Australian Government
Australian Transport Safety Bureau

Shifted load collision with bridge

Great Western, Victoria, 9 December 2014

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Addendum

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Safety summary

What happened

On Tuesday 9 December 2014, at about 0003 (EDT), the load on train 2MP9 struck a timber pylon of an over-rail bridge near Great Western, Victoria. The train was transporting a number of Maxitrans skeletal road trailers (in piggyback configuration). During the journey, one of the upper road trailers had shifted laterally by almost 2 m, striking the Paxton Street bridge as the train passed beneath. Authorities closed the bridge, assessed it for safety and cleared it for normal traffic some time later. After being alerted to the load shift and collision while stopped and waiting for a passing train, the rail operator made arrangements to remove the road trailer load. Train 2MP9 subsequently departed Great Western at 1205 and continued its journey to Perth.

Shifted load on rail wagon

Source: SCT Logistics

What the ATSB found

The ATSB found that, based on recorded data from wayside monitoring systems and the condition of the wagon's side bearers, it is likely that the wagon carrying the shifted load (PQMY4346V) was hunting. The hunting motion would be expected to increase the lateral forces on the load restraints. Compounding this, SCT's freight loading procedures did not specifically provide for the effective restraint and securement of commercial road transport vehicles for transportation on rail vehicles. Terminal staff responsible for securing and checking the load were not fully aware of the load securement requirements documented in the Rail Industry Safety and Standards Board (RISSB) *Code of Practice for the Loading of Rail Freight*.

What's been done as a result

SCT Logistics have issued a safety alert to all SCT managers and supervisors, reminding them of the freight loading Code of Practice requirements and instructing that only qualified and/or experienced staff are to perform the loading task.

SCT also addressed the mandatory replacement of wagon side bearers in accordance with the manufacturer's service bulletin.

Safety message

A shifted load during rail vehicle transit represents a significant risk to infrastructure, railway employees, passengers, and the general public. In light of this occurrence, all rail freight operators should consider the safety implications of inadequate load restraint within their own operations - taking action where opportunities exist for improvement and compliance with requirements.

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The occurrence

On Monday 8 December 2014, a load of Maxitrans skeletal road trailers arrived at the Laverton freight terminal, Melbourne. The trailers arrived via road in a piggyback (stacked) configuration. During the day the trailers were loaded onto a flat container wagon to form part of train 2MP9 travelling to Perth, WA. Train 2MP9 departed Melbourne at about 2050 (EDT).

At some point in the journey, one of the skeletal road trailers moved, leading to the load protruding almost 2 m beyond the edges of the rail wagon (out-of-gauge) (Figure 1). An out-of-gauge load is a load that does not conform to a predefined loading outline.

At about 0003 on 9 December 2014, the out-of-gauge road trailer on the 33rd wagon struck the Paxton Street over-rail bridge. The 33rd wagon was about 956 m behind the lead locomotive and the train crew were unaware of the collision. The train continued about 6.7 km further into Great Western, Victoria where it waited on the main line to cross train 6PM6 travelling from Perth. Great Western is about 288 km North West from Melbourne.

As train 6PM6 travelled through Great Western on the loop line, the driver noticed that 'something was hanging off' the train on the main line. The driver stopped the train and reported the condition to train 2MP9's crew.

Shortly thereafter, train 7768, following 2MP9, discovered the damage to the Paxton Street over-rail bridge. The crew reported the damage to the Australian Rail Track Corporation (ARTC) network control centre. The ARTC control centre subsequently coordinated a response to the incident. The response involved repositioning train 2MP9 on the main line and closing the over-rail bridge to both rail and road traffic. A crane removed the shifted trailer, after which the train continued its journey.

Figure 1: The shifted load

The top road trailer had shifted to the left-hand-side in direction of travel. The movement was enough to strike the bridge infrastructure. Source: SCT Logistics

An examination of the over-rail bridge established that a timber pylon had been struck and destroyed (Figure 2). Accordingly, the bridge was cleared for rail traffic but remained closed to road traffic pending a subsequent structural engineering examination.

There were no injuries resulting from the collision and the road trailers sustained only minor damage.

Figure 2: Paxton Street bridge damage

The shifted road trailer struck and destroyed the wooden pylon as indicated. Note however, the pylon was redundant due to an additional steel support structure installed at an earlier time. Source: SCT

Context

The location

The out-of-gauge load was detected while train 2MP9 was at Great Western, about 288 track kilometres from Melbourne on the interstate main line between Melbourne and Adelaide. It was evident that the load on train 2MP9 had shifted sideways at some stage prior to striking the Paxton Road Bridge; about 6.7 km before entering the loop.

