Australian Government
Australian Transport Safety Bureau

Collision between two road-rail vehicles

Haig, Western Australia | 24 May 2012

Investigation

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Addendum

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Safety summary

What happened

On 24 May 2012, three Transfield Services Australia (Transfield) road-rail vehicles were travelling in convoy in a westerly direction between Forrest and Haig in Western Australia, where they were to be taken off the track.

Shortly before 1700, on arrival at the Haig level crossing, the lead vehicle was off-tracked, but a problem with the second vehicle prevented its removal from the track. At about 1711, while work was continuing to remove the second vehicle from the track, the third vehicle in the convoy, a flatbed truck, collided with the rear of the second vehicle. The force of the impact shunted the stationary vehicle forwards with both vehicles running over one worker, fatally injuring him, while the other jumped clear. The driver of flatbed truck was not injured.

What the ATSB found

The ATSB determined that the flatbed truck could not be stopped in time to avoid the collision because the brakes that were originally fitted to its front rail guidance equipment had been removed, and the vehicle's rear wheel brakes were in a poor state of repair. The investigation also identified that the rail workers had developed localised practices that were not compliant with Transfield's operational procedures.

A sample of the deceased worker's blood tested positive to both the active and inactive metabolite of cannabis. The other workers were not tested for the presence of drugs and alcohol following the accident.

The ATSB identified a number of systemic issues associated with Transfield's road-rail vehicle maintenance regime, rail safety worker training, management oversight and drug and alcohol policy and procedures.

In addition, the ATSB highlighted the absence of a national standard for road-rail vehicles which addresses the fitment, modification and maintenance of road-rail equipment and the consequent risk that unsuitable modifications may adversely affect the safe operation of a road-rail vehicle.

What's been done as a result

Transfield Services Australia has reviewed and updated its road-rail vehicle maintenance regime. The company has also taken action to improve its management oversight of rail safety workers, its training processes for maintenance and operational staff and its drug and alcohol policies and procedures.

The Rail Industry Safety Standards Board (RISSB) is facilitating the development of Australian Standard, AS 7502, *Road Rail Vehicles*. The standard will cover the basic requirements for road-rail vehicles across their life cycle, including design, construction, testing and certification, operation, maintenance, modification and disposal.

Safety message

Rail operators should ensure that safety critical road-rail vehicle equipment is appropriately maintained. Maintenance regimes and activities should consider the increased loading and wear and tear on the vehicle and its various components as a result of fitting of rail guidance equipment and of the operation of the vehicle on rail.

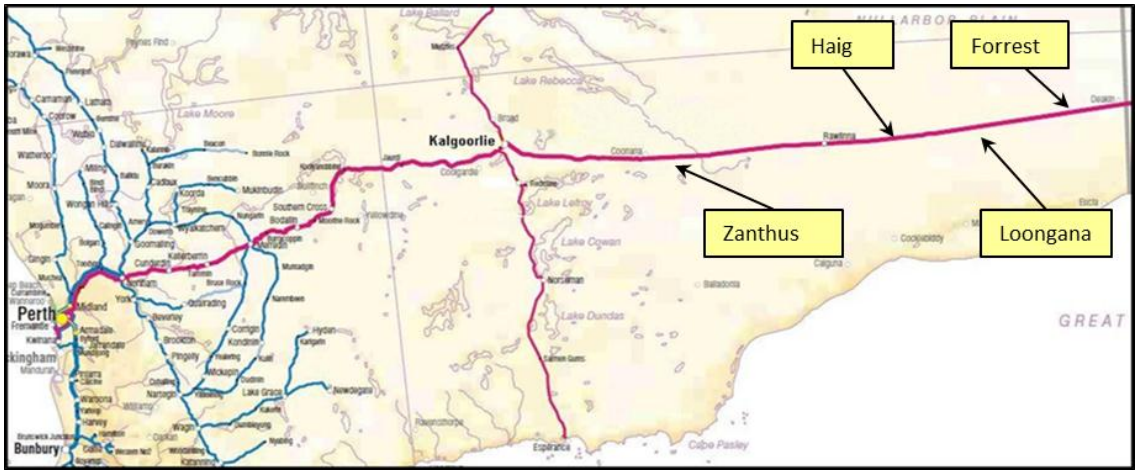
Rail Operators should also conduct regular reviews of staff members' and contractors' ability and competency to ensure they are consistently performing their duties in accordance with the most up to date and endorsed working instructions.

Contents

The occurrence

At about 1400[1] on 24 May 2012, the drivers of three Transfield road-rail vehicles, Toyota Landcruiser TS24, Toyota Landcruiser TS45 and Hino flatbed truck TS63 commenced duty at Forrest, Western Australia (Figure 1). Shortly afterwards, they had a 'job-start'[2] meeting and discussed their plan to travel by rail from Forrest to Zanthus. They planned to travel in convoy and along the way drop off a co-worker at Loongana where another vehicle was stationed. Once at Loongana, the co-worker was to separate from the convoy and drive his vehicle on road to Zanthus.

Figure 1: Location of Haig, Western Australia



Source: Geoscience Australia annotated by ATSB

At about 1420, the safeworking officer, who was also the driver of the lead vehicle (TS24), contacted the Australian Rail Track Corporation (ARTC) Network Control Officer (NCO) and requested a train authority to travel between Forrest and Loongana. The NCO issued train authority No. W61 to the convoy of three road-rail vehicles to travel on track as train 8M77.

TS24 was placed on track and then moved forward to allow TS45 and then TS63 to be placed on track. During this process, the driver of TS63 assisted the driver of TS45 with replacing a fuse in TS45's Aries[3] rail guidance equipment[4] electrical system. Once on track, the convoy made its way to Loongana, a distance of about 102 km.

At 1557, TS24 arrived on the main line[5] at Loongana. The safeworking officer then reported the arrival of the convoy and fulfilled train authority No. W61. At about 1559, TS45 arrived within the yard limits at Loongana and dropped off the co-worker who then left the convoy. At this time, TS63 was still travelling towards Loongana and not yet within its yard limits.

At 1559, train authority No. W75 was issued by the NCO to the safeworking officer for the convoy to continue to travel west from Loongana to Haig as train 8M77. The authority required the removal of the road-rail vehicles from the track on arrival at Haig to allow the passage of eastbound freight train 4PM6.

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1 The 24-hour clock is used in this report. Australian Western Standard Time (WST), UTC + 8 hours

2 Term used to describe a meeting held between team members at the commencement of a work shift to discuss daily notices and the plan for the day's work.

3 'Aries' is a brand of rail guidance equipment built and installed by Trac-West Machinery. This equipment was installed on vehicles TS45 and TS63.

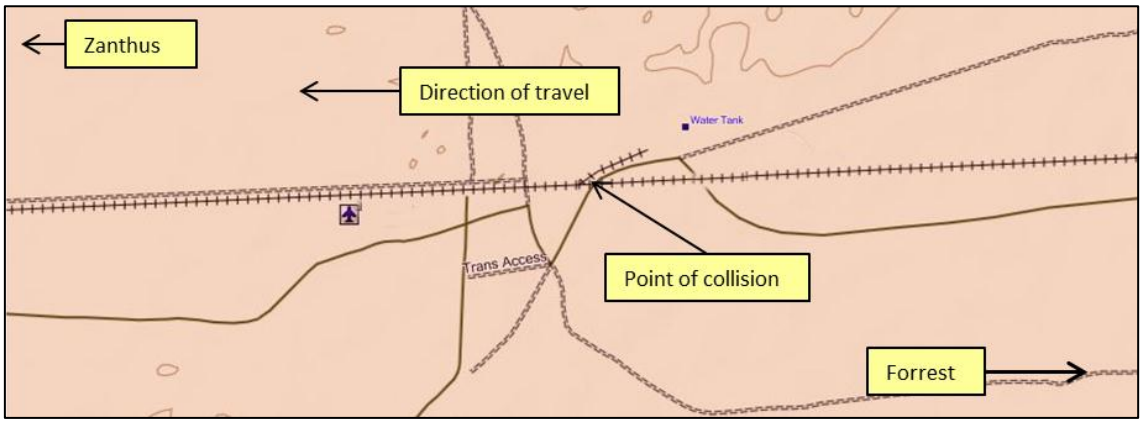
4 A pair of flanged rail wheels fitted to the front and rear of the vehicle which guide the vehicle when travelling on rail.

