensive damage to the centre exit door and the side structure on the collision side. Tram 2030 received extensive structural damage to the front left-hand corner (driver’s cabin).

Figure 4: Damage to trams

2.3 Infrastructure

2.3.1 Automatic points operation

The junction points system at the Flemington Road/Abbotsford Street intersection comprises four sets of Hanning & Kahl automatic points and associated tangent and curved trackage providing two opposing junctions (see Figure 2).

\(^5\) By which the functionality of the tram running gear to convey an electrical current in order to shunt a track circuit is verified.
Its application in Melbourne (see Figure 5) consists of:

- A points-setting detection loop (a buried antenna that accepts the turn call from the tram transponder for wire transmission to the points control receiver located in a cabinet in the vicinity). For convenience and consistency across the network, this loop is installed between the single and double stud markers that define the limits of the overhead contact wire section insulator.

- An elongated track circuit region. A low electrical voltage supplied to the rails at this point is carried through a solid-state relay to create a track circuit. When a tram occupies this region its metal wheelsets create a voltage discrepancy in the circuit that is interpreted by the system electronics as track occupation at this location. In this electrical state the system secures the points against movement until the tram clears the region.

- A mass detector. A buried antenna is situated at the facing points between, and slightly subsequent to, the facing point blades. It detects the physical presence of a tram and works in conjunction with the track circuit to ensure that only trams, rather than other vehicular road traffic, will operate the points locking function.

These components are located between the rails and buried in the road surface. The track circuit and mass detector are passive arrangements – there being no active element required on the tram to enable detection. The active element that exists on the tram is the points-setting transponder. This device transmits the points setting direction call from the driver’s points-selection switch. The points-selection switch is a momentary switch that is spring-loaded for each of its ‘Left’ and ‘Right’ positions. After being operated to call for a left or right setting at the points ahead, the switch returns to its central default position.

As a tram approaches the facing points at an automatically-operated turnout, the points are lying for the direction set by the previous tram movement through this location. They are in an unlocked state awaiting an input command from the transponder beneath the approaching tram. At a certain distance before the points (approximately 25 metres) the tram enters the points-selection detection area and crosses the detection loop. If the driver does not operate the points-selection switch the transponder will convey a default ‘straight ahead’ command via the detection loop to the points controller, and if the points are lying for the turn they will automatically reset for the straight direction. If the driver operates the points-selection switch to

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6 The wheel-axle-wheel combination, comprising two wheels fixed—one at each end, usually by ‘shrink-fit’—to a steel axle. Unless a design feature specifically precludes it, this arrangement permits electrical conductivity between one wheel (and the rail on which it is riding) and the other, hence creating an electrical connection between the two rails.
provide a ‘turn’ command, the tram will transmit that command, via the detection loop, to the points controller.

Tram drivers are expected to identify the lie of points by visual observation. A points indicator—variously referred-to by Yarra Trams as a *triple-aspect points signal lantern*, a *points signal light*, and a *points lantern*—is located on a pole prior to the compulsory stop. The reason for the rearward location of this signal is that it is intended to be used by drivers of trams that are following close behind a preceding tram and thus cannot see the condition of the points ahead. The signal indicates the setting of the points via an illuminated bar: vertical for the straight-ahead route; at 45 degrees (toward the direction of turn) for the turnout; or a horizontal bar meaning ‘Stop’. (Note: A Stop indication means that the points may not be correctly set. Apart from the possible presence of a preceding tram, such an indication may result from silting of the points or fouling by a foreign object. In such an instance the resulting signal aspect is a warning indication to tram drivers.)

Once it is beyond the points-setting detection loop the tram occupies the track circuit region, wherein the points controller ensures that the points cannot operate while the tram is over either the track circuit or the mass detector, or is moving between the two.

The points operation is not interlocked with the traffic signals and neither is there an event recording system for the tram control apparatus at this location. The points control cabinet for this intersection does contain a diagnostic LED display that shows the last control command placed upon the points controller. In this incident, though, it was of no assistance to technicians as the power for the intersection had previously been isolated by Carlton Control Centre (CCC) upon their notification of the incident. The display was thus extinguished and the data lost.

