Australian Government
Australian Transport Safety Bureau

Collision between two road rail vehicles

Rinadeena, Tasmania | 4 June 2013

Investigation

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Addendum

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Safety summary

What happened

On 4 June 2013, track workers were preparing a road-rail vehicle to travel to a worksite near Rinadeena Station on the West Coast Wilderness Railway, Tasmania, when the vehicle unexpectedly started to roll backwards down a 1:20 grade. The driver was unable to slow the vehicle, so he and the passenger jumped clear, sustaining minor injuries.

The now unmanned out-of-control vehicle continued to accelerate down the steep grade, heading towards a second road-rail vehicle containing four track workers. Two passengers of the second vehicle jumped clear, sustaining minor injuries, but a third passenger and the driver were still inside when the unmanned road-rail vehicle collided with theirs.

The passenger sustained minor injuries but the driver was trapped and seriously injured in the collision. He was subsequently removed from the vehicle and air lifted to hospital. Both road-rail vehicles were extensively damaged.

What the ATSB found

The ATSB found that the vehicle's rear road tyres were lifted from the track to examine a suspected problem with the rear rail guidance wheels. As a result, the braking force provided by the rear road wheels was lost and the vehicle began to roll down the incline. The rail guidance wheel electric brake controller had not yet been set correctly and, as a result, little braking effort was applied through the rail guidance wheels.

The investigation also found that the West Coast Wilderness Railway had not considered all of the risks associated with the operation of road-rail vehicles on the steep railway. As a result, documented operational procedures had not been developed and locations where vehicles could be safely on and off railed had not been defined.

Other findings related to the effectiveness of the training provided to the road-rail vehicle operators, road-rail vehicle procurement standards, acceptance testing and commissioning of road-rail vehicles, reliability of the very high frequency (VHF) radio network in the Rinadeena area and radio communication protocols.

What's been done as a result

West Coast Wilderness Railway has reviewed its risk register and implemented operational procedures covering the safe operation of road-rail vehicles on the network. This has led to the development and implementation of an updated training package, procurement specifications and documented on/off tracking points. The company has also taken action to improve radio reception in the Rinadeena area and to ensure reliable communications at the station.

Safety message

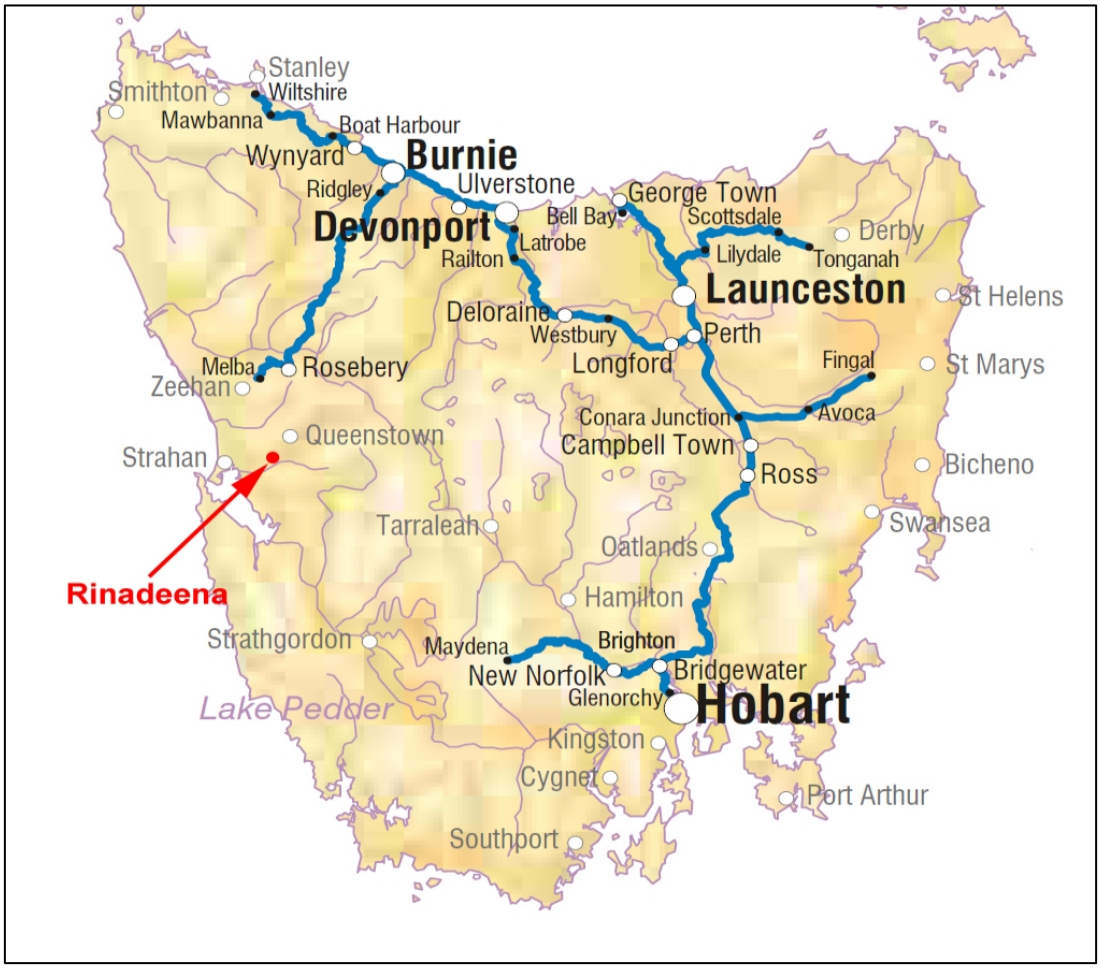
All organisations operating road-rail vehicles should consider the risks associated with operating the vehicles on their networks. Information on the risk of operating road-rail vehicles can be found at the Office of National Rail Safety Regulator website http://www.onrsr.com.au/safety-improvement/roadrail-vehicle-safety.

Contents

The occurrence

On the morning of 4 June 2013, the West Coast Wilderness Railway (WCWR) track maintenance gang held a toolbox meeting at their Queenstown, Tasmania, workshop (Carswell Park) before heading off to a worksite just south of Rinadeena Station (Figure 1).

Figure 1: Location of Rinadeena

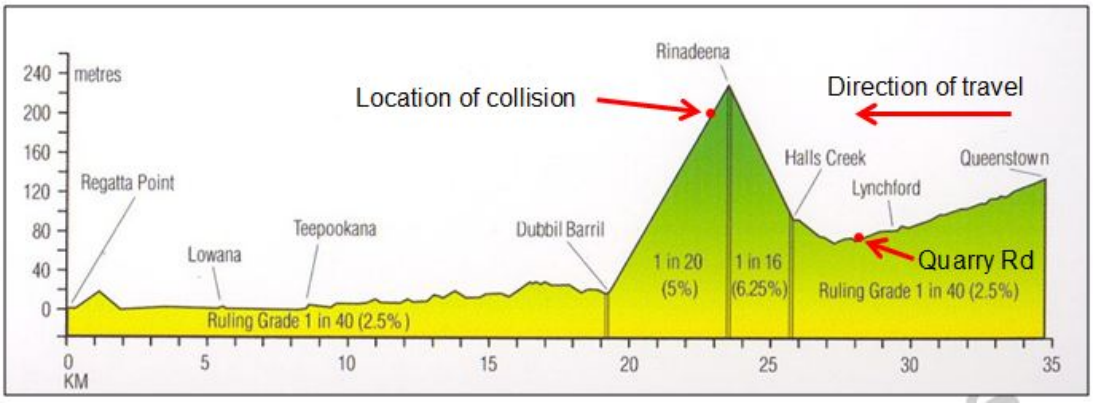


Source: Natmap

At about 1045, Hirail 1 (a Mazda dual-cab truck fitted with rail guidance equipment) and Hirail 3 (a Mitsubishi Canter dual-cab truck fitted with rail guidance equipment) departed for the agreed on-track point at Quarry Road near Lynchford (Figure 2). There were four track workers in each vehicle.