5 Loongana has a 'main line' and a 'crossing loop' to provide a facility for trains to both cross and pass each other.

At 1600, TS24 and TS45 departed Loongana for Haig (a distance of about 89 km). At 1602, TS63 passed through Loongana and followed on behind the other two vehicles.

On arrival at the level crossing at the eastern end of the Haig crossing loop (1330.141 km point[6]), the lead vehicle (TS24) was off-tracked. By about 1700, it was clear of the track.

Figure 2: Level crossing location at Haig, Western Australia



Source: Garmin MapSource

The second vehicle, TS45 arrived shortly afterwards and stopped on the level crossing. Once stationary, the driver attempted to use the in-cab controls to lift the Aries rail guidance equipment. However, he was unable to do so. After establishing that there was a fault with the rail guidance equipment, he sought assistance from the safeworking officer.

The safeworking officer called the driver of TS63 (who was about 2.5 km from Haig) on the very high frequency (VHF) radio to inform him of the vehicle on track. He did not receive a response. He then retrieved a hydraulic hand pump from TS24 and accompanied the driver of TS45 to the front of the vehicle. The safeworking officer and the driver of TS45 crouched down at the front of TS45 and connected the hydraulic pump to the attachment point on the Aries equipment in order to manually lift the equipment so that TS45 could be off-tracked.

Meanwhile, TS63 was approaching the stationary TS45 and was gradually decelerating from a speed of about 57 km/h. At 1711:33, TS63 was about 150 m from the stationary TS45 and approaching at a speed of 50 km/h. It was at this time that the driver of TS63 saw TS45 on the track at the crossing. He immediately braked, but quickly realised that TS63 was not slowing sufficiently to stop in time. He then down shifted the gears and pumped the brakes. He also depressed the steering wheel horn pad, but the horn did not work.

At 1711:46, TS63 collided with the rear of TS45 at a speed of about 28 km/h. The force of the impact shunted TS45 forward with both vehicles running over the driver of TS45, who sustained fatal injuries. The safeworking officer, who had looked up moments before the collision, observed the approaching truck and attempted to get clear. He received minor injuries when he was struck in the torso by the bull bar of TS45. The driver of TS63 was shaken but not physically injured as a result of the impact.

Post collision

At 1720, the safeworking officer reported the accident to the NCO and requested emergency assistance. In response, the NCO stopped all rail traffic movements in the sections of track between Wilban (about 38 km west of Haig) and Nurina (about 44 km east of Haig) and then

[6] Distance in kilometres from a track reference point located at Coonamia in South Australia.

contacted emergency services. He also contacted senior Transfield staff to seek further assistance.

The NCO made several other phone calls and radio transmissions in support of the safeworking officer and the road-rail drivers. He also arranged for freight train 4PM6 at Wilban to move to Haig so that its crew could provide assistance on site.

At about 1840, train 4PM6 arrived at the western yard limit at Haig. The train driver advised the NCO that a nurse from a nearby pastoral station was on site and providing medical assistance.

At 1950, the NCO was advised that the Royal Flying Doctor Service would not be attending the site as it had been confirmed that the driver of TS45 had been fatally injured and that further emergency evacuations were not required.

The collision did not cause any damage to the track or infrastructure and the track was assessed as suitable for rail traffic once the two vehicles had been removed.

On 25 May, the Western Australia Police Service attended the site and secured the two vehicles involved in the accident. That same morning, investigators from the Australian Transport Safety Bureau (ATSB) attended the site, collected evidentiary material and interviewed the safeworking officer and the driver of TS63.

At 1445, the rail line was officially declared open to traffic.

Context

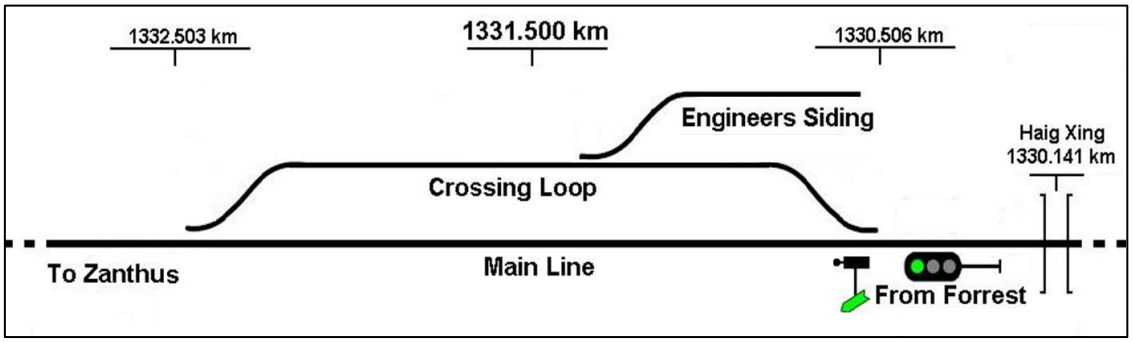
Location

Haig is located on the Defined Interstate Rail Network (DIRN) at the 1331.500 km point, about 450 km east of Kalgoorlie, Western Australia (Figure 1). At the time of the accident the rail line was owned and operated by the ARTC with track maintenance contracted to Transfield.[7] Management of train movements was carried out from the ARTC Network Control centre located at Mile End in Adelaide, using the Train Order Working system of safeworking.

Train Order Working is a communications-based system where proceed authorities are issued in the form of a train authority which authorises a train (or other track vehicles) to move between specified points. A train authority is issued by a NCO to the train crew and the train crew are required to comply with the instructions in the authority.

The track through Haig comprised the main line, a crossing loop and an engineer's siding. The level crossing where the collision occurred was located at the eastern end of the Haig loop, at the 1330.141 km point, about 360 m from the easternmost turnout. The level crossing was accessible to the public and also used by rail workers to access the track using road-rail vehicles.

Figure 3: Schematic for Haig, Western Australia



Source: Australian Transport Safety Bureau in consultation with the ARTC

The track approaching Haig from the east was straight, with a slight rise in track gradient just before the level crossing. At the time of the collision, the posted main line track speed for trains approaching Haig was 110 km/h.

The ARTC and Transfield

The ARTC is a central point of contact and administration for rail operators seeking access to the standard gauge rail network between Kalgoorlie, WA and Acacia Ridge, QLD and includes rail corridors within South Australia, Victoria and New South Wales[8]. It is responsible for the management of track access, safety, management of the track infrastructure and traffic movements. The ARTC has implemented a safety management system covering its operations including the provision of a safe working environment for its personnel and third parties who have access to the rail network.

Transfield is an operations, maintenance and construction services business operating globally across many different industries. At the time of this occurrence, Transfield was providing construction and maintenance services to the ARTC by way of contracted work under specified terms. One of the requirements of the contract was that Transfield was to operate a safety

[7] As of January 2013, ARTC maintenance staff took over all maintenance of infrastructure in Western Australia

[8] Referred to as the Defined Interstate Rail Network or DIRN

management system which covered all operational aspects of its work including plant, equipment and the provision of a safe working environment for their staff.

Transfield was not an accredited rail service provider under the Western Australian *Rail Safety Act 2010*, and therefore operated under the accreditation of the ARTC as the principal. In this capacity, the ARTC provided oversight of Transfield's rail maintenance activities between Parkeston and the South Australian border. As part of that function, the ARTC conducted audits that focussed on Transfield's staff and its safety management system.