### 2.3.2 Manual points operation

From time to time, some aspect of this automated operation may fail to function, in which case tram drivers are required to alight and manually change the points. This is accomplished by taking a points bar that is carried in the drivers cab of all trams, inserting it in the points mechanism, and levering the points across to change their setting. The auto points mechanism is designed to permit this action.

### 2.3.3 Intersection interlocking

Although tram and road traffic control systems are coordinated at intersections—to prevent conflict between trams and road traffic and to afford priority to trams—there is no interlocking of tram signals with points operation on the Melbourne tram network. Such interlocking would require an advanced design interface between Yarra Trams (for points operation) and VicRoads (for traffic signal) control systems.

The investigation was advised by Yarra Trams personnel that this degree of interlocking of control systems could be provided if required. In their own infrastructure report for this incident, Yarra Trams engineering personnel suggest that if the tram priority signals could be ‘interfaced’ with the points, a priority signal for a tram to proceed in a direction that differed from that for which the points were set could not be displayed.

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7 *Light-Emitting Diode* - A semiconductor device that emits light when current flows through it. LEDs can be arranged in such a way as to convey language or to exist as a single indicator code lamp.

8 Yarra Trams’ centralised electrical power control centre.
Figure 6: This tram is city-bound on Flemington Road and has stopped at the junction with Abbotsford Street.

In Figure 6, the tram driver has manually changed the auto points leading into Abbotsford Street and is returning to the tram with points bar in hand. The tram has stopped at the compulsory stop immediately at the points blades. The tram is sitting beyond the points indicator (showing the points as being set for Abbotsford Street) but the driver can still observe traffic lights and tram priority signals located on the pole beside the tram as well as traffic lights across the intersection (not apparent in
this image). The tram priority signal (above and slightly to the left of the tram driver) shows a white ‘straight-ahead’ arrow authorising the tram to move directly across the intersection with the traffic flow. This signal is displayed during a ‘straight-ahead’ traffic light phase even though the points in front of the tram may be set for the turn into Abbotsford Street.

2.4 Yarra Trams operational processes

2.4.1 Operations rules and guidelines

Yarra Trams’ TRAINING MODULE - POINTS & SHUNTING, section 9.1.1 Step 1: Approaching and Setting a Command states: “Every time a driver approaches Automatic Points, the correct command must be entered. The command must be entered when the front of the tram passes between the first and the second studs, i.e. the point direction selection area.”.

The section then describes the correct driver’s points-selection switch settings, with that for the ‘straight-ahead’ command being: “Points selector must be left in the middle position”.

Note: The instructions include a diagram depicting the stud markings that define the point direction selection area as well as a 15 km/h speed limit approaching the compulsory stop prior to the facing points. This speed that is mandated at Rule 79 in the Yarra Trams GENERAL OPERATIONAL RULES & PROCEDURES 2003 does not accord with that prescribed in a separate document, the TRAM DRIVER’S TRAINING COURSE, section 9, that quotes: “10 km/h”.

Yarra Trams’ TRAINING MODULE - POINTS & SHUNTING, section 9.1.2 Step 2: After the Command Is Selected states: “After the Command is Selected: Proceed slowly to the Provisional Stop mark (three studs). Check the points signal light, [referred-to elsewhere in the document by Yarra Trams as a ‘triple-aspect points signal lantern’], follow the [indication conveyed by the signal]”.

In addition, company rules specify the following:

- It is always the tram driver’s responsibility to ensure the points are correctly set prior to moving over them; and
- Tram drivers must not attempt to travel over any points that are not set correctly.

2.4.2 Operation of ‘transport car’ to Abbotsford Street

The investigation was informed by Yarra Trams that they have historically utilised out-of-service tram movements to convey tram drivers from some depots—where driver changeover is required on certain routes at a location greater than walking distance from the depot—the relieved driver then operating the transport tram back to the depot. This procedure has been necessary since not all tram drivers possessed motor vehicle driver’s licences. Since 1994 the employment of Melbourne tram drivers has been conditional upon their possession of a valid car driver’s licence; however, tram drivers whose employment predates 1994 are entitled to advise the company that they do not hold a car driver’s licence. Although the number of tram drivers who do not hold a motor vehicle driver’s licence is now relatively few, Yarra Trams is obliged to continue with the use of transport trams in specific instances.