When Hirail 1 arrived at Quarry Road, it was put on track in a forward facing direction in preparation for the trip to Rinadeena. Before moving off, the driver called the crew in Hirail 3 using the in-cab very high frequency (VHF) radio to confirm their location. At the time, Hirail 3's crew were in the nearby yard picking up materials. Shortly afterwards, Hirail 3 was put on track in a forward facing direction to follow Hirail 1 to Rinadeena.

Figure 2: Railway grade chart showing the approximate location of the collision and Quarry Rd



Source: West Coast Wilderness Railway annotated by the ATSB

When Hirail 1 arrived at the Rinadeena Station on/off-track point (Figure 3), it was off tracked, turned around and then on tracked again in readiness for reversing down the 1:20 grade to the worksite. The driver again called the crew in Hirail 3 via VHF radio to confirm their location before moving off travelling in reverse at about 5 km/h. Hirail 3 was not far behind and as it arrived at Rinadeena Station the driver could see Hirail 1 as it disappeared around the bend on the falling grade.

Figure 3: Rinadeena Station access road and vehicle on/off point

Source: ATSB

Hirail 3 was off tracked at the Rinadeena Station on/off-track point, turned around and then on tracked. The vehicle's handbrake was on, its rail guidance equipment was engaged on the track and it was ready to reverse down the steep grade following Hirail 1. At this time, one of the track workers commented to the works leader that the driver's side rear rail guidance wheel had previously been reported as noisy. It was his understanding that it had been fixed, but he suggested they check it anyway.

The two men got out of the vehicle to inspect the wheel. One of them then asked the driver to raise the rear rail guidance wheels so they could take a closer look. When the driver raised the wheels, the vehicle's rear road-going tyres were lifted off the head of the rail. Hirail 3 then started

to roll backwards down the grade with its rear road tyres skidding across the gravel surface of the road as the vehicle picked up speed.

As Hirail 3 rolled away, its engine stalled. The driver frantically tried to re-start the engine while pushing on the brake pedal and pulling on the handbrake. However, there was insufficient braking force being applied to the rail guidance wheels to control the vehicle's speed. The driver also tried without success to slow the vehicle by raising the front rail guidance wheels in an attempt to lower the front road wheels back onto the track structure.

Hirail 3 was out of control and gathering speed, so the driver told the remaining passenger to get out of the vehicle. The passenger jumped clear from the rear driver's side of the vehicle. Seconds later, the driver realised that he could not control the vehicle and climbed across to the passenger side and jumped out. Hirail 3 was now unmanned, out-of-control and heading towards Hirail 1.

None of the track workers from Hirail 3 had a hand held VHF radio to warn the workers in Hirail 1, so one of them went to the nearby station building to use the radio located there. He first had to start the generator as the station was unmanned and had no permanent power. However, he was unable to get the radio to work.

At the same time, one of the other workers ran up the vehicle access road to gain higher ground and mobile telephone reception. He then called Carswell Park, explained what had happened and requested help. One of the remaining two workers started to make his way down the grade following the vehicles.

Meanwhile, Hirail 1 was still railing backwards towards the worksite at a speed of about 5 km/h. Its occupants were unaware that the out-of-control and unmanned Hirail 3 was approaching them at speed.

Hirail 3 continued to gather speed as it rolled down the grade towards Hirail 1. Once Hirail 3 came into view of the passenger in the front seat of Hirail 1, it was clear that the vehicle was out of control. Its speed was much higher than normal and its front passenger door was open.

Figure 4: Hirail 1 (foreground) and Hirail 3 (background) after the collision

Source: ATSB

The front passenger alerted the others to Hirail 3's rapid approach then jumped clear of Hirail 1, seeking refuge in a trackside drain. The worker sitting in the rear driver's side seat also jumped clear while the worker in the rear passenger side seat and driver remained in the vehicle. The driver of Hirail 1 then increased speed in an attempt to outrun the approaching Hirail 3.

Hirail 3 continued on, passing the two workers who had jumped clear, before colliding with Hirail 1 and pushing it about 40 m along the track (Figure 4).

The worker in the rear of Hirail 1 freed himself and attempted to use the vehicle's VHF radio to advise Carswell Park of the collision. After determining the radio was not working, he made his way into Hirail 3 and, at about 1130, used its radio to contact Carswell Park to raise the alarm.

The two occupants who had jumped clear of Hirail 1 made their way to the vehicle and began assessing the situation and rendering assistance to the driver who had been trapped and seriously injured as a result of the collision. Soon afterwards, the first of the occupants from Hirail 3 arrived at the scene. He advised the workers from Hirail 1 that the others were attempting to get assistance.

After the initial contact by radio and mobile telephone to Carswell Park, two personnel were dispatched to the Rinadeena Station access road to help coordinate communications between the field and the office and to assist emergency services in accessing the accident site.

At about 1200, paramedics from Ambulance Tasmania arrived at the access road entry point, but they could not negotiate the access road in their vehicle. The Tasmanian Fire Service and the State Emergency Service arrived shortly after with an appropriate vehicle. All three emergency services then proceeded down the access road to the Rinadeena Station and then on foot to the accident site accompanied by a WCWR employee. Another WCWR employee remained at the access road entry point waiting for the police and further first aid supplies to arrive.

Once emergency personnel arrived at the scene, they treated the trapped driver and the other injured men. Once the driver was stabilised, emergency crews began working to free him from the wreckage.

The Tasmania Police and further first aid supplies arrived shortly after and they were taken down the access road to the station and then onto the accident site. The police then took control of the site and began their initial enquires.

Shortly after 1330, the trapped driver was removed from the wreckage and treated at the scene. At 1421, he was taken to Strahan by ambulance. He was then air lifted to Royal Hobart Hospital for further treatment.

Context

West Coast Wilderness Railway

The West Coast Wilderness Railway (WCWR) is a heritage passenger railway. It is a reconstruction of the disused Mount Lyell Mining and Railway Company Abt[1] Railway that was built in the 1890's to transport copper from the company's Queenstown mine to the port of Strahan on the west coast of Tasmania. The narrow gauge[2] track, which still employs the Abt rack[3] and pinion system, is about 35 km in length and traverses steep gradients of up to 1:16.

The steam powered locomotives used on the railway have an independent pinion drive which engages in a rack (Figure 5) that is installed centrally between the rails from Halls Creek through Rinadeena to Dubbil Barril. The rack system overcomes traction adhesion issues associated with operating over steep gradients.

Figure 5: The Abt rack

Source: ATSB

Train operations

Passenger services on the WCWR ceased at the end of April 2013 after the previous rail operator surrendered its lease to the Tasmanian Government.

At the time of the incident, none of the stations were manned and the track was undergoing restoration works in anticipation of a new lease being awarded and the resumption of services.

As a result of the cancelation of the regular passenger services, there was a greater risk of track contamination build up as the only rail traffic at the time of the incident was the infrequent works trains and road-rail vehicles that were accessing work sites along the track.

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1 The Abt rack and pinion drive system was developed by Swiss locomotive engineer Roman Abt in 1882.
2 Track gauge of 1,067 mm.
3 Rack refers to the dual racks mounted between the running rails that the pinion wheel engages.