Weather and light conditions

Weather observations and ambient light conditions for the afternoon of 24 May 2012 were obtained from the Bureau of Meteorology weather station located at Forrest, Western Australia (about 195 km east of Haig). The recorded conditions at 1500 were a temperature of 16.2°C with south-southwest winds at 22 km/h. Sunset was at 1638 with evening civil twilight[9] ending at 1704.

The safeworking officer described the lighting conditions as 'dusk' with the sun providing ambient light in the sky. He was not affected by any glare from the sun or other light source and had good sighting of the crossing during his approach to Haig.

The driver of TS63 described the weather as 'cloudy' and the lighting as 'late but not dark and no noticeable glare from the sun'.

Driver information

The driver of TS24 performed the function of safeworking officer throughout the convoy transit. He was the most qualified person in the group and had more than 10 years of service with Transfield. During that time, he had received training, including a Certificate 3 in Transport and Distribution, and was accredited in many aspects of rail safe working. The culmination of this training provided him with the necessary accreditations to perform the function of safeworking officer.

In November 2000, he attended a 2 day road-rail vehicle training course provided by Transfield. On completion, he was assessed as competent to operate road-rail vehicles and awarded a certificate.

The driver of TS45 had completed just over 2 years of service with Transfield. During that time, he had gained accreditation in aspects of rail safeworking and had completed a Certificate 1 in Transport and Distribution. In March 2010, he completed a 1 day course in the operation of road-rail vehicles. In the days immediately prior to and following the road-rail vehicle course, he also attended other Transfield provided training sessions on aspects of rail safety and equipment operation.

The driver of TS63 had completed over 10 years of service with Transfield. During that time he had gained accreditation in rail safeworking and completed various units in Certificates 1, 2 and 3 of Transport and Distribution. Like the drivers of TS24 and TS45 he had been assessed as competent in safeworking requirements as well as the operation of various types of rail maintenance equipment. In March 2010, he completed a 1 day training course in the operation of a road-rail vehicle. At the time of the occurrence he also held an 'MR' class WA Driver's License[10].

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[9] Defined as the instant in the evening, when the centre of the Sun is at a depression angle of 6° below an ideal horizon. At this time in the absence of moonlight, artificial lighting or adverse atmospheric conditions, the illumination is such that large objects may be seen but no detail is discernible.

[10] WA Department of Infrastructure road vehicle license to operate a vehicle in excess of 8 t and consisting of no more than 2 axles.

Working away from home arrangement

In the 18 days before the occurrence, the three drivers had worked a series of shifts in a remote location. During this time, they remained in the field. This working arrangement required them to share a rest house.

The day immediately prior to the day of the occurrence, all three drivers had a rest day in Forrest to accommodate for a change in shift times and train scheduling.

Fatigue

All three men had a rest period of more than 24 hours duration prior to the commencement of their shift at 1400 on 24 May 2012 and, at the time of the accident, they were just over 3 hours into the shift.

A review of this information and all of the other available evidence indicates that it was unlikely that the performance of the three workers was adversely affected by fatigue.

Road-rail vehicles

Road-rail vehicles are motor vehicles manufactured to road specification by the original manufacturer and then modified by an aftermarket supplier for on-rail operation. These modifications include the fitment of front and rear rail guidance equipment.

The fitting of rail guidance equipment requires reinforcement and modification of the vehicle chassis to ensure structural integrity and driver safety. At the time of this accident, there was no national standard specifying minimum engineering requirements for rail guidance equipment. Therefore, equipment configurations and installation methods varied according to each manufacturer's design, the customer's specifications and relevant safeworking requirements.

There are two common types of road-rail guidance equipment; 'non-elevation' and 'elevation'.

Non-elevation guidance equipment

This guidance system is suitable for road vehicles where the vehicle chassis width and tyre position allow for the road tyres to run on the head of the rail. The equipment is lowered into position and the rail wheels engage the rails while all four vehicle road tyres maintain contact on the rail head (Figure 4).

Figure 4: Non-elevation type rail guidance equipment fitted to a Toyota Landcruiser

Source: Trac-West Machinery

Elevation guidance equipment

This type of equipment is fitted to road vehicles where the road tyres do not align with the head of the rail. The equipment is lowered into position to lift the vehicle's road tyres off the ground.

This type of equipment is often fitted in combination with non-elevation guidance equipment. In this type of arrangement, the elevation equipment is fitted to the front of the vehicle and the non-elevation equipment is fitted to the rear. In some cases, this configuration may require modification to the vehicle's rear axle in order to allow the rear road tyres to make contact with the head of the rail.

For dual-wheel rear axle vehicles (such as that of Hino TS63), the rear inner road tyre achieves contact with the head of the rail without modification to the axle and the outer tyre sits outside the head of the rail (Figure 5, Note that the illustration shows a dual-rear-axle truck whereas TS63 was a single-rear-axle truck).

Figure 5: Elevation type rail guidance equipment fitted to a dual-rear-axle truck

Source: Trac-West Machinery

Drive and braking

Drive and braking effort is provided by the road tyres that are in contact with the rail head (non-elevation type equipment installed). While the road tyres continue to bear most of the vehicle's weight, the rail wheels will carry some of the load. Therefore, the vehicle's drive and braking performance is affected by the reduced load on the drive/braking wheels and the lower coefficient of friction between the rubber tyres and the smooth steel rail head.

This effect is even greater when elevation type equipment is used, as the vehicle's centre of gravity is altered and only the rear wheels remain in contact with the rail.

To compensate for the reduction in braking performance, manufacturers and operators may choose to install a supplementary braking system on the rail wheels of the road-rail guidance equipment. This may be particularly necessary where elevation type equipment is fitted to the front of the vehicle, as lifting of the road tyres away from the rail surface removes the availability of the braking system on the front wheels.

Incident vehicles

All three vehicles were owned and operated by Transfield and used by rail workers in undertaking rail track maintenance and inspection activities on the DIRN in Western Australia. At the time of the accident, they were based at the Transfield maintenance facility at Parkeston, a suburb of Kalgoorlie.

All three road-rail vehicles were fitted with a Tacholink Millennium data logger system that was linked to the vehicle's Aries rail guidance equipment.

TS24

TS24 was a Toyota Landcruiser Troop Carrier fitted with non-elevation Aries rail guidance equipment.

TS45

TS45 was a Toyota Landcruiser cab chassis fitted with a tray and non-elevation Aries rail guidance equipment.

The rail workers had encountered a problem operating TS45's Aries equipment when they placed the vehicle on track at Forrest. To overcome this problem, a fuse was taken from TS63 and put into TS45. Once TS45 was on track, the fuse was removed and returned to TS63.

While it was not confirmed after the accident, it is likely that the Aires equipment did not operate when the driver attempted to off track TS45 at Haig for the same reason as it did not operate at Forrest.

TS63

TS63 was a single cab Hino Ranger truck fitted with a table top drop side tray and hydraulic crane. It was fitted with non-elevation type equipment at the rear of the vehicle and elevation type equipment at the front of the vehicle.

Primary braking system

TS63 was fitted with a pneumatic air brake system comprising full air-over-mechanical drum-brakes to all road wheels with maxi/spring brakes fitted to the rear wheels.[11] In this system, the forces of compressed air and leverage are used in the activation of the brake mechanisms. The various components in the air brake system work together to create and maintain a supply of compressed air, direct and control the flow of that air and transform air pressure into a mechanical force.