Some depots have a motor vehicle provided specifically for the purpose of carrying out these driver changeovers but Essendon has not, due to the convenient frequency
of tram services past the depot on Mt Alexander Road. On those occasions where the timetabled schedule does not provide a convenient service for the conveyance of drivers to change over, a transport tram is utilised as was the case in this instance.

In addition to the requirement for changeovers on Flemington Road, the Essendon Depot roster also schedules a regular transport tram between the depot and Stop № 19 on Abbotsford Street where a driver change is effected in a manner similar to that in which this driver was intending to be involved.

2.4.3 Incident management

Yarra Trams document, Major Incident Management (c303wi0002, Issue No. 22) applies to incident investigation and major incident notification, among other things. Section 5, Method, deals with the initial response to and reporting of tram operational incidents. The Fleet Operations Centre (FOC)\(^9\) is defined as the entity to be contacted in the first instance and is required to obtain information in order to assess the appropriate response required. Among other things, FOC is required to obtain information on the condition of the overhead tram wire and to notify Carlton Control Centre immediately of any abnormality.

This section also lists the emergency actions to be taken by CCC, these mostly being in the nature of information-gathering. The section instructs that priority is to be given by CCC at the time of an incident to ensuring that electrical infrastructure is safe and that all electrical hazards are identified and either controlled or eliminated. There is no explicit instruction to immediately cut overhead power regardless of circumstances.

2.4.4 Tram driver ‘fit for work’ assessment

Yarra Trams’ GENERAL OPERATIONAL RULES & PROCEDURES incorporate a ‘fit for work’ procedure. This specifies that it is the employee’s immediate responsibility to advise their supervisor of any injury or illness that occurs while on duty. Provisions for employees to take sick leave are built into the company’s Enterprise Bargaining Agreement and supported by established human resources procedures. There is also Employee Assisted Services providing counselling and workplace rehabilitation programs for employees who are or have been sick or injured. However, the organisation does not have a specific policy by which employees can be encouraged to self-assess as to their suitability for safety-critical work due to a state of mind caused by a personal matter or welfare issue that they believe might adversely affect them in this capacity.

\(^9\) The centralised operational control centre by which Yarra Trams carries out day-to-day network operational planning and decision making, incident management and customer needs response. Controllers maintain two-way radio communication with trams.
3. ANALYSIS

3.1 Driver actions

The driver of tram 154 cannot explain why he alighted at the points and changed them for the Abbotsford Street direction. The last tram movement on Flemington Road towards the city at the Abbotsford Road intersection prior to transport tram 154 arriving there, had been a Route 57 service approximately 2 minutes ahead. This service had turned and proceeded into Abbotsford Street per its normal routing. As tram 154 approached this turnout the points would have been lying for the turn as a consequence of the passage of this previous tram. From this, two scenarios seem possible:

- The first, and perhaps the most likely, is that the driver noticed the points lying for the turn as he approached the intersection (forgetting they were auto points) and had been aware that the direction needed to be changed. This thought may have occupied his attention as he stopped at the points, hence his action in alighting and manually altering them. However, if he was preoccupied he may have forgotten that the points would have automatically reset for the straight direction in response to the approach of his tram, and if his attention had been temporarily diverted at some point during his approach, he may not have noticed this occur as his tram crossed the detection loop. In such a state of absent-mindedness, it might be expected that he stopped at the intersection—having already passed beyond the points signal lantern and therefore unable to see it (see Figure 6)—alighted, and hastening due to the inclement weather, altered the points without thinking and without visually checking their position. In this case his instinct might have been to restore the points for the straight direction; however, as they had already self-restored during the approach of his tram, this action would have served instead to reset them for the turn into Abbotsford Street.