Road-rail vehicles

Road-rail vehicles are generally motor vehicles manufactured to road specification by the original manufacturer and then modified by an aftermarket supplier so that they are suitable for on rail operation. In order for a motor vehicle to be used on rail, it must have rail guidance equipment fitted to the front and rear of the vehicle.

The wheels of the rail guidance equipment are made of steel and provide relatively low adhesion properties between the drive wheels and the rail surface. When the rail guidance equipment is lowered, the front rail guidance wheels bear most of the vehicle weight which in turn alters the vehicle's performance characteristics.

The fitting of rail guidance equipment requires reinforcement and modification of the vehicle chassis to ensure structural integrity and safety.

Road-rail vehicle standards

At the time of the occurrence, there was no national standard specifying minimum engineering requirements for rail guidance equipment. As a result, equipment configurations and installation methods varied according to each road-rail equipment manufacturer's design, the customer's specifications and relevant safeworking requirements.

At the time of the release of this report, the Rail Industry Safety and Standards Board (RISSB) were working in consultation with stakeholders to develop a national road-rail vehicle standard.

WCWR road-rail vehicles

West Coast Wilderness Railway had three operational road-rail vehicles at the time of this occurrence, all of which had fixed VHF radios for safeworking and local communications.

All three vehicles were equipped with front rail guidance equipment which when lowered raised the front road wheels from the head of the track and rear rail guidance equipment which when lowered kept the rear inner road wheels in contact with the head of the rail (Figure 6). Two of the vehicles were fitted with hydraulically operated brakes on the front guidance wheels while the third, Hirail 3, was fitted with electrically operated brakes on all four rail guidance wheels.

Hirail 3

Hirail 3 was a 2009 Mitsubishi Fuso Canter dual-cab tip truck (Figure 7) which was modified for rail operations by Harrybilt Engineering and Welding Services (Harrybilt) in Ballarat, Victoria. When the vehicle was ordered, WCWR did not have their own documented design standard for road-rail vehicles, but they specified that all four of the vehicle's rail guidance wheels should be braked.

Since there was no defined design standard, Harrybilt chose to design and fit the vehicle's rail guidance equipment in accordance with the applicable Railcorp standard.[4] Brake performance requirements stated in this standard required road-rail vehicles to have an average deceleration rate of 0.9 m/s^2.

Hirail 3's front guidance wheels were of the elevated type. When the guidance wheels were rotated into position, the front road wheels were lifted away from the ground and rail.

The rear rail guidance wheels were of the non-elevated type. When the guidance wheels were rotated into position, the inner rear tyres on the dual rear axles remained in contact with the rail and provided driving force and braking effort. During the course of the investigation, Harrybilt advised that the design of the rear road-rail equipment allowed the rear truck tyres to have some contact with the rail head even when of the rear rail wheels were being lowered into position.

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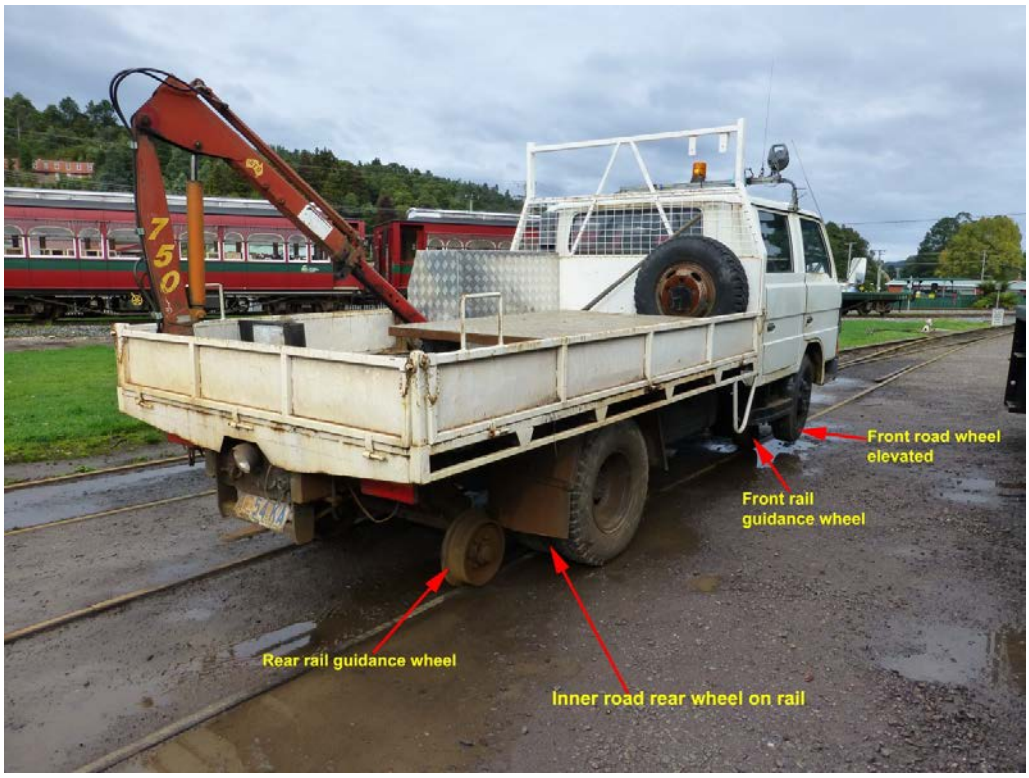
[4] Rollingstock Standard ESR 001-700.

Figure 6: Hirail 2 with its rail guidance wheels lowered



Source: ATSB

Figure 7: Hirail 3 with rail guidance wheels lowered

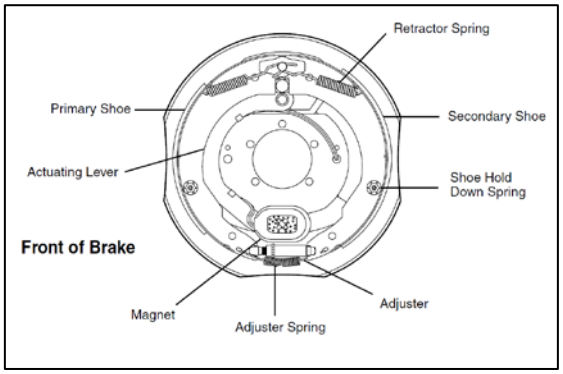
Source: Harrybilt Engineering & Welding Services

Braking system

Hirail 3 was fitted with an electrically activated braking system to the rail wheels. While the rail wheel brakes were operated by the brake pedal, they were independent of the vehicle's road brakes to ensure the road anti-lock braking system (ABS) was not compromised.

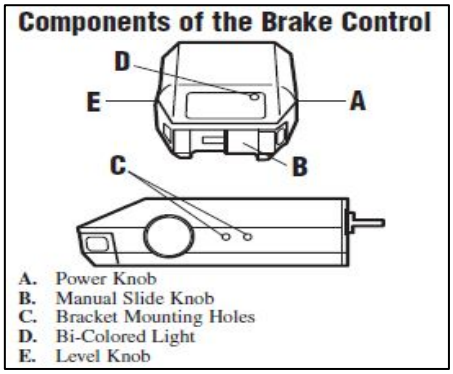
Each of the rail wheels were machined to incorporate an electrically actuated drum brake unit (Figure 8). Equal brake force was applied to each wheel via a Tekonsha Voyager Electric Brake controller (Figure 9) that was fitted under the dash in the cab of the vehicle. An input signal to the brake controller was supplied through movement of the vehicle's brake pedal and subsequent activation of the brake light switch.