A lateral force is usually required to initiate a sideways load shift. This could result from in-train forces while travelling, or from passage across a track geometry defect. Information provided by the drivers indicated that track leading up to the Paxton Road Bridge was fine, with no notable instances of rough-ride that could be associated with geometry defects. A section of track between Maroona and Ararat (about 30 km before Great Western) was noted as having track geometry issues, but a temporary speed restriction had been applied in this area, which would have served to reduce undesirable lateral forces.

There was no evidence available to determine at what point the load had shifted during the journey from Melbourne. Similarly, there was no evidence to suggest that a specific track geometry feature or defect may have initiated the load shift.

Trackside condition monitoring equipment

The ARTC have wayside hunting[1] detection equipment installed at Port Germein, South Australia. Motion measurements from passing trains are stored so that the operator can interrogate the data for developing trends. The data can only be accessed by the relevant rolling stock owner/operator and is used to predict maintenance issues with rolling stock.

The ATSB examined the recorded condition monitoring data relevant to wagon PQMY4346V. The data logged 166 journeys between 22 December 2012 and 24 November 2014. In that time, the wagon had registered five medium, three high, and two extreme indications. This would suggest a developing trend that may have required maintenance intervention.

Train information

Train 2MP9 was owned and operated by SCT Logistics, and crewed by Genesee and Wyoming Australia (GWA) under contract to SCT Logistics. The train consisted of three locomotives hauling 51 wagons, totalling a combined length of 1,378 m and a gross mass of 4,181 t.

There was no evidence to suggest the train had been operated inappropriately, and as such, train handling was not considered to have been a factor contributing to the load shift.

Wagon PQMY4346V condition and monitoring

Following the incident, wagon PQMY4346V was sent to the maintainer's facility in Perth for an inspection, where it was identified as having a number of faults that could have contributed to hunting, including failed side bearers[2]. Should hunting have developed while in transit, the hunting motion could very likely have increased the lateral forces on the load restraints.

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1 Uncontrolled and undesirable cyclic lateral and yaw displacements of the wheelsets of a vehicle, generally worsening with increased speed.

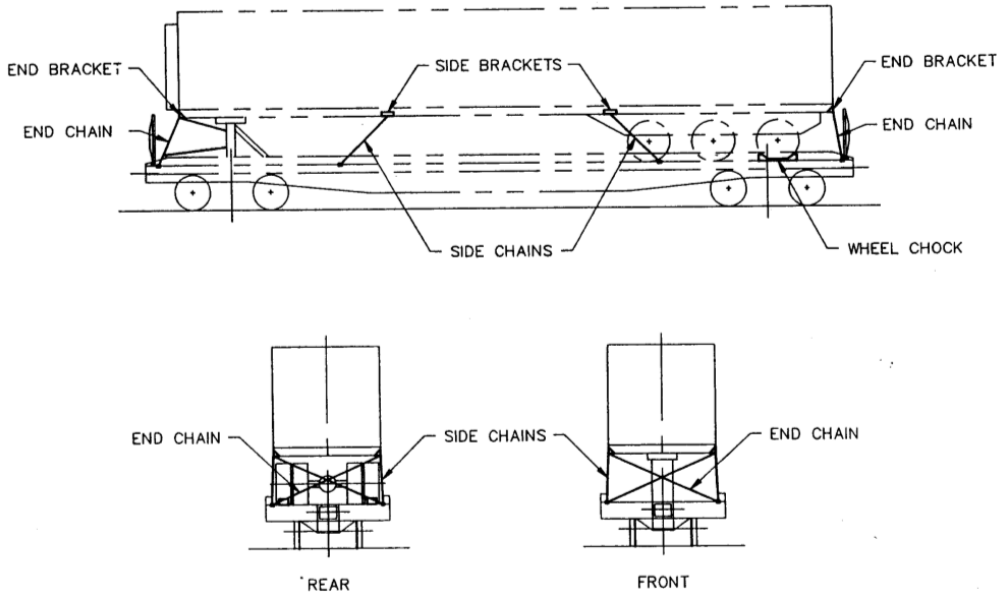
2 Brackets or assemblies on both sides of the longitudinal centre of a bogie that limit roll of the underframe on the bogie bolster.