When the traffic lights turned green for movement across the intersection, and with a white ‘straight-ahead’ tram priority arrow (see Figure 4), the driver moved off. The unintended setting of the points sent his tram unexpectedly to the right and into the path of the tram passing on the parallel track.

- The second possible scenario is that as well as operating other services this driver regularly operated both Route 57 trams that routinely turn into and out of Abbotsford Street at this location, and transport trams that turn into and terminate at Stop № 19 in Abbotsford Street to effect driver changes on this route. On this occasion, in a state of absent-mindedness, he may have approached the intersection with the subconscious intention of doing this. (Note that both of the Route 59 and 57 tram stops at this location—on Flemington Road and Abbotsford Street—are numbered ‘19’ and are in close proximity to each other.) When the traffic lights turned green, and expecting to have an associated ‘right-turn’ tram priority signal arrow, he proceeded instinctively.

3.2 Interlocking at intersections

Unintended turns by trams at junctions—by which one tram turns into the path of another—have occurred several times before on the Melbourne tram network and inevitably result in significant damage. Yarra Trams has been fortunate there have been no serious injuries or fatalities from these incidents. Previous investigation
reports completed by the Chief Investigator have recommended that some form of interlocking of tram signals with track points control should be considered by Yarra Trams. Resulting from this incident, Yarra Trams infrastructure staff have also suggested consideration of some form of interfacing of tram signals with points position.

If the degree of constant vigilance required of tram drivers in order for the network to operate safely day-to-day cannot be relied upon, it may also be necessary for the operator to consider changing the protocols applying to the meaning of some system condition indicators such as tram priority signals and points indicators. If these or other system indicators were accorded a signal connotation rather than being merely an indicator; in other words, not just conveying information to the tram driver regarding system status but also providing unconditional authority to proceed, then an interlocking scheme could achieve the outcome of preventing conflicting movements.

3.3 System data logging

A data logging system is currently used by Yarra Trams for points event logging at some locations. This is designed to capture critical data at older-style points controllers. Yarra Trams staff have informed the investigation that these devices require about two hours to install.

In this incident, the equipment controlling this junction included a diagnostic device (not a data logger) that displayed the last control command placed upon the points controller. Such a device is extremely useful to maintenance staff and anyone examining the sequence of equipment operation surrounding an incident. However, in this incident, the power for the intersection was isolated by staff at the site on instructions from Yarra Trams’ electrical power control centre. This action extinguished the diagnostic display and the information was lost to maintenance staff who attended.

Yarra Trams do not appear to have an explicit incident response instruction covering those incidents where the overhead line may not be damaged or affected by the incident. It might be useful for Yarra Trams, if it can be clearly established that there is no electrical danger requiring isolation of the overhead wire, to include in their incident response process a requirement that if power is to be cut following an incident at a junction or intersection equipped with a diagnostic system, that maintenance staff should first access and view the diagnostic display.

3.4 Automatic points operation

The Flemington Road/Abbotsford Street intersection and tram junction is equipped with the standard Melbourne tram network automatic points system. Safe operation requires the drivers of trams approaching such points to be aware of their intended routing. The Z3 class tram has a points-setting switch on the driver’s control console by which the driver can condition the tram’s points-setting equipment to transmit a left or right ‘turn call’ when the transponder passes across a detection loop embedded between the rails.

If the points are set for the turn as the tram approaches and the driver intends for their tram to continue straight ahead, the driver takes no action with this switch and the transponder will convey a default ‘straight-ahead’ command via the detection loop to the points controller. This occurs in relatively close proximity to the points, and it is
possible that a driver not focusing on events at hand might not observe the points change. Under such circumstances, the driver might stop as required at the points, alight with the points bar and instinctively change the points without realising their actions.

Compulsory stops on the tram network are located very close to the sets of points to which they apply (see Figure 7). If a tram pulls right up to a compulsory stop, the points blades will not be visible to a tram driver remaining seated in their cabin, and the points indicator that might otherwise provide an alert cue as to their position is located behind the driver’s field of vision (see section 2.3.3). Since control of the points is not interlocked with the traffic light indications, the fact that the points might be set for the turn when the traffic lights were authorising a ‘straight-ahead’ move (including a ‘straight-ahead’ white arrow), will not be obvious to the tram driver.