Figure 8: Schematic of electric brakes



Source: Dexter Axles

Figure 9: Tekonsha brake controller



Source: Tekonsha

The Tekonsha Voyager Electric Brake Controller was not designed specifically for road-rail vehicle application and was typically used in an automotive application to control trailer/caravan electric brake systems.

The controller had three control knobs for brake performance adjustment and a single bi-coloured light emitting diode (LED) for indication (Figure 9 item D).

The power knob (Figure 9 item A) set the maximum braking effort that would be applied to the rail wheels by varying the amount of voltage applied to the electromagnet mounted within the brake housing. An increase or decrease in voltage adjusted the attraction force applied to the rotating brake drum armature and the consequential mechanical effort that was applied between the brake shoes and the circumferential brake drum friction surfaces (Figure 8).

The level knob (Figure 9 item E) controlled the progressive application of braking effort when the brake pedal was depressed, from zero up to the maximum effort set by the power knob. The effect of the level knob adjustment was described as ranging from least aggressive to most aggressive brake application.

The manual slide knob (Figure 9 item B) enabled the operator to manually activate the brakes independently of the vehicle's brake pedal.

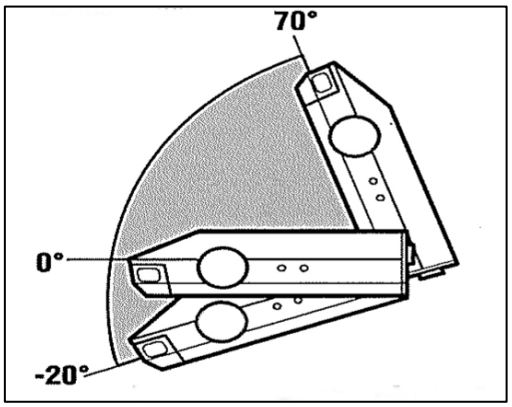
The LED showed a green light when the controller was switched on. The LED changed colour when the brake pedal was pressed and depending on the adjustment of the power and level knobs, the LED would progressively change from green to bright red. The brake controller provided no indication of power and level settings until the vehicle's brake pedal was depressed or the manual slide knob was activated and the LED changed colour.

The manufacturer stated that the controller must be installed with a mounting angle of -20° to 70° (Figure 11). In this case, the controller in Hirail 3 was mounted at about 45° (Figure 10), in line with this requirement.

Figure 10: Brake controller orientation

Source: ONRSR

Figure 11: Recommended mounting range



Source: Tekonsa

Maintenance

As an accredited rolling stock operator, WCWR performed the maintenance work on their road-rail vehicles. This maintenance was carried out in accordance with the requirements of the WCWR Rolling Stock Maintenance Procedures Manual. According to that manual:

> All Hirail vehicles operated by WCWR shall be subject to a daily (A) inspection by the driver of that vehicle, the driver in signing the logbook acknowledges completion of this inspection. Hirail vehicles shall also be examined on a 3 monthly (AB) basis; this inspection is to be carried out by Workshop Maintenance Staff.

The company's maintenance records show that Hirail 3 was maintained in accordance with these requirements.

The driver

The driver of Hirail 3 on the day of the occurrence held the current minimum industry competency TLIC3045A 'Operate Road-Rail Vehicle'. He had also completed the WCWR 'Hirail Assessment Procedure' training.

Following the occurrence, the driver was tested for the presence of alcohol. These tests returned a zero result. An examination of the available evidence also indicates that the driver's performance was not fatigue impaired at the time of the occurrence.

Safety analysis

When Hirail 3 was placed on rail at Rinadeena, the head of the rail was contaminated due to the environment and lack of regular rail traffic.

The vehicle was readied to reverse down the 1:20 grade to the worksite, but the brake controller was set for minimum braking effort to the rail wheels. Before Hirail 3 moved off, two occupants alighted from the vehicle without a hand held VHF radio, to check for a possible noisy rail wheel. They then requested that the rear rail guidance wheels be raised to perform an inspection.

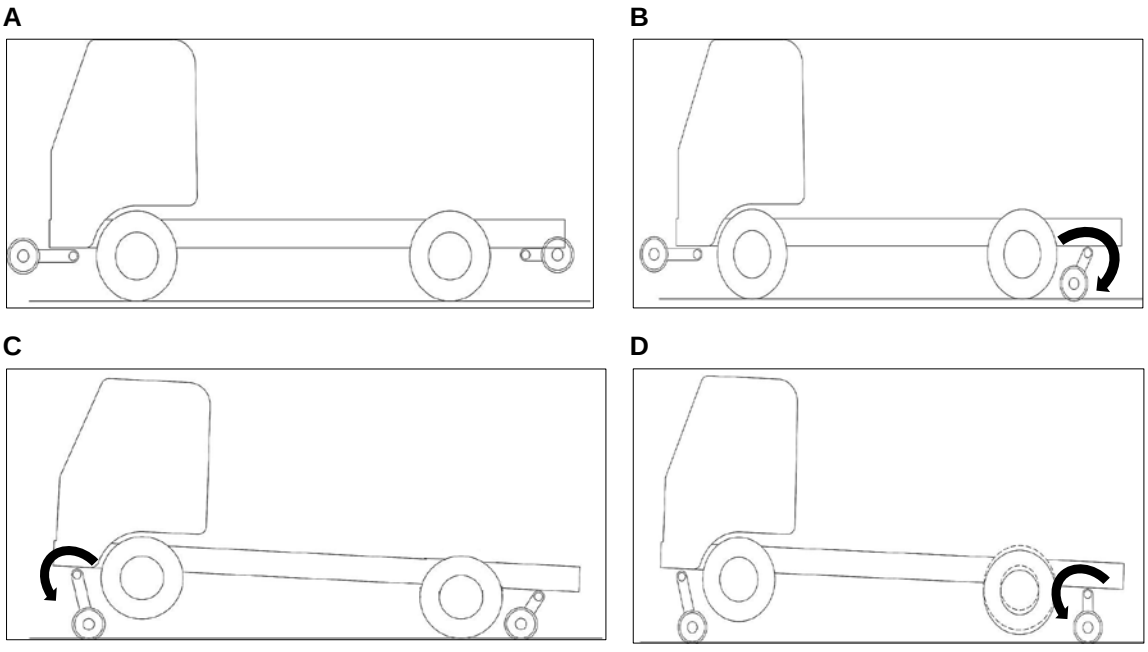
As the rear rail guidance wheels rotated from the operating position, through vertical centre, most of the weight of the truck was lifted from the rear road tyres. Without any supplementary braking from the rail wheels and negligible traction and braking effort from the road wheels, Hirail 3 began to roll away.

On railing at Rinadeena

The usual method of placing the road-rail vehicles on and off track at Rinadeena was to position the vehicle on the track and lower the rear guidance wheels onto the head of the rails (Figure 12:B). As the rear radius arm swung the rail wheels through the vertical/centre position where maximum chassis lift was achieved, braking effort existed predominantly through the front road wheels. The vehicle would then be moved forward or backwards to line up the front rail guidance wheels. When the front rail guidance wheels were lowered into position, the front radius arm lifted the front truck wheels off the ground (Figure 12:C). During this process, braking effort was applied through the rear rail guidance and road wheels.

The operator would then drive towards the worksite while adjusting the brake controller and, as a result, varying the applied braking effort to the rail guidance wheels.

Figure 12: A) Hirail in road position. B) Hirail rear wheels lowered. C) Hirail front wheels lowered. D) Hirail rear wheels lifted raising the road wheels.