Loading of freight on rail vehicles

The Australian Rail Industry Safety and Standards Board (RISSB) Code of Practice for the *Loading of Rail Freight* (CoP) specifies the requirements for loading, restraint, and securement of freight on rail vehicles, and is the standard adopted by SCT Logistics. Appendix F.1 of the CoP provides specific guidance for the lashing and securing of commercial road transport vehicles, and states:

> F.1.4 Lashing & Securement
>
> (a) Trailers should be secured using transport chain fitted with load-binders or turnbuckles—
>
> (i) Trailers should be chained diagonally at the front and rear to provide lateral and longitudinal restraint, using two chains at each end. Each chain is fixed to the trailer and to the flat car at the opposite side.
>
> (ii) Additional chains should be used along the sides of the trailer for further longitudinal restraint. These chains should be fixed to the trailer and the flat car in opposing directions so that they provide restraint in both directions.
>
> (b) For trailers up to 24 tonnes gross mass—
>
> (i) The lashings should be 10mm chain with a minimum tensile strength of 10 tonnes.
>
> (ii) They should be attached as follows—
>
> a. Two (2) each end in diagonal configuration to provide lateral and longitudinal restraint.
>
> b. Two (2) chains each side sloping away from each other to provide longitudinal restraint in both directions.

Figure 3: Lashing and securing typical arrangement



Source: RISSB *Code of Practice Loading of Rail Freight, Appendix F*

The RISSB CoP did not specifically provide for the double stacking of road vehicles. While SCT Logistics did not have any additional documented procedures addressing the securing and restraining of double stacking of road vehicles, it would be expected that the general principles of the CoP should still be applied.

Loading on Wagon PQMY4346V

The wagon upon which the load had shifted was located at the 33rd position in the train consist. Two other similar loads were located to either side of this wagon (Figure 4).

Figure 4: Trailer loading on train 2MP9

The shifted trailer (indicated) compared with similar loads on adjacent wagons. Source: SCT Logistics

The Maxitrans skeletal trailers arrived at the train loading depot already unitised in the piggyback configuration. These units were lifted and placed on top of the flat rail wagons. Wooden pallets were stacked under the fifth wheel position to support the lower trailer. The lower trailer was secured to the rail wagon (Figure 5 and Figure 6)

Figure 5: Securing of trailers on wagon PQMY4346V

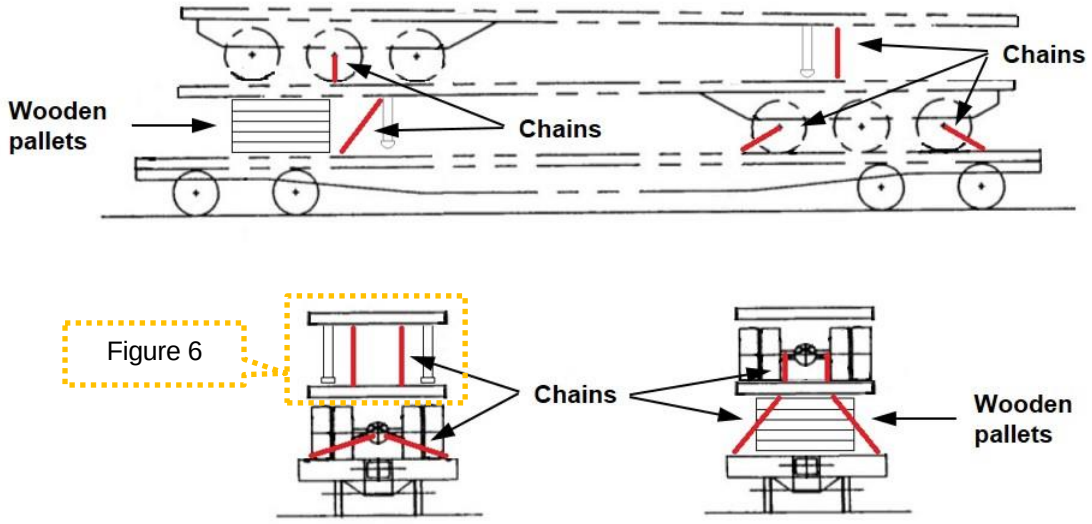


Figure 5 illustrates the load and securing configuration for the double stacked road vehicles on the rail wagon. The red lines represent securing of the trailers to the wagon at the time of the incident. Source: ATSB