![Figure 7: Proximity of compulsory stop lines to points blades – Flemington Rd/Abbotsford St junction.](image)

### 3.5 Tram driver ‘fit for work’ assessment

Personnel who operate transport vehicles—especially those conveying members of the paying public—are critical to the success of that transport undertaking. It should be acknowledged that it might be possible for such safety-critical staff to be at once both medically fit for their duty and yet be unfit due to an emotional or psychological state of mind. Yarra Trams’ human resources provisions do not include a specific mechanism by which employees can self-assess as to their suitability for safety-critical work under circumstances in which aspects of their personal life might create a preoccupation or state of mental distraction that they believe could adversely affect them in performing their work safely. Such a process is common in commercial
aviation and is also utilised in the rail industry. This ‘safety-critical’ dimension to the role of tram driving should not be overlooked.
4. **CONCLUSIONS**

4.1 **Findings**

1. The driver of Z3 class tram 154 was qualified and considered medically fit for duty, and had been assessed as competent at his most recent appraisal.

2. The driver of Z3 class tram 154 approached the facing points for the Flemington Road/Abbotsford Street intersection unmindful that their setting would change automatically upon the tram’s approach.

3. Prior to the approach of tram 154, the facing points were not set for the intended route but changed automatically as the tram approached.

4. The driver’s actions with regard to the junction points did not accord with prescribed procedures in that he failed to ensure that the points were set for his intended route.

5. Post-occurrence testing found no fault with either the automatic points system or the tram’s onboard equipment that operates the points system.

6. At the time of the incident the driver of tram 154 was awaiting the results of specialist medical tests for a serious health condition.

4.2 **Contributing factors**

1. It is likely that the tram driver was preoccupied as he approached the junction and that this resulted in his inattention.

2. The driver of tram 154 manually, but erroneously, set the points for the diverging route. This action left them set for a direction that conflicted with an opposing tram on the adjacent track.
5. **SAFETY ACTIONS**

5.1 **Recommended Safety Actions**

**Issue 1**

The driver involved in this incident had recently undergone medical tests in relation to the potential existence of a serious health condition. He was awaiting, and was concerned about, the results of these tests and he advised the investigation that this matter was on his mind at the time of the incident. It may be advantageous to Yarra Trams to promote a workplace culture that encourages safety-critical staff to consider and evaluate their psychological as well as their physical fitness for work.

**RSA 2011016**

That Yarra Trams consider the provision of appropriate guidelines and training to establish a means by which safety-critical employees can consider their fitness for work should a serious personal or health issue occur that has the potential to distract them from the safe discharge of that work.

**Issue 2**

A tram network is a rail transport system. Its safe operation requires constant vigilance by tram operating staff to prevent conflict between their tram and road traffic, and between one tram and another. Tram interaction at street intersections where tram routes cross but do not connect are controlled by traffic signals and appear to operate effectively. However, when switch points are involved, this extra element is sometimes overlooked by an unwary tram driver with the result that a collision can occur between trams. If the constant operator vigilance required to prevent such conflict cannot be relied upon, it may be prudent for the network operator to provide a railway-style system of points and signal interlocking at these locations.

**RSA 2011017**

That Yarra Trams considers the provision of an appropriate system of interlocking of points and signals that would prevent conflicting movements at junction locations.

**Issue 3**

The quality and content of training courseware and instructional documentation for the direction of operating staff in any transport business is crucial. To most effectively convey the required information and instructions, such documentation requires to be not only technically accurate but specific and consistent in the application of terminology. Some parts of Yarra Trams instructional documentation refer to the prescribed speed over points as being 10 km/h and others as 15 km/h. The points direction indicator is also named variously within documentation, as are other devices or items of apparatus such as tram priority indicators. This has the potential to cause confusion to and a lack of comprehension by staff.
RSA 2011018

That Yarra Trams review and assess driver training course material for accuracy in technical and factual detail as well as consistency in terminology.