Source: Trac-West

The runaway

On the day of the occurrence, the driver was following the normal process of lowering the rear rail guidance wheels first and then the front wheels. However, before moving off towards the worksite, he raised the rear rail guidance wheels, when requested to do so, to allow for an inspection of a suspected noisy wheel.

When the rear rail guidance wheels began moving towards the raised position, the radius arm swung the rail wheels through the vertical/centre position where maximum chassis lift was achieved. At this point in time, the front road wheels were lifted clear of the track and most of the weight of the vehicle was lifted off the rear road wheels. As a result, the road wheels were unable to contribute to the braking effort to hold the vehicle in position.

Having broken away from the normal on-railing process, the driver had not progressed to the step of setting the rail wheel brake controller. Consequently, neither the road nor the rail wheels were providing any braking effort, so the vehicle began to roll-away down the steep gradient.

The driver and those around him diverted away from the usual on/off-railing process. These actions exposed the importance of documenting, training and following defined procedures for the operation of road-rail vehicles. Furthermore, the actions exposed the importance of having the rail brakes correctly set for optimum braking at all times.

Brake controller adjustment

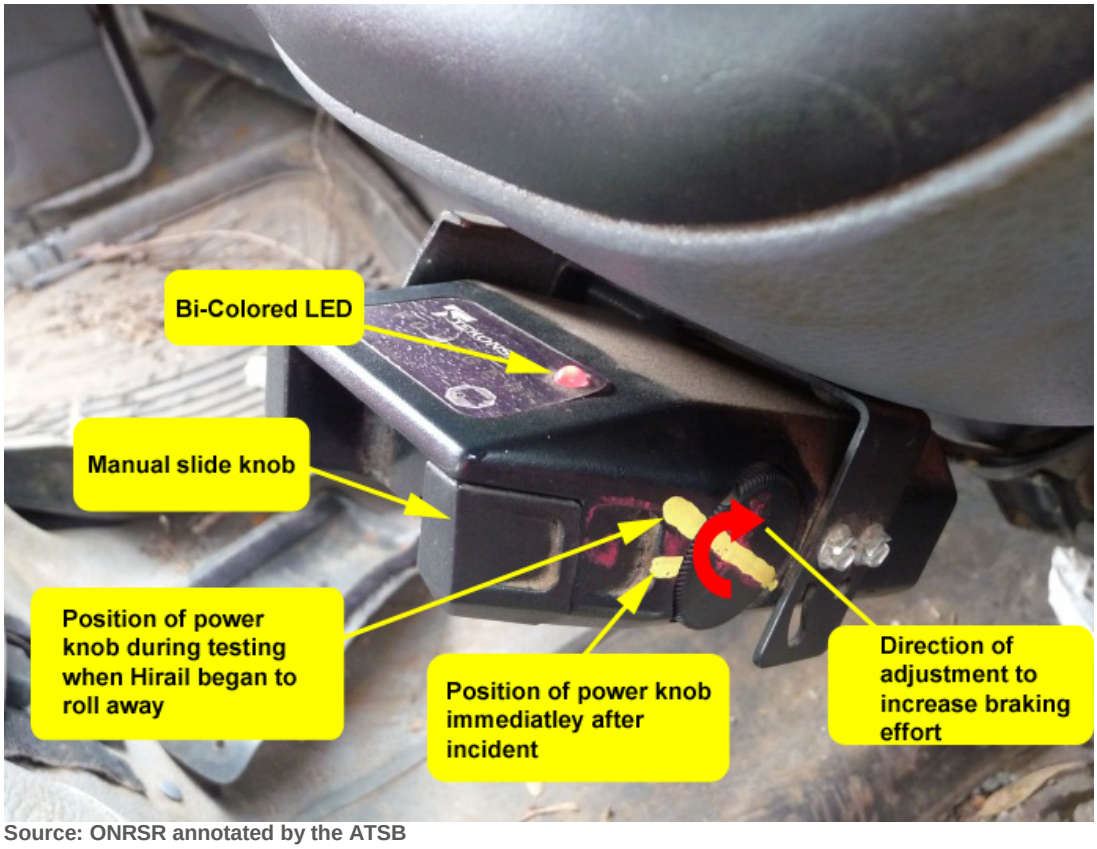
When setting up the brake controller, the operators had to take into account the grade, track condition (contamination), weather conditions and the loading of the vehicle. The operator then had to constantly adjust the controller while monitoring the performance of the vehicle and the brakes, while compensating for the change in the grade and rail conditions. When descending in the reverse direction from Rinadeena, it was usual practice for the brakes to be adjusted, checked and readjusted as required while descending the ‘rack’.

The mounting of the brake controller made adjustment difficult, as it was mounted below the dashboard (Figure 10), well out of the way of the driver’s view. Furthermore, adjustment of the brake controller power knob (Figure 10) was difficult as fine adjustments had to be made over a small arc of movement.

Following the incident, the brake controller power knob was found to be positioned in the upper quadrant (Figure 10). Post incident testing conducted with Hirail 3 on a similar grade to Rinadeena at Carswell Park in wet conditions (low adhesion) concluded that with the power knob adjusted to this position, the amount of braking force that was applied to the rail guidance wheels was not sufficient to keep Hirail 3 stationary when the weight of the vehicle was lifted off the rear road wheels.

While the brake controller was not designed specifically for on rail operations, when set correctly, the rail wheel braking system met the applicable Railcorp standard ESR 001-700 in achieving the specified deceleration rate. However, a braking system that required constant driver attention to achieve acceptable braking performance was not appropriate, especially for the steep grades of the WCWR.

Figure 13: Brake controller Power Knob marks and position



Source: ONRSR annotated by the ATSB

Risks associated with operating road-rail vehicles

The WCWR operates over various steep grades and generally has some contamination on the rail head due to the environmental conditions and location of the track infrastructure in a highly vegetated area. These factors heighten the risks associated with operating road-rail vehicles, including the risks associated with placing them on and off track.

However, the risks associated with on tracking road-rail vehicles on a grade, without the brake controller correctly set, and the possibility of a roll-away had not been identified by the WCWR. The investigation also found there were no formal procedures that described how to place the road-rail vehicle on track, how and when to correctly set the brake controller for different load and rail grade factors and specific locations where these vehicles could be safely placed on or off track.

In October 2012, these risks were identified by the then rail safety regulator (the Department of Infrastructure, Energy and Resources) who issued a Rail Industry Safety Notice (RISN) Number 7/2012 (see Appendix A) in an attempt to raise awareness of these issues in the Tasmanian rail industry.

Hirail 3 testing and acceptance

When WCWR approached Harrybilt to fit rail guidance equipment to the Mitsubishi Fuso Canter tip truck (Hirail 3) they did not have a design standard for road-rail vehicles. Therefore, there were no formalised requirements on how this task should be managed or what equipment should be fitted to the vehicle.

It was decided that electric brakes would be fitted to the rail wheels, rather than interfering with (and possibly compromising) the vehicle's original equipment by interfacing with the hydraulic brakes and ABS. However, a risk assessment associated with the fitment of electrically operated

brakes and the Tekonsha Voyager brake controller was not conducted by Harrybilt or WCWR at that time.

Since Harrybilt did not have access to a section of narrow gauge track, testing of the rail guidance equipment on track was not carried out on completion of its fitment. It was agreed that on track testing and any final adjustments would be completed by WCWR. Harrybilt provided instruction and supporting documentation on the controls and operation of the rail guidance equipment.