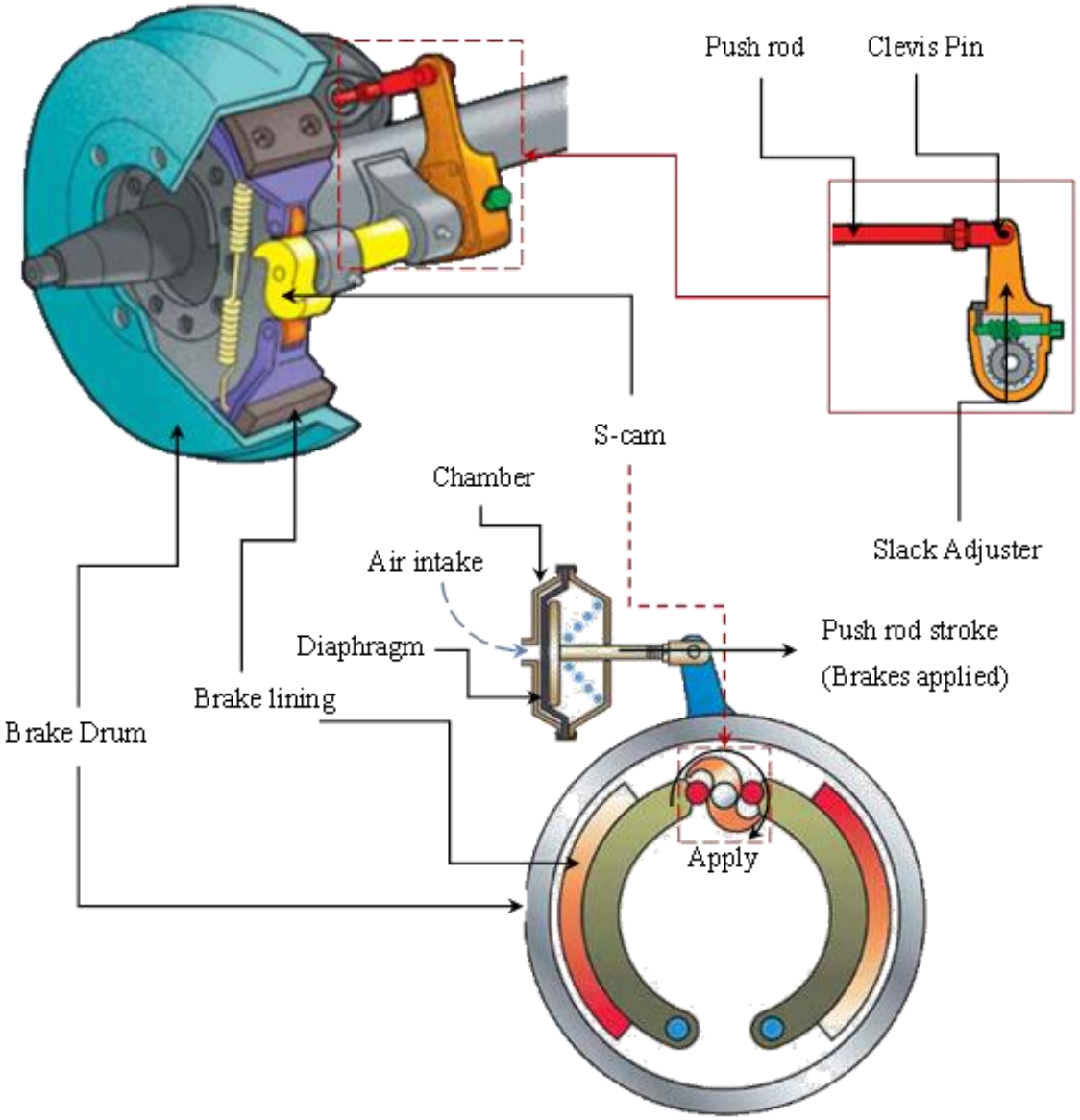
Heavy vehicles, such as TS63, use a dual air brake system, which consists of two separate air brake systems using a single set of brake controls. It is designed to retain some braking effort in the event one system should fail. In the case of TS63, the primary system operated the brakes on the front wheels and a secondary system operated the brakes on the rear wheels.

Application of force to the brake pedal opened a plunger allowing pressurised air stored in reservoirs to pass to the front and rear brakes. Depressing the brake pedal further down allowed more air to pass to the brake systems which further increased the amount of brake force applied at the brake hubs. Releasing the brake pedal allowed air to exhaust to the atmosphere which released the brakes. Unlike the foot brake in a hydraulic braking system, pumping the brake pedal did not increase braking effort.

When the brakes were applied, compressed air entered the brake chambers near each wheel. The air pressure acted on a diaphragm within a chamber (Figure 6) and was transformed into a mechanical force via a push rod attached to the diaphragm. The push rod was attached to the arm of a slack adjuster via a clevis pin. The slack adjuster was attached to a cam shaft which housed an S-cam at the opposite end of the shaft within the brake drum.

[11] Vehicle Examination Report, Wells Kaye and Appleby, Vehicle Investigation Unit, Western Australian Police Service

Figure 6: Brake Components in air brake system



Source: Air Brake Manual, Manitoba Public Insurance

When the operator applied the brake, the push rod forced the cam shaft to rotate which in turn rotated the S-cam, which forced the brake linings against the drum.

Supplementary braking system

The Aries rail guidance equipment fitted to the front of TS63 was supplied with a disc brake system. Transfield advised, in 2003 'following concerns associated with the callipers' the disc brake system was disconnected and removed from the vehicle. Transfield did not provide further documentation to support why the braking equipment was removed.

Although Transfield conducted brake stop tests following the removal of this supplementary brake equipment, the removal of the supplementary braking system almost certainly reduced the vehicle's braking capability when operated on rail.

Brake performance

To comply with road traffic rules in Western Australia, trucks with a gross mass greater than 2,500 kg must be able to decelerate from any speed at which the vehicle can travel at a rate of 2.8 m/s².

Following this accident, vehicle investigators from Western Australia Police used a brake roller tester[12] to check the effectiveness of TS63's brakes. The tests performed measured the achievable deceleration rate and brake balance[13].

The tests determined that the vehicle's brakes were capable of achieving a deceleration rate of 3.1 m/sec², in excess of the applicable standard.

The test report also concluded that the left-rear brake mechanism slack adjusters were 'out of adjustment' resulting in the wheel not being able to lock during the static brake test. Once the slack adjusters had been correctly set, the brake mechanism provided sufficient force to lock the wheel. The same test revealed that while the right-rear brake assembly locked the wheel on application, it was also out of adjustment, with the measured 'cold' stroke travel (59 mm) being 95% of the total available stroke travel for the mechanism.

As a result of these faults, the roller test returned a brake balance of only 11% for the rear axle. This was well below the specified minimum and indicates that little braking force was being applied to the left rear wheel. This indicates that while TS63's brakes were capable of effective deceleration when all four wheels were on the ground, they were ineffective in an on-rail application where the front wheels were lifted.

There is also a high probability, given that only the right-rear brake was providing any useful braking force, that this brake would have rapidly generated enough heat to further reduce the brake effort as it progressively ran out of stroke and faded[14].

Calculations based on the vehicles recorded data indicate that, on the day of the accident, TS63 (with the Aries equipment engaged and the front wheels lifted) decelerated at a rate of about 0.44 m/sec² before it collided with TS45. This deceleration rate was insufficient to safely bring the vehicle to a stop in the distance available.

Previous occurrences

In November 2007, a road-rail vehicle collided with the rear of train 4SP5 near Haig. The accident was reviewed by the Western Australia Office of Rail Safety and that review led to Transfield revising its road-rail vehicle operating manual.

During 2012, the ATSB was advised of two collisions between road-rail vehicles in Western Australia which occurred under conditions similar to the incident at Haig. In both cases, the vehicles were involved in track maintenance activities and the trailing vehicle collided with the rear of the lead vehicle after it had stopped. As with this collision at Haig, the operators of these vehicles relied upon network specific operational procedures and effective driver vigilance to ensure vehicle separation.

The most recent similar occurrence was in January 2013, when a road-rail vehicle operated by an ARTC employee conducting a track inspection collided with the rear of another road-rail vehicle. The collision occurred in the section of track between Coonana and Chifley, about 290 km from Haig. Neither driver was injured, but both vehicles were damaged and had to be recovered by truck from the site of the collision.

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[12] Measuring machine consisting of two pairs of powered rollers used for the assessment of a vehicle's braking performance.

[13] Balance is determined by the difference in braking force between one side of the axle and the other. The maximum recorded force for a wheel on any axle must be 70% or more than the other wheel on the same axle.