Figure 6: Securing of trailers

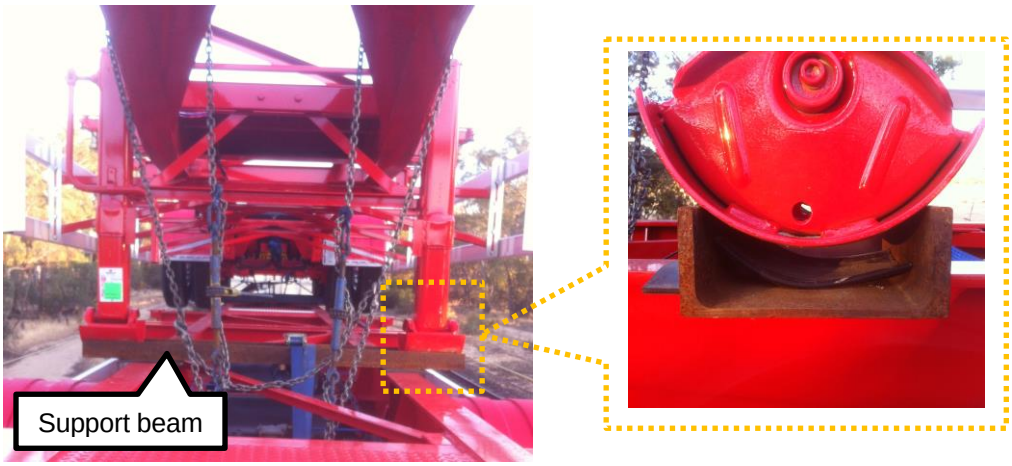


Figure 6 shows the securing chain unitising the two trailers together. Note the steel beam on which the trailer support stands sit. A similar beam was used as a wheel guide for the rear wheels. Source: SCT Logistics

The trailers were secured at the road wheels via their axles. Since the securing chains did not bridge the suspension elements, the vehicle suspension was unlikely to compromise the integrity of the securement system.

Safety analysis

Wagon maintenance and monitoring

Wagon PQMY4346V was fitted with constant contact side bearers[3] manufactured by the A. Stucki Company. SCT maintenance procedures do not require replacement during inspections, unless worn. However, a Stucki service bulletin, circa 2011, states research showing the Stucki side bearer blocks have a useful life of 600,000 miles (about 1 million kilometres) or six years of service. Each Stucki side bearer is stamped with a date of manufacture, although the date of manufacture could not be identified on the failed side bearer from PQMY4346V. Based on maintenance records, it was likely that the side bearers from this wagon had not been replaced in at least seven years.

Wayside monitoring equipment at Port Germein, South Australia, identified a series of motion indications from wagon PQMY4346V. In particular, during the period from 5 November 2014 until the incident, there were five indications recorded – two medium, one high, and two extreme. Of note however, the ownership of wagon PQMY4346V had been recorded against another transport operator on the ARTC system. While this may have contributed to SCT not identifying the motion indications from the wagon, it was noted that SCT, as the operator of the wagon, could still have accessed this data against the wagon identification.

Based on the condition of the side bearers (post-incident examination) and the recorded trackside condition data, it is likely that wagon PQMY4346V was hunting during the journey from Melbourne on 8 December 2014. A hunting wagon would almost certainly have increased the lateral forces on the load restraints.

Loading of rail freight

The RISSB Code of Practice for the *Loading of Rail Freight* requires items transported via rail to be appropriately secured. The securement system's function is to restrain the load (prevent relative movement between the load and the vehicle), retain the load on the vehicle during normal transit, and minimise the risk of separation from the vehicle in adverse conditions such as collisions or derailments.

Restraint systems should be selected and applied to prevent the load from moving relative to the vehicle, in the longitudinal (length-wise), lateral (sideways) and vertical planes. Surface grip (friction), the vehicle structure, specific attachments, or combinations of these can be employed as forms of restraint. While frictional forces between the load and the vehicle deck or floor can provide some resistance to horizontal movement, friction alone is generally insufficient to restrain a load under dynamic forces and needs to be supplemented by other means.

Retention devices generally retain the loading on the vehicle by preventing vertical movement and providing longitudinal and lateral restraint. The retention function may be incorporated into the restraint system.

Freight movement on 2MP9

In this occurrence, the methods used to secure the lower trailer to the wagon (Figure 5) had provided limited restraint against longitudinal, lateral, and vertical forces. Most significantly, the upper trailer had only been restrained on the vertical axis, relying on the downward clamping (frictional) forces provided by the two forward hold-down chains to restrain the load against lateral or longitudinal movement.

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[3] A constant contact type side bearing that utilises some form of a resilient element to maintain a compression force and proportional shear restraint between the bogie and wagon body, the purpose is to control bogie hunting.

Neither trailer had been secured sufficiently to prevent movement relative to the rail vehicle, as required by the RISSB CoP. This allowed the upper trailer stands and/or support beams to move laterally and subsequently collapse downward (Figure 7). When the upper trailer collapsed, the restraint chains became ineffective at restraining lateral movement, allowing the trailer to move further out-of-gauge.