Hirail 3 was subsequently tested on track by WCWR in the presence of a representative from the then rail safety regulator. Once the tests were successfully completed, the vehicle was put into service. While these tests included a brake test, WCWR did not have a documented process for testing road-rail vehicles before they were used on their railway to ensure that they met their engineering requirements.

At the time of Hirail 3's delivery, there was no nationally recognised standard that addressed design, fitment and safety performance of road-rail vehicle rail guidance equipment. The WCWR did not define a standard to which the fitment of Hirail 3's rail guidance equipment was to meet and the risks associated with the fitting of an electric brake controller that was not specifically designed for on rail use were not assessed.

Following this incident, WCWR developed a specification which defined the standards to which all road-rail vehicles must comply before they can operate on their network. This standard applies to all road-rail vehicles owned or leased by WCWR, contractors or other third parties that access the WCWR network.

Operating procedures for road-rail vehicles

Procedures are a tool used to mitigate the identified risks involved with tasks being undertaken and provide content for the effective training or competency assessment of rail safety workers. A formalised procedure also provides the operators with a sequence of predetermined instructions aimed at guiding actions towards effective and consistently safe outcomes.

The use of standardised procedures allows personnel to use rule-based decisions to react quickly and effectively to contain a situation. This permits the considered design of procedures by experts to be efficiently implemented by operators, and has the potential to mitigate the effects of inexperience or misunderstanding of an event.[5]

On 4 June 2013, the road-rail vehicle operator used the usual process of on tracking Hirail 3. As there was no documented procedure, it was largely left to the operator to consider the operational requirements of the day such as track grade, rail conditions and load of the vehicle.

When the operator was asked to raise the rear rail guidance wheels, he did so without realising that the braking effect provided by the rear tyres would be lost and that he had not yet completed the crucial step of setting the brake controller. His attention to the task had been broken and he did not realise that the usual process had changed.

Without a formalised procedure for on/off-railing road-rail vehicles, the process was exposed to unacceptable risk, especially when operating on a railway with steep gradients.

Training

The Australian Quality Training Framework (AQTF) is a national set of standards which assures nationally consistent, high quality training and assessment services for the clients of Australia's vocational education and training systems.

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[5] Flin, R., O'Connor, P., & Crichton, M. (2008). Safety at the Sharp End. A Guide to Non-Technical Skills. Ashgate: Aldershot. p52

At the time of this incident, the WCWR required all road-rail vehicle operators to complete and be assessed as competent in the national standard 'TLIC3045A Operate Road-Rail Vehicle'. This package was developed by the Transport & Logistics Industry Skills Council (TLIC) and the rail industry, and was considered to be the minimum requirement for competency of rail safety workers in the operation of road-rail vehicles.

It was an AQTF requirement that the TLIC3045A competency be delivered and assessed by a Registered Training Organisation (RTO). The RTO was required to use the TLIC3045A training package to assess the competency of those required to operate a road-rail vehicle and was responsible for ensuring that the operators met the competencies set out in the package. In ensuring that the training met the specific requirements of the rail operator, the RTO was required to tailor the training package in line with the range statement[6] to incorporate the policies and procedures of the rail operator.

When the WCWR adopted the TLIC3045A package, it was anticipated that the package would replace the previous WCWR local training course 'Hirail Assessment Procedure' and include the site specific content as required under the TLIC3045A range statement.

However, the training package provided to the WCWR workers by the RTO did not cover site specific content and did not reference the operator's procedures, because none had been documented. Although the WCWR workers achieved competency through the training provided by the RTO, the training package did not meet all of the requirements for operating road-rail vehicles on the WCWR network. As a result, WCWR road-rail vehicle operators had not been appropriately trained for their specific work environment.

Radio communications

West Coast Wilderness Railway used VHF radios for all its rail safety work. Radio repeaters were located at Mount Owen, Teepookana and Strahan (Figure 14). Previously, there was a repeater located at Hazels Hill in the Rinadeena area, but it was removed as the location was susceptible to lightning strikes and constant damage. The repeater was relocated to Queenstown in an attempt to improve the overall communications across the railway. As a result, radio coverage in the Rinadeena area was problematic with reception being difficult in some areas, including the section of track where the collision took place.

On the day of this occurrence, radio communications from the accident site were unreliable due to a lack of reception. However, critical parts of the initial radio messages where received by the duty officer at Carswell Park and a coordinated and timely dispatch of key personal and emergency services was achieved.

In an effort to establish reliable communications, a staff member was sent up the Rinadeena Station access road to gain mobile telephone coverage and relay information from the accident site. This action assisted the emergency services in their timely response where communications from the accident site and the station were difficult and unreliable.

There was a fixed VHF radio at Rinadeena Station which was used for station communications whenever trains were running. However, the station had no permanent electrical power supply, so whenever the radio was required, a generator located at the rear of the station had to be started.

West Coast Wilderness Railway advised that the radio at Rinadeena Station was not provided for the purpose of carrying out rail safety work and was provided to assist with the delivery of food and beverages services during the railways peak tourist season. As a result, the radio was not maintained in an operational state when passenger services were not running.

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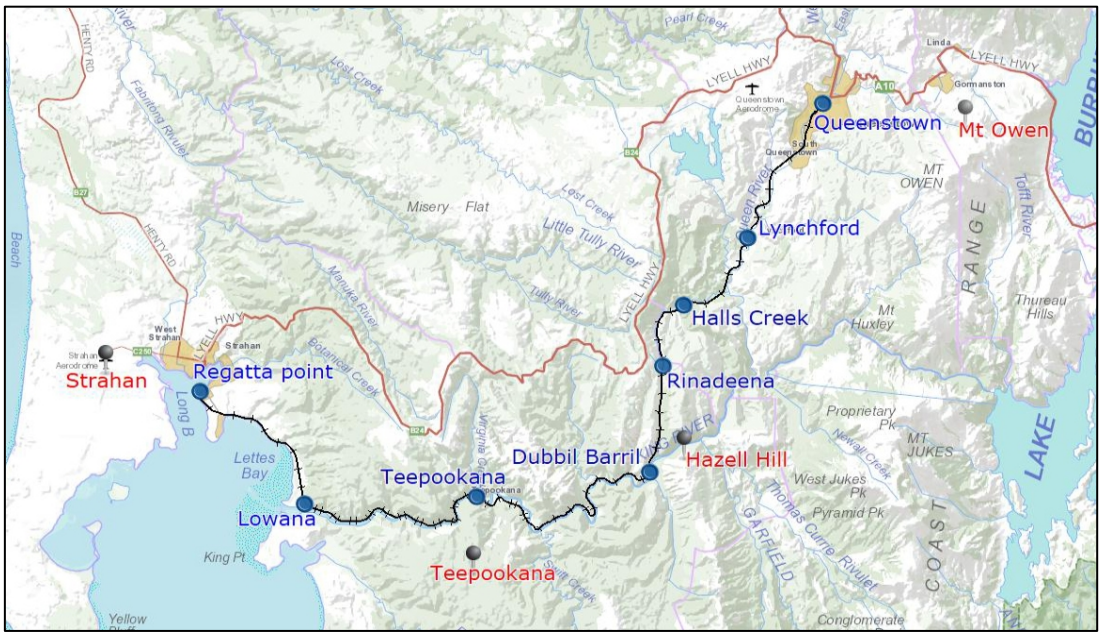
[6] Some topics covered in the range statements include suitable on-track and off-track locations and the use of communications equipment such as radios.

However, Rinadeena Station was the only emergency meeting point between Queenstown and Strahan and the only road access point on the rack between Halls Creek and Dubbil Barril. Therefore, it was important that an effective and reliable communication system was always available at that location.