[14] The brake drum is subjected to excessive heating causing the drum to expand away from the brake shoes to a distance that the pushrod travel may be insufficient to fully actuate the brakes.

Safety analysis

Road-rail vehicle standards

At the time of this accident, the Australian rail industry did not have a national standard that addressed the design, fitment and maintenance of rail guidance equipment or the performance and maintenance of road-rail vehicles while on-rail.

Similarly, rail operators and access managers across Australia provide limited reference to road-rail vehicles when prescribing vehicle braking performance requirements.

In November 2012, a series of workshops were conducted examining the need for a road-rail vehicle national standard.[15] The exercise was commenced with a view to reduce the number of incidents involving road-rail vehicles.

Two recommendations which are being developed in this workshop group address key aspects of the road-rail vehicle issues highlighted through this incident:

- Engineering controls for the manufacturing standards of a road-rail vehicle before and during its commission of service, including the equipment configuration requirements whilst on track.
- Road-rail vehicle management – development of plant and rolling stock management procedures, processes and systems to ensure the effective management of assets throughout the life cycle of the equipment, including the responsibility for providing information to the relevant authority when modifying the equipment.

Transfield has advised that it has been an active participant in this process and in conjunction with the rest of the rail industry will reference the finalised road-rail vehicle standards to inform their safety management system.

Available standards

In the absence of any national standard, many road-rail equipment installers and operators refer to the applicable RailCorp (NSW) standard[16] for braking performance testing. The RailCorp standard specifies an average deceleration rate of 1.0 m/sec² for all road-rail vehicles (in loaded condition) with rubber wheels braking on rail.

Transfield stated that removal of the supplementary braking system from TS63 was prompted by maintenance issues associated with braking callipers. They engaged experts to ‘safely disconnect the callipers and conduct brake testing’ to ensure adequate braking performance was maintained. Transfield stated that their test result confirmed ‘that TS63 could stop in 58.8 m from 50 km/h’ at an average deceleration rate of 1.64 m/sec², which was within the acceptable rolling stock braking standard. Documentation to verify these tests was not produced by Transfield.

As previously discussed, TS63’s pneumatic air brake system was in a poor state of repair. On the day of the accident, TS63 decelerated at an average rate of 0.44 m/sec² before colliding with TS45, well below the RailCorp performance standard.

Road-rail vehicle maintenance

At the time of the collision, TS63 was not in good operational condition. The supplementary rail wheel braking system had been removed and the rear axle braking system was in a poor state of repair.

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[15] The Independent Transport Safety Regulator New South Wales was the lead agency at commencement of the workshops, since then the Rail Industry Safety Standards Board has taken responsibility for the development and implementation of the Standard.

[16] Rollingstock Standard ESR 001-700.

The vehicle was maintained by a third party motor vehicle mechanic who followed the vehicle manufacturer's guidelines for preventative maintenance with scheduled services carried out every 6 months or 10,000 km. These services were supplemented by monthly inspections and any necessary breakdown maintenance. The Aries rail guidance equipment was periodically serviced by Transfield staff.

However, the manufacturer's maintenance schedule did not take into consideration significant aftermarket vehicle modifications such as the addition of road-rail equipment. This modification altered the vehicle's performance and placed considerably higher working loads on the braking system, which resulted in significantly accelerated wear and tear on the rear braking mechanisms.

As there were no standards that applied to the maintenance of road-rail vehicles, it was incumbent upon Transfield to consider the operating conditions of the vehicle, and the increased levels of wear and tear as a result of on rail operations, and to subsequently devise a maintenance regime to ensure that the vehicle was maintained in good operational condition.

However, this was not done. As a result, on the day of this accident, the condition of the vehicle's braking system had deteriorated to the point that it could not be relied upon to effectively stop the vehicle when operating on rail.

Operational procedures

Organisations put risk controls and defences in place to prevent human failures or to mitigate their consequences. This is especially important for safety critical tasks, where incorrect performance of the task may initiate or fail to mitigate an incident. Such controls could include: rules, procedures, safe systems of work, supervision, performance monitoring, audits, training and competence management.[17]

By the time TS24 had arrived at Haig, several breakdowns in procedure and operational safety had occurred. Furthermore, the evidence suggests that the staff directly involved in the occurrence had developed routine, non-compliant work practices in the areas of communication protocols, daily vehicle inspections, and convoy vehicle marshalling and spacing which did not align with Transfield operating manuals and instructions.

Communication protocols

The three track maintenance workers involved in this accident had undertaken training in the conduct of effective communication protocols. The content of this training included the industry standardised radio communication protocols for transmission and receipt of information by an individual when working within the rail corridor.

In the context of travelling in convoy, each vehicle/machine operator was required to communicate directly with the safeworking officer or track section authority holder and confirm all communication relevant to their movements. However, the investigation established that this group of workers had, over time, developed a local work practice for communications wherein the drivers of TS45 and TS63 would simply listen in to the safeworking officer's radio communications with train control, and by doing so were informed of the approved movements of the convoy.

It is likely that the workers perceived this practice as an efficient shortcut which reduced the requirement for seemingly redundant communication practices between the vehicle operators. However, this practice also created a context where it became normal practice to transmit a communication with no requirement to provide confirmation that the message had been received and understood.

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[17] J. Wilson, A. Mills, T. Clarke, J. Rajan & N. Dadashi (2012) *Rail Human Factors Around the World: Impacts on and of People for Successful Rail Operations.*

In the minutes prior to the collision, the safeworking officer called the driver of TS63 by radio to inform him of TS45 still being on track. In the context of the developed common practice of reduced communications between the workers, it is likely that the lack of a confirming communication from the driver of TS63 failed to trigger any concern for the safeworking officer who then commenced work on TS45, falsely believing that the driver of TS63 was aware of the situation and would take action to avoid a collision. However, the driver of TS63 did not hear the radio broadcast and hence was not warned of the vehicle ahead.

These adaptations to standard communication protocols represent a failed risk control which might have prevented the collision and subsequent fatality.

Daily vehicle inspections

Each Transfield road-rail vehicle was supplied with a log book to record servicing and inspections. While workshop maintenance and inspections were recorded, the recording of daily inspections was spasmodic at best, and indicative that the operators were not inspecting the vehicles on a daily basis in accordance with Transfield's requirements.

Convoy vehicle marshalling order and spacing procedures

Transfield's *Road-rail vehicle Operating Manual* specified, amongst other things, that road-rail vehicles travelling in convoy were to maintain at least a 500 m separation between vehicles and that the heavier vehicle should lead the convoy. Had TS63 (by far the heaviest of the three vehicles) been placed at the lead of the marshalling order it would not have been in a position to collide with any of the other vehicles in convoy.

The road-rail vehicle training provided to the safeworking officer preceded the development of Transfield's operating manual, by some 9 years. He had not been provided with relevant training since the development of the operating manual and hence, he did not consider the requirement for the heavier vehicle to lead the convoy when determining the marshalling order of the vehicles.

The convoy was travelling under a train authority and for the purpose of rail traffic movement was issued with train number 8M77. In this scenario, all vehicles within the convoy were considered to be part of one complete train and as such the last vehicle in the convoy was considered to be the last 'wagon' in the train.

In this case, the vehicle with the slowest permitted speed limit (TS63) was marshalled at the rear of the convoy and the lead vehicles travelled ahead without consideration of TS63 progressively falling further behind. Therefore, train 8M77 was not clear of the Mundrabilla to Loongana section at the time the train order No. W61 was fulfilled, because TS63 was still within that section at the time the train authority was fulfilled.

The fulfilling of a train authority prior to all vehicles being completely clear of a section places the occupying vehicle(s) at a heightened risk of collision. This practice is considered a safe working breach contrary to the protocol for reporting 'clear' in train order working territory.[18]

Like the breakdown in communication protocols, these non-compliant practices are likely to have developed over time and were probably perceived to represent efficient adaptations enabling the crew to achieve their tasks in a timelier manner.