Figure 7: Collapsed trailer

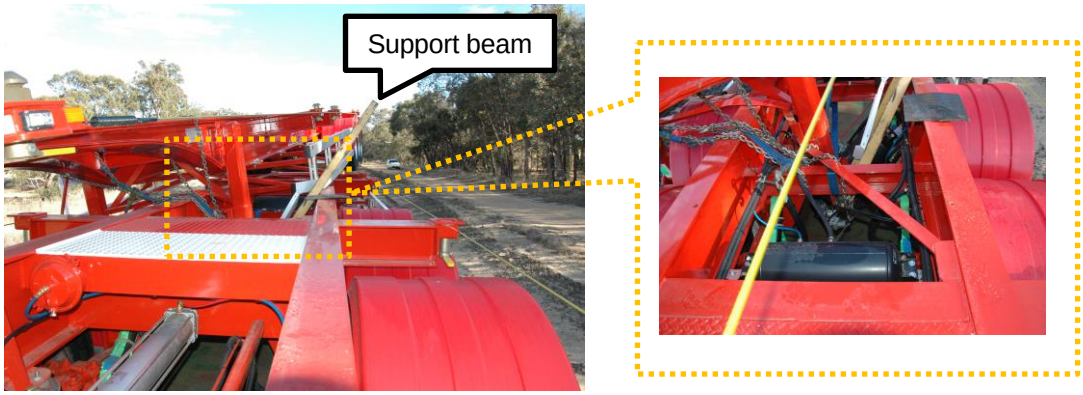

Figure 7 shows the collapsed upper trailer and support beam. Note the securing point of the two forward hold-down chains on a lateral beam of the lower trailer. In this configuration, the potential existed for the chains to move laterally along the beam, contributing further to the lack of lateral restraint. Source: SCT Logistics

Freight acceptance

There was no documented guidance specific to securing and restraining double stacked road vehicles for transportation on rail wagons. Given the stacked trailer securing arrangements evident on train 2MP9, it was likely that the loading handlers accepted the load of road trailers without adequate inspection of the securement system that had been employed. It was also evident from the inadequate load restraint configuration that the loading handlers were not aware of the general principles contained in the RISSB CoP regarding securing road vehicles onto rail wagons.

Findings

From the evidence available, the following findings are made with respect to the collision between loading on train 2MP9 and an over-rail road bridge near Great Western, Victoria, on 9 December 2014. 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

- Based on the condition of the side bearers and recorded data, it is likely that wagon PQMY4346V was hunting. The hunting motion increased the lateral forces on the load restraints.
- SCT Logistics' maintenance processes and systems did not detect the wagon's side bearer faults or ensure that life-limited components were replaced in a timely manner.
- SCT's freight loading procedures did not specifically provide for the restraint and securement of double-stacked commercial road transport vehicles for transportation on rail vehicles.
- The loading handlers did not apply the general principles of the RISSB Code of Practice for the *Loading of Rail Freight* when lashing and securing commercial road transport vehicles to rail vehicles.

Safety actions

Additional safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Additional safety action taken by SCT Logistics

On 15 December 2014, SCT Logistics issued a safety alert to State Managers, Operations Managers, and Rail Manager/Supervisors, instructing that:

- Road vehicles are (to be) secured as described in the Australian Code of Practice – Loading of Rail Freight (Appendix F – Road Vehicles).
- A copy of the Code of Practice MUST be available to all staff who are required to secure loading.
- Loading should only be undertaken by trained and / or experienced staff.

On 2 November 2015, SCT also reviewed their procedures to ensure the mandatory replacement of Stucki side bearers after one million kilometres or six years of service.

General details

Occurrence details

Date and time:	9 December 2014 – 0003 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Collision	
Location:	Great Western	
	Latitude: 37° 09.33’ S	Longitude: 142° 51.223’ E

Train details

Train operator:	SCT Logistics	
Registration:	2MP9	
Type of operation:	Freight	
Persons on board:	Crew – 2	Passengers – n/a
Injuries:	Crew – nil	Passengers – n/a
Damage:	Minor	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- Australian Rail Track Corporation information
- Rail Industry Safety and Standards Board Australia (RISSB) Code of Practice *Loading of Rail Freight*
- Recorded data such as locomotive data logs
- SCT Logistics information
- Staff statements.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (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 SCT Logistics (SCT), Genesee & Wyoming Australia Pty Ltd (GWA), the Office of the National Rail Safety Regulator (ONRSR) and the Australian Rail Track Corporation (ARTC).

Submissions were received from SCT, GWA, ONRSR and ARTC. 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 operations involving the travelling public.

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.