Figure 14: Map of WCWR track, stations and repeater tower locations



Source: Land Information System Tasmania (LIST).

Radio procedures and protocols

West Coast Wilderness Railway did not have a set of documented radio communication procedures. As a result, radio transmissions were ad hoc and casual in nature and not always acknowledged as being received and understood.

The VHF radios were considered to be a necessary piece of safe working equipment when trains were running. However, normally accepted protocols of radio use beyond that for safe working were not always followed.

On occasions, track workers were on track and away from the road-rail vehicles without any means of radio communications. For example, at the time of the runaway of Hirail 3, the workers had alighted from the vehicle without a hand held radio. As a result, they were unable to contact Hirail 1 and warn its occupants of the imminent danger posed by the runaway vehicle.

Findings

From the evidence available, the following findings are made with respect to the collision of two road-rail vehicles that occurred at Rinadeena, Tasmania, on 4 June 2013. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance. A safety issue is an event or condition that increases safety risk and (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 operating environment at a specific point in time.

Contributing factors

- West Coast Wilderness Railway road-rail vehicle operators were not aware of the importance of having the brakes correctly set for optimum braking at all times. Furthermore, they did not consider the dangers they were exposing themselves to by not having the brakes effectively adjusted before they raised the rear rail guidance equipment.
- As the rear rail guidance wheels rotated from the operating position, through vertical centre, most of the weight of the truck was lifted from the rear road tyres. This resulted in the reduction of traction and braking effort being applied to the rail head.
- **West Coast Wilderness Railway had not considered all of the risks associated with the operation of road-rail vehicles on the steep railway. As a result, documented operational procedures had not been developed and locations where vehicles could be safely on/off railed had not been defined. [Safety issue]**
- **The training provided to the West Coast Wilderness Railway road-rail vehicle operators did not identify and incorporate local specific training requirements, such as operating on very steep grades and the use of radios. [Safety issue]**
- The occupants of Hirail 1 could not be warned of the imminent danger posed by the out-of-control Hirail 3 as its occupants had alighted from the vehicle without a hand held VHF radio.

Other factors that increase risk

- **Rinadeena Station was the only emergency meeting point between Queenstown and Strahan and the only road access point on the rack between Halls Creek and Dubbil Barril. However, the Rinadeena Station radio was not maintained in a serviceable state at all times. [Safety issue]**
- **The West Coast Wilderness Railway did not have documented radio communication procedures and their staff were not trained in the use of radios. As a result, radio protocols were not formalised and communications were adhoc and casual in nature. [Safety issue]**
- Radio transmission and reception was poor in the vicinity of the accident site following the removal the Hazells Hill radio repeater.
- **West Coast Wilderness Railway had not developed and implemented a specification for the design, fitment and safety performance of road-rail vehicle rail guidance equipment. [Safety issue]**
- **The West Coast Wilderness Railway did not have a documented process of testing road-rail vehicles. [Safety issue]**

Other findings

- Hirail 3 was in a roadworthy condition and its rail guidance equipment had been regularly maintained.
- Due to the nature of the environment in which West Coast Wilderness Railway operates, the rail condition generally has some contamination on the rail head. The build-up of contamination had increased at the time of this occurrence due to the infrequent nature of train operations.

Safety issues and actions

The safety issues identified during this investigation are listed in the Findings and Safety issues and 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 action, rather than to issue formal safety recommendations or safety advisory notices.

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 [aviation, marine, rail - as applicable] industry, the ATSB may issue safety recommendations or safety advisory notices as part of the final report.

Risk assessment, procedure and guidelines

Number:	RO-2013-014-SI-01
Issue owner:	West Coast Wilderness Railway
Type of operation:	Rail – road-rail vehicles
Who it affects:	All owners and operators of road-rail vehicles

Safety issue description:

West Coast Wilderness Railway had not considered all of the risks associated with the operation of road-rail vehicles on the steep railway. As a result, documented operational procedures had not been developed and locations where vehicles could be safely on/off railed had not been defined.

Proactive safety action taken by: West Coast Wilderness Railway

The West Coast Wilderness Railway has advised the ATSB that they have:

- Reviewed their risk register in relation to the operation of road-rail vehicles.
- Reviewed ISMS manuals – systems, rolling stock and infrastructure for operation and training for road-rail vehicles operations.
- Developed procedures (operations manual) governing the operation of road-rail vehicles including on/off tracking and vehicle operation.
- Initiated a new training and assessment program for personnel customised around West Coast Wilderness Railway operations and procedures.
- Implemented a requirement for all West Coast Wilderness Railway operators to receive the new training and be reassessed in road-rail vehicle operations on the network.
- Begun implementing a road-rail vehicle procurement and selection program, procedure and vehicle compliance checklist.
- Reviewed rail conditions.
- Reviewed all road-rail vehicle on/off tracking locations.
- Upgraded the VHF radio system
- Considered providing ‘Spot Track’ GPS based emergency contact system.

Action number: RO-2013-014-NSA-02

ATSB comment/action in response:

West Coast Wilderness was advised in the preliminary report that the ATSB will continue to monitor these and any further safety actions initiated to address this safety issue.

ATSB safety recommendation to: West Coast Wilderness Railway

Action number: RO-2013-014-SR-010

Action status: Closed

The Australian Transport Safety Bureau recommends that West Coast Wildness Railway undertake further work to address the risks associated with railing road-rail vehicles on an incline.

Response to recommendation

The West Coast Wilderness Railway reviewed and updated their risk register, included with respect to managing hazards associated with the operation of road-rail vehicles on steep grades. The changes were developed in consultation with the Office of National Rail Safety Regulator.

ATSB comment/action in response:

The ATSB is satisfied that the West Coast Wilderness Railway has addressed the safety recommendation. As a result of this safety recommendation the ATSB has issued a safety advisory notice to all operators of road-rail vehicles.

ATSB safety advisory notice to: All road-rail vehicle operators

Action number: RO-2013-014-SAN-011

The Australian Transport Safety Bureau advises that all road-rail vehicle operators should consider the risks associated with railing road-rail vehicles on an incline and take action where considered appropriate.

Response to safety advisory notice

The Office of National Rail Safety Regulator (ONRSR) advised that it is raising the awareness of operators with respect to road-rail vehicle safety. The ONRSR issued a Safety Bulletin in August 2013 and has conducted a series of workshops with industry across New South Wales, Tasmania and South Australia. Further details are available on the following web address:

http://www.onrsr.com.au/safety-improvement/roadrail-vehicle-safety

Current status of the safety issue:

Issue status: Closed

Justification: The ATSB is satisfied that the actions taken by West Coast Wilderness Railway and the Office of National Rail Safety Regulator address this safety issue.

Training

Number:	RO-2013-014-SI-04
Issue owner:	West Coast Wilderness Railway
Operation effected:	Rail : Rolling Stock
Who it affects:	All owners and operators of road-rail vehicles

Safety issue description:

The training provided to the West Coast Wilderness Railway road-rail vehicle operators did not identify and incorporate local specific training requirements, such as operating on very steep grades and the use of radios.

Proactive safety action taken by: West Coast Wilderness Railway

The West Coast Wilderness Railway has engaged a Registered Training Organisation (RTO) who has developed a training package that specifically recognises the risk of operating a road-rail vehicle in their network. This new training complies with the Australian Quality Training Framework. Operators have now been re-trained by the new RTO incorporating the new training package.

Action number: RO-2013-014-NSA-038

Current status of the safety issue:

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by West Coast Wilderness Railway in engaging an RTO and developing a training package that recognises specific risks for road-rail vehicles operating on their network addresses this safety issue.