Predictors of routine non-compliance

Safety Management Systems (SMS) are predicated on the assumption that people will follow the guidelines and procedures. When people deviate from guidelines, the whole basis of the SMS is

[18] Train Authority Protocol 3.9.12 of Department of Transport and Regional Services Code of Practice for the Defined Interstate Rail Network - Volume 3 published May 2002 ARTC Annotated version

compromised.[19] Research into the issue of non-compliance with rules and procedures has established four main predictors of non-compliant behaviour. These are:

> *Expectation* - the expectation that the rules have to be bent to get the job done, and nothing has changed (as a result)
>
> *Powerfulness* - the feeling that one has the ability and experience to do the job without slavishly following the procedures
>
> *Opportunity* - seeing opportunities that present themselves for short cuts or to do things 'better'
>
> *Planning* - inadequate work planning and advance preparation, leading to working 'on the fly' and solving problems as they arise[20]

All three workers had undertaken training in communication protocols, yet they had developed an adaptation of those practices wherein no confirmation of communication and understanding was required. This can be understood in the context of both 'powerfulness' and 'opportunity' as described above. The track maintenance workers appear to have performed the majority of their work with very little oversight or direction from the organisation, entrusted to complete their work essentially autonomously. When decisions were made within the crew to adapt the communication protocols, the associated increased risk was not apparent to them. As they continued to use this adapted protocol and nothing adverse occurred, the apparent merit of the adaptation was increasingly confirmed, and so, unbeknownst to the organisation, the adaptation became normalised practice for that group.

Similarly, shortcuts were developed and subsequently normalised for convoy marshalling order. Although contrary to instructions, placing the two Toyota vehicles at the front of the convoy marshalling order was probably perceived as a more efficient practice, enabling the two smaller vehicles to travel at a maximum speed of 80 km/h and not be slowed by TS63 which was limited to 60 km/h. This marshalling order would permit the safeworking officer and the driver of TS45 to arrive, off-track and set up a worksite prior to the arrival of TS63. Once the last vehicle arrived, work could commence without further delay.

The ATSB found that the safeworking officer was not aware of the procedures and protocols specifically related to convoy operations. It is probable that this knowledge gap contributed to the development of the group's non-compliant convoy practices with regard to both spacing and marshalling order. Without the necessary information to adequately assess all of the risks involved, and in attempts to improve the way the work was done, the group unwittingly placed themselves at elevated risk of personal injury and/or harm.

Further, solving problems 'on the fly' (inadequate planning) was characteristic of the way in which the track maintenance workers performed their duties, evidenced in the operational maintenance of the vehicles and the inconsistent practices regarding vehicle inspections. Having performed similar work on multiple occasions over the period of working together without adverse incident, the crew probably formed the view that the omission of pre start inspections was a time saving action which posed little or no risk to their operational safety.

It is not clear over what length of time the safeworking officer and drivers developed their non-compliant work practices but what was evident was the 'gap' in the operational and safe working knowledge of the staff involved. This knowledge gap, combined with the isolation of the work sites, provided an environment in which non-compliant work practices could develop and were probably perceived as more efficient but which failed to recognise the increased risk involved.

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[19] Hudson, P., Parker, D, Lawton, R, and van der Graaf, G. (n.d.). *Bending the Rules: Managing Violation in the Workplace*.: http://www.eimicrosites.org/heartsandminds/userfiles/file/MRB/MRB%20PDF%20bending%20the%20rules.pdf

[20] Hudson, P., Vujik, M.,Bryden, R., Biela, D. and Cowley, C. (2008*). Meeting Expectations: A New Model for a Just and Fair Culture SPE 111977*: Society of Petroleum Engineers.

Oversight and training

A function of the role as safeworking officer is to provide supervision and guidance to other personnel, in this case the drivers of TS45 and TS63. This includes ensuring that work is conducted in compliance with current practices and procedures as set by Transfield and the ARTC, who implement these controls as a safeguard to prevent or to mitigate the consequences of human error. Good supervision, refresher training and auditing of the safe systems of work provide additional defences to reduce the incidence of deviations from the specified procedure.[21]

At interview, the safeworking officer stated that, since attending the road-rail vehicle training in November 2000, he had not received any further training or instruction in the operation of a road-rail vehicle and the associated safety measures. He described the training delivered at that time as brief, with a focus on the placing of the road-rail vehicle on track and the engagement of the Aries equipment. He did not recall ever receiving any specific instructions or being advised of any safety measures relating to the convoying of vehicles, either during his initial training or subsequently throughout his employment with Transfield. His recollection of the road-rail vehicle operating procedures indicates that work practices as described in the operating manual were not routinely carried out.

In the two years prior to the day of the incident, Transfield released *Toolbox Talk* notices relevant to the safeworking and operation of personnel and machinery. A notice dated 17 February 2012 provided instructions specific to communication protocols and method of travel for on track vehicles. The instructions within this document are consistent with the *Road-rail vehicle - Operating Manual*. However, even though this information was made available to Transfield personnel, the safeworking officer had no recollection of ever receiving it.

Taking into consideration the publication of the road-rail vehicle operating manual, the lack of refresher training and the informal promulgation of notices, it is likely the safeworking officer was not aware of the most recent road-rail vehicle operating manual and as such TS63 was placed in a marshalling order that led to the collision.

This knowledge gap was a factor which placed the safeworking officer in a situation where he was ‘set up to fail’ by the system in which he was working.

Consideration was also given to the level of oversight provided by Transfield as the employer and the ARTC as the infrastructure owner. In the years prior to the day of the occurrence, neither Transfield nor the ARTC had conducted compliance assurance work which involved any of the three individuals involved in this incident.

The ATSB was not provided with any information to show whether any type of review or audit was carried out in relation to employee knowledge currency, vehicle log books or on board recording devices. The absence of this oversight, a lack of re-training on current procedures, and the ineffective promulgation of safety related bulletins and alerts pertaining to road-rail vehicle operation, all combined to support the development of non-compliant work practices.

Drug and alcohol

The rail safety legislation and regulations in Western Australia require rail transport operators to implement a drug and alcohol management program. The program must include a drug and alcohol policy, testing and training procedures and guidelines on how to deal with rail safety workers whose work is or may be affected by the use of alcohol or other drugs.

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[21] J. Wilson, A. Mills, T. Clarke, J. Rajan & N. Dadashi (2012) *Rail Human Factors Around the World: Impacts on and of People for Successful Rail Operations.*

Transfield's drug and alcohol management programme required workers to not be adversely affected by drugs or alcohol while conducting safety related work. Enforcement was achieved through a system of random and incident initiated testing. The management programme was documented in:

- Document TMP-8004-SA-0001, Rail drug and alcohol testing requirments

  The document stated its purpose was 'to ensure workers engaged in activities affecting railway safety are not adversely affected by alcohol or other drugs (legal or illicit) when about to carry out, or while conducting safety related work'. For rail contracts in Western Australia, the document stated a requirement to conduct testing for drugs and alcohol under the Rail Safety Act in Western Australia and referred to a Transfield testing procedure.

- Document TMP-0000-SA-0041, Drug and alcohol procedure

  The document stated its purpose to '…outline the principles that will be used by Transfield Services in determining fitness for duty in relation to alcohol and drugs'. The document largely describes the process for implementing drug and alcohol testing plus some information about the obligations of employees. Employees are required to report to work without detectable levels of alcohol or other drugs and are reminded of an obligation to abstain from any activity or behaviour (on and off duty) that could result in a breach of Transfields policies.

It was evident that the documents focused predominantly on how testing was to be carried out and how the regulator would be notified of a positive result. There was only limited guidance regarding how Transfield ensured rail workers were not affected by the use of alcohol or other drugs when carrying out rail safety work.