Radio communications

Number:	RO-2013-014-SI-05
Issue owner:	West Coast Wilderness Railway
Operation affected:	Rail : Operations control
Who it affects:	All track managers

Safety issue description:

Rinadeena Station was the only emergency meeting point between Queenstown and Strahan and the only road access point on the rack between Halls Creek and Dubbil Barril. However, the Rinadeena Station radio was not maintained in a serviceable state at all times.

Proactive safety action taken by: West Coast Wilderness Railway

The West Coast Wilderness Railway advised that they have installed a battery backup system to provide independent power for the station radio and implemented administrative controls which will result in the radio's operation being tested daily to ensure it is functioning correctly. In addition, another repeater has been installed to help with limited radio reception at Rinadeena.

Action number: RO-2013-014-NSA-039

Current status of the safety issue:

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by West Coast Wilderness Railway addresses this safety issue.

Radio procedures and protocols

Number:	RO-2013-014-SI-08
Issue owner:	West Coast Wilderness Railway
Operation affected:	Rail : Operations control
Who it affects:	All track managers

Safety issue description:

The West Coast Wilderness Railway did not have documented radio communication procedures and their staff were not trained in the use of radios. As a result, radio protocols were not formalised and communications were ad hoc and casual in nature.

Proactive safety action taken by: West Coast Wilderness Railway

The West Coast Wilderness Railway has advised that they are currently developing a communications procedure on the correct use of radios and the requirement to have them on hand while on and off railing road-rail vehicles. All road-rail vehicle training will now include information about the importance of having a portable radio on any person engaged in operations before exiting a vehicle for whatever reason. All vehicles will be equipped with a portable radio in addition to the vehicle mounted radio.

Action number: RO-2013-014-NSA-041

ATSB comment/action in response:

The ATSB is satisfied that the action taken by West Coast Wilderness Railway in the revised training package and the included availability of radios while on and off tracking road-rail vehicles has addressed this safety issue.

Current status of the safety issue:

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by West Coast Wilderness Railway in the revised training package and the included availability of radios while on and off tracking road-rail vehicles has addressed this safety issue.

Hirail 3 testing and acceptance

Number:	RO-2013-014-SI-06
Issue owner:	West Coast Wilderness Railway
Operation affected:	Rail : Rolling stock
Who it affects:	All owners and operators of road-rail vehicles

Safety issue description:

West Coast Wilderness Railway had not developed and implemented a specification for the design, fitment and safety performance of road-rail vehicle rail guidance equipment.

Proactive safety action taken by: West Coast Wilderness Railway

West Coast Wilderness Railway (WCWR) has developed a specification which defines the minimum standards for compliance of all road-rail vehicles that operate on WCWR's network. These minimum standards apply to road-rail vehicles owned or leased by WCWR, contractors or other third parties that access the WCWR network.

Action number: RO-2013-014-NSA-043

Current status of the safety issue:

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by West Coast Wilderness Railway in specifying design, fitment and safety performance of road-rail vehicle rail guidance equipment has addressed this safety issue.

Documented process for the testing of RRV's

Number:	RO-2013-014-SI-07
Issue owner:	West Coast Wilderness Railway
Operation affected:	Rail : Rolling stock
Who it affects:	All owners and operators of road-rail vehicles

Safety issue description:

The West Coast Wilderness Railway did not have a documented process of testing road-rail vehicles.

Proactive safety action taken by: West Coast Wilderness Railway

West Coast Wilderness Railway has developed a procurement standard that specifies the process for commissioning and testing of the road-rail vehicle rail guidance equipment.

Action number: RO-2013-014-NSA-044

Current status of the safety issue:

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by West Coast Wilderness Railway in having a process to commission and test road-rail vehicle rail guidance equipment has addressed this safety issue.

General details

Occurrence details

Date and time:	4 June 2013 – 1130 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision	
Location:	Near Rinadeena, Tasmania	
	Latitude: 42° 9.565' S	Longitude: 145° 29.681' E

Hirail 1 details

Manufacturer and model:	1995 Mazda T4600 truck	
Registration:	ES 8908	
Operator:	West Coast Wilderness Railway	
Serial number:	Hirail 1	
Type of operation:	Rail Maintenance	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – 1	Passengers – 3
Damage:	Destroyed	

Hirail 3 details

Manufacturer and model:	Mitsubishi Fuso Canter 4.0 FE85	
Registration:	B71HJ	
Operator:	West Coast Wilderness Railway	
Serial number:	Hirail 3	
Type of operation:	Rail Maintenance	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – 1	Passengers – 1
Damage:	Destroyed	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- Ambulance Tasmania
- Australian Communications and Media Authoirty
- Department of Infrastructure, Energy & Resources, Tasmania
- Department of Primary Industries, Parks, Water and Enviroment Tasmania
- Harrybilt Engineering & Welding Services, Ballarat, Victoria
- Office of the National Rail Safety Regulator
- Tasmania Police
- West Coast Wilderness Railway

References

- ONRSR website http://www.onrsr.com.au/
- Rail Industry Safety Notice No. 7/2012 issued by the Department of Infrastructure, Energy & Resources, Tasmania
- Railcorp Minimum Operating Standard For Rolling Stock – Infrastructure Maintenance Vehicle Specfic Interface Requirements ESR 0001-700 Nov 2012
- RISSB Glossary of Railway Terminology Version 1
- TLIC3045A Operate Road/Rail Vehicle
- WCWR Operational Procedures
- WCWR Procurement Standard
- WCWR Rolling Stock Maintenance Procedures Manual

Submissions

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

A draft of this report was provided to West Coast Wilderness Railway management and track workers, the Officer of the National Rail Safety Regulator, Harrybilt and the Department of Infrastructure Energy and Resources.

Submissions were received from West Coast Wilderness Railway, the Officer of the National Rail Safety Regulator, Harrybilt, and the Department of Infrastructure Energy and Resources. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Appendices

Appendix A – RISN 7/2012

Rail Industry Safety Notice

29 October 2012

RISN No 7 / 2012

RISKS ASSOCIATED WITH HIRAIL OPERATIONS

Background
The Rail Safety Unit requests that rail transport operators in Tasmania read the attached Safety Alerts regarding the risks associated with Hi-rail operations. The notices issued by Western Australia, New South Wales and Victoria arise from an increase in serious incidents involving such equipment.

The safety alerts can be found at the following internet links:

- Western Australia:
  www.transport.wa.gov.au/rail/731.asp
- New South Wales:
  www.transportregulator.nsw.gov.au/rail/publications/tsas/tsa39.pdf.view
- Victoria:
  www.transportsafety.vic.gov.au/__data/assets/pdf_file/0005/81680/Risks-associated-with-hi-rail-operations.pdf

In Tasmania, incidents involving hi-rail equipment have included loss of braking capacity (incorrect brake setting adjustment) and the failure of splined shafts in rail guidance equipment. Audits in this State have also identified examples of an absence of engineering certification for the design of hi-rail equipment or its fitting to the vehicle/machine.

Action

All rail transport operators with hi-rail equipment should consider the advice in these safety alerts and review how they are managing the risks associated with their operation.

Rail Safety Unit
Department of Infrastructure,
Energy and Resources

Tasmania
Explore the possibilities

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

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 identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, 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 initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

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Notifications 1800 011 034
REPCON 1800 011 034
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Investigation

ATSB Transport Safety Report
Rail Occurrence Investigation

Collision between two road rail vehicles
Rinadeena, Tasmania, 4 June 2013

RO-2013-014
Final – 11 June 2014