On the day of attending the accident site, the ATSB Investigators noted that a quantity of alcohol and empty alcohol packaging (of the same manufacture brand) was present in vehicles TS63 and TS45. This indicated that alcohol was present at the Transfield worksites, carried in the Transfield vehicles and available to be consumed during the 19 day shift cycle.

Taking the presence of alcohol into consideration, it is reasonable to conclude that at least some of the Transfield workers involved in the collision had consumed alcohol during the 19 day shift cycle. A review of Transfield's policy and procedures found no prohibition clauses about consuming alcohol, only that employees must report to work without detectable levels of alcohol or other drugs.

While Transfield's policy and procedures stated its purpose was to ensure workers were not affected by alcohol or other drugs and this was to be achieved through testing, evidence gathered during the investigation showed that the Transfield workers did not have any testing equipment on hand to assess whether they were affected by alcohol while conducting rail safety work. This was further evidenced by the safeworking officer and the driver of TS63 not being tested for the presence of drugs or alcohol following the accident, as there were no facilities on site for carrying out the required tests. Therefore, the ATSB was unable to determine whether or not their performance at the time of the accident and leading up to it was adversely affected by consumption of a drug or alcohol.

Although blood samples obtained from the fatally injured driver of TS45 detected a concentration of alcohol, the samples were taken some considerable time after the accident and without suitable controls to prevent degradation. Therefore, the results were considered unreliable for determining whether the driver of TS45 was affected by alcohol at the time of the accident.

The blood samples obtained from the fatally injured driver were tested for the existence of various drug indicators. The results of these tests were positive to both the active and inactive metabolite of cannabis, with the active metabolite (delta-9-tetrahydrocannabinol or Delta-9-THC) returning a concentration of 12.0 ng/ml in whole blood. These results of these tests are considered to be reliable and indicated evidence of recent cannabis use.

Delta-9-THC, the major psychoactive component of cannabis, is rapidly converted after cannabis use to an inactive metabolite commonly referred to as THC-acid. Several studies have linked Delta-9-THC to performance impairment. The predominant form of impairment is an inability to react to complex or unexpected scenarios. Studies have concluded that affected drivers appear to be aware of their impairment and where possible compensate by slowing down, focussing attention and not taking risks (like overtaking).[22] However, this compensation is ineffective when the driver encounters unexpected events and/or is placed in situations requiring increased mental load or continuous attention.[23]

An Australian study indicated that the crash risk for drivers with THC concentrations >5.0 ng/ml was similar to the crash risk associated with drivers with a blood alcohol concentration (BAC) >0.15%.[24] An overseas study has indicated that performance impairment became 'truly prominent' across all driving related performance measures at THC concentrations equivalent to 2.5 - 5.0 ng/ml in whole blood.[25]

It is therefore considered likely that in this case, the presence of the psychoactive metabolite of cannabis in the driver's blood would have contributed to a reduced capacity to respond appropriately to a complex and unexpected condition, such as reacting to the rapid approach of TS63 and its subsequent impact with TS45.

The absence of specific prohibitions for the consumption of alcohol by rail workers during their 19-day shift cycle, creates an environment where the risk of drug or alcohol related impairment may increase. Furthermore, in what was a remote work environment in this case, Transfield did not have adequate systems in place to mitigate this risk and ensure workers were not adversely affected by drugs or alcohol while conducting safety related work (as per their policy). The absence of an adequate testing regime also contributed to the inability to conduct post occurrence testing for drugs and alcohol following the accident.

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22 Smiley, A. (1986). Marijuana: On-road and driving simulator studies. Alcohol, Drugs and Driving, 2(3-4), 121-134.

23 Robbe, H. W. J. (1994). Influence of marijuana on driving. Unpublished PhD, University of Limburg, Maastricht.

24 Drummer, O. H., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M. D., & Swann, P.(2004). The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. Accident Analysis & Prevention, 36, 239-248.

25 Ramaekers, J. G., Moeller, M. R., van Ruitenbeek, P., Theunissen, E. L., Schneider, E., & Kauert, G. (2006). Cognition and motor control as a function of delta-9-THC concentration in serum and oral fluid: Limits of impairment. Drug and Alcohol Dependence, 85, 114-122.

Findings

At 1711 on 24 May 2012, Transfield road-rail vehicle Hino TS63 collided with Transfield road-rail vehicle Toyota TS45 at Haig in Western Australia causing the death of one rail worker and the injury of another.

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

- **The maintenance regime for Hino TS63 was inadequate and did not account for the accelerated wear and tear on the vehicle when used as a road-rail vehicle. [Safety Issue]**
- The supplementary braking system on the rail wheels, provided as compensation for reduced braking performance when operating on-track, had been removed from Hino TS63.
- The compromised braking system on Hino TS63 did not produce sufficient deceleration to stop the vehicle before it collided with Toyota TS45.
- It is likely that non-compliant communication practices, convoy marshalling and vehicle inspection practices had developed over time.
- **Transfield did not provide oversight sufficient to identify and rectify the non-compliant work practices in the road-rail vehicle operation involved in this occurrence. [Safety Issue]**
- The safeworking officer supervising the operation was not aware of the most recent road-rail vehicle operational requirements in Transfield's '*Road-rail vehicle – Operating Manual*' which stipulated the heaviest vehicle (Hino TS63) was required to lead the convoy.
- **Transfield's training regime did not ensure that the track workers involved in this occurrence were trained in new or updated work practices relating to road-rail vehicle operations. Similarly, relevant amended procedures, safety bulletins and alerts had not been effectively promulgated to these employees. [Safety Issue]**

Other factors that increase risk

- **Transfield did not have adequate systems in place to ensure workers were not adversely affected by drugs or alcohol while conducting safety related work in a remote work environment. [Safety Issue]**
- **The absence of a national standard that addresses the design, fitment and maintenance of rail guidance equipment and the safety performance for road-rail vehicles while on-rail, increases the risks associated with operating road-rail vehicles. [Safety Issue]**

Other findings

- The safeworking officer and driver of TS63 did not complete a blood alcohol breath test within the prescribed time frame for an incident of this type.

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.

All of the directly involved parties were provided a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Road-rail vehicle maintenance regime

Number:	RO-2012-006-SI-02
Issue owner:	Transfield Services Australia
Type of operation:	Rail – Rail maintenance
Who it affects:	Track maintenance staff

Safety issue description:

The maintenance regime for Hino TS63 was inadequate and did not account for the accelerated wear and tear on the vehicle when used as a road-rail vehicle.

Proactive safety action taken by: Transfield Services Australia

Action number: RO-2012-006-NSA-011

Transfield confirmed that it has reviewed and updated its road-rail vehicle maintenance regime including (but not limited to) through the following proactive safety actions.

- Conducting plant risk assessments – all Transfield road rail vehicles were assessed and non-conforming vehicles were either modified and updated, or decommissioned from service.
- Implementing a new Computerised Scheduled Maintenance Planning ("CMMS") – for hi-rail equipment, this process included comprehensive review by mechanical and communication technicians.
- Plant log books were reviewed and reissued through educative processes.

Current status of the safety issue

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by Transfield Services Australia in the identification and implementation of a more rigorous maintenance and risk assessment regime which is tailored to road-rail vehicles has addressed this issue.

Oversight

Number:	RO-2012-006-SI-04
Issue owner:	Transfield Services Australia
Type of operation:	Rail –Rail maintenance staff
Who it affects:	Track maintenance staff

Safety issue description:

Transfield did not provide oversight sufficient to identify and rectify the non-compliant work practices in the road-rail vehicle operation involved in this occurrence.

Proactive action taken by: Transfield Services Australia

Action Number: RO-2012-006-NSA-012

Transfield confirms that it has taken several proactive safety measures to increase oversight into road-rail vehicle operations, including in relation to non-compliance. These include but are not limited to the following measures.

- A Remote or Isolated Work Procedure.
- A Higher Duties Procedure.
- Introducing Tailored Leadership Training for leaders across the rail business.
- Workplace inspections across all Transfield rail sites on a monthly basis, with an emphasis on safety and compliance.
- Rail Safety Stand Downs - half day events at which rail safety issues and topics are presented to the workforce and other safety activities (i.e. training) are undertaken.
- Quarterly Compliance Certificate ("QCC") – a measure developed and implemented for use by the Transfield rail contract and project teams to ensure compliance, and support high quality and consistent internal reporting. The QCC record will provide a quarterly audit position, which is verified and signed off by the appropriate responsible personnel.
- Updated pre-start logbooks and instruction sheet.

Current status of the safety issue

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by Transfield Services Australia in the improved measures for identification and rectification of non-compliant work practises has addressed this issue.

Training

Number:	RO-2012-006-SI-03
Issue owner:	Transfield Services Australia
Type of operation:	Rail – Rail maintenance
Who it affects:	Track maintenance staff

Safety issue description:

Transfield's training regime did not ensure that the track workers involved in this occurrence were trained in new or updated work practices relating to road-rail vehicle operations. Similarly, relevant amended procedures, safety bulletins and alerts had not been effectively promulgated to these employees.

Proactive action taken by: Transfield Services Australia

Action: RO-2012-006-NSA-013

Transfield continually reviews and updates its training regime including but not limited to taking the following proactive measures.

- Updated training induction and on-the-job training.
- The annual Rail Safety Roadshow.
- Rail Safety Stand Down education and training events.
- The Leading for Safety Supervisor Training Program and the Leadership Commitment Program.

Current status of the safety issue

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by Transfield Services Australia to review and update its training regime has addressed this issue.

Drug & alcohol management

Number:	RO-2012-006-SI-06
Issue owner:	Transfield Services Australia
Type of operation:	Rail – Rail maintenance
Who it affects:	Track maintenance staff

Safety issue description:

Transfield did not have adequate systems in place to ensure workers were not adversely affected by drugs or alcohol while conducting safety related work in a remote work environment.

Proactive action taken by: Transfield Services Australia

Action: RO-2012-006-NSA-015

Transfield employees are no longer required to live in rest house conditions in remote locations following the cessation of the Services Agreement between Transfield and the ARTC. Notwithstanding this, Transfield has established numerous initiatives, and implemented a range of measures, to eliminate or reduce, to as low as is reasonably practicable, the risk to the health and safety of relevant Transfield personnel. These initiatives and measures promote and support a

safe system of work through effective leadership and supervision. Some of the proactive safety measures taken by Transfield include but are not limited to the following.

- Increasing the number of accredited Drug & Alcohol testers within the organisation.

- Ongoing revision of the Drug and Alcohol Procedure and Policy. Senior safety management are in the process of reviewing the Drug and Alcohol Procedure. Proposed changes have not yet been finalised but will likely include the following:

    - Introducing a separate Fitness for Work Policy which will further address relevant matters regarding drugs & alcohol.

    - The introduction of drug saliva testing.

    - Engaging external providers to conduct drug and alcohol testing in remote locations (in addition to the in-house testing regime).

- Immediately following the occurrence on 24 May 2012, information sessions were held with all Transfield employees on safety issues identified because of the occurrence. This included taking employees through the Drug & Alcohol Policy and Procedure. All supervisors and managers were required to sign a letter of assurance confirming that all relevant topics were covered.

- Ongoing education and enforcement of Transfield's Mandatory Safety Rules which prohibits employees from consuming or being under the influence of alcohol or illicit drugs while at work.

- Introducing Tailored Leadership Training for leaders across the rail business. This program is designed to specifically educate leaders within the organisation on the foundations of safety, communication, leadership and work planning skills.

Current status of the safety issue

Issue status: Closed

Justification: The ATSB is satisfied that the action taken by Transfield Services Australia to effectively manage and reduce the presence of drugs and alcohol within the workplace has addressed this issue.

Road-rail vehicle national standards

Number:	RO-2012-006-SI-05
Issue owner:	Transfield Services Australia, the Office of National Rail Safety Regulator and the Rail Industry Safety Standards Board
Type of operation:	Rail – Rail maintenance
Who it affects:	Rail – Owners and operators of road-rail vehicles

Safety issue description:

The absence of a national standard that addresses the design, fitment and maintenance of rail guidance equipment and the safety performance for road-rail vehicles while on-rail, increases the risks associated with operating road-rail vehicles.

Proactive action taken by: Rail Industry Safety Standards Board

Action: RO-2012-006-NSA-017

The Rail Industry Safety Standards Board (RISSB) is facilitating the development of an Australian Standard, AS 7502, *Road Rail Vehicles*. The standard covers the basic requirements for road rail vehicles across their life cycle, including design, construction, testing/certification, operation, maintenance, modification and disposal.

The RISSB advised that they are actively encouraging its membership, and the wider rail industry, to participate in the standards development process. Development of AS 7502, Road Rail Vehicles is currently scheduled for completion by June 2015.

Proactive action taken by: Transfield Services Australia

Action: RO-2012-006-NSA-014

Transfield noted that this safety issue concerns the industry at large and confirmed that it is participating in the standards development process facilitated by the Rail Industry Safety Standards Board in relation to road-rail vehicles.

Proactive action taken by: The Office of National Rail Safety Regulator (ONRSR)

Action: RO-2012-006-NSA-016

The Office of National Rail Safety Regulator (ONRSR) 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. In addition, the ONRSR actively supports the development of a national standard, work to develop road-rail vehicle competency standards and is also investigating how to better capture rail safety data for the management of risks associated with road-rail vehicle operations.

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

ATSB comment in response:

The ATSB notes that the rail industry continues to participate in the development of a national standard that addresses the design, fitment and maintenance of rail guidance equipment and the safety performance for road-rail vehicles while on-rail. The successful development of a standard, when completed, should adequately address this safety issue.

ATSB safety recommendation to: Rail Industry Safety Standards Board

Action number: RO -2012-006-SR-018

Action status: Monitor

The Australian Transport Safety Bureau recommends that the Rail Industry Safety Standards Board continue to progress the timely development of a standard that adequately addresses this safety issue.

General details

Occurrence details

Date and time:	24 May 2012 at 1711 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision	
Location:	Haig, Western Australia	
	Latitude: 31° 0.14' S	Longitude: 126° 5.38' E

Vehicle details

Manufacturer and model:	Toyota Landcruiser	
Registration:	XMF969	
Operator:	Transfield	
Serial number:	TS45	
Type of operation:	Rail Maintenance	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1	Passengers – Nil
Damage:	Destroyed	

Vehicle details

Manufacturer and model:	Hino Ranger	
Registration:	WOD188	
Serial number:	TS63	
Operator:	Transfield	
Type of operation:	Rail Maintenance	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Vehicle details

Manufacturer and model:	Toyota Landcruiser	
Registration:	XNK561	
Operator:	Transfield	
Serial number:	TS24	
Type of operation:	Rail Maintenance	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1	Passengers – Nil
Damage:	Nil	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- Transfield Services Australia Pty Ltd
- The Australian Rail Track Corporation
- Railway Industry Safety and Standards Board
- Trac-West Machinery
- Manitoba Public Insurance
- Western Australia Police
- Western Australia Office of Rail Safety
- Department of Transport and Regional Services
- Western Australia Department of Infrastructure

References

- Traffic Accident Reconstruction Vol. 2, Fricke, Northwestern University Traffic Institute
- Reason, J (2008). The Human Contribution

Submissions

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

A draft of this report was provided to the safeworking officer, Transfield Services Australia, Australian Rail Track Corporation, Western Australia Office of Rail Safety and Trac-West Machinery

Submissions were received from Transfield Services Australia, Australian Rail Track Corporation, Western Australia Office of Rail Safety. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

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

Enquiries 1800 020 616
Notifications 1800 011 034
REPCON 1800 011 034
Web www.atsb.gov.au
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Investigation

ATSB Transport Safety Report
Rail Occurrence Investigation
Collision between two road-rail vehicles, Haig, Western Australia
24 May 2012

RO-2012-006
Final – 15 September 2014