



Australian Government  
Australian Transport Safety Bureau

# Collision between a ballast regulator and tamper

near Greta, NSW | 14 July 2015



Investigation

**ATSB Transport Safety Report**  
Rail Occurrence Investigation  
RO-2015-012  
Final – 24 March 2016

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**Postal address:** PO Box 967, Civic Square ACT 2608  
**Office:** 62 Northbourne Avenue Canberra, Australian Capital Territory 2601  
**Telephone:** 1800 020 616, from overseas +61 2 6257 4150 (24 hours)  
Accident and incident notification: 1800 011 034 (24 hours)  
**Facsimile:** 02 6247 3117, from overseas +61 2 6247 3117  
**Email:** [atsbinfo@atsb.gov.au](mailto:atsbinfo@atsb.gov.au)  
**Internet:** [www.atsb.gov.au](http://www.atsb.gov.au)

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#### **Addendum**

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# Safety summary

## What happened

After carrying out track resurfacing and tamping works at Allandale, NSW, the Australian Rail Track Corporation Network Control Officer (NCO) granted permission for a Leighton Swietelsky Rail Joint Venture (LS Rail) tamper and ballast regulator to travel in convoy and stop before signal BN 87U near Greta. The tamper led the ballast regulator, with the Traffic Officer (TO) travelling in the rear vehicle. Near Greta, the lead track vehicle operator (operator) contacted the TO advising he was approaching a signal displaying a stop (red) indication, but that he was unable to identify the signal number. Both the TO and the operator thought that this signal was BN 87U.

Track machines post-collision



Source: Copyright The Australian Rail Track Corporation

The TO contacted the NCO for further instructions. During the discussion, both the operator (lead vehicle) and the TO (rear vehicle) independently established that the signal ahead was BN 83U. At about this time the tamper stopped near signal BN 83U, but the rear vehicle was still approaching from behind. The TO continued to talk to the NCO about clearing signal BN 83U, so they could continue on to signal BN 87U in preparation for stabling the vehicles at Greta.

While the TO was talking with the NCO, the TO sensed that the ballast regulator (rear vehicle) was not slowing. He looked ahead to see the gap was closing between the two vehicles. The TO noticed that the ballast regulator operator was looking at him and the TO hand gestured in a forward motion. The operator interpreted the hand gestures to mean 'keep going'. Instead, the TO was indicating that the operator 'look forward'. Soon after, the TO called out for the operator to 'STOP'. The operator turned and quickly realised that the tamper was closer than he had realised and made a full brake application. However, there was insufficient time to stop before colliding with the rear of the tamper.

The collision saw the ballast regulator ride above the tamper coupler and remain supported on the tamper deck. The ballast regulator also derailed the lead axle. The tamper operator sustained a minor injury and there was moderate damage to both vehicles.

## What the ATSB found

The ATSB found that the Traffic Officer's telephone conversations distracted the ballast regulator operator, drawing his attention away from the driving task and the location of the tamper ahead. Although the operator was aware of the slowing tamper ahead, he did not maintain a safe distance between the vehicles. When the operator became aware of the stationary vehicle ahead, there was insufficient time for the operator to react and bring the vehicle to a stop before colliding with the tamper.

## What's been done as a result

LS Rail has taken action to mitigate against the risk of further collisions between track maintenance vehicles, including requiring greater attention to worksite planning, briefing, communications, hazard identification and route knowledge.

## Safety message

When travelling in convoy, track vehicle operators should remain alert, focused on the driving task and maintain a safe braking distance from other vehicles.

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## The occurrence

On 14 July 2015, a tamper and ballast regulator had carried out track resurfacing and tamping works near Allandale (New South Wales).

The section of track between Allandale and Greta was on the Australian Rail Track Corporation (ARTC) Hunter Valley corridor and was part of the Middle Hunter Train Control area. (Figure 1).

At about 1712<sup>1</sup>, the Traffic Officer (TO<sup>2</sup>) contacted the worksite Possession Protection Officer who granted permission for both track machines to travel from Allandale on the Up Main track prior to stabling on the Up Relief track at Greta.

**Figure 1: Location map**



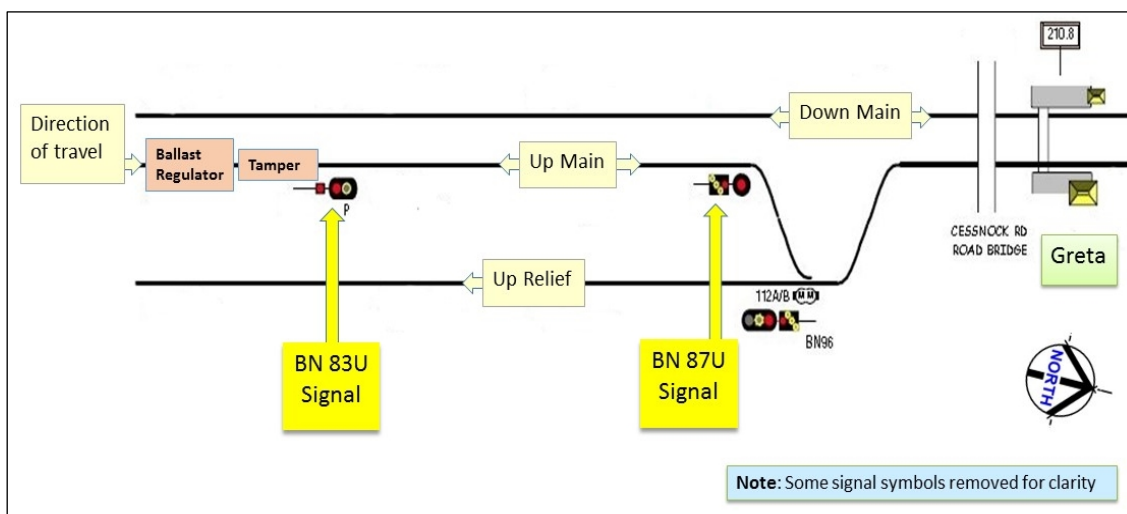
The tamper and ballast regulator had been working near Allandale before travelling in convoy to Greta.  
Source: ARA/Geoscience Australia; annotated by ATSB

The NCO authorised the movement to travel to and stop at signal BN 87U at Greta (Figure 2). The TO then contacted the tamper track vehicle operator (operator) by radio, advising that they were now authorised to travel up to signal BN 87U.

At about 1714 the vehicles departed the worksite near Allandale and travelled in convoy with the tamper leading and the ballast regulator following. In accordance with Rule ANWT 316, the TO was travelling in the rear vehicle, the ballast regulator.

<sup>1</sup> Time shown as Eastern Standard Time (EST).

<sup>2</sup> The Traffic Officer also performs the role of Protection Officer (PO).

**Figure 2: Diagram showing track layout near Greta, NSW.**

The tamper and ballast regulator were authorised to travel to signal BN 87U before stabling on the Up Relief track at Greta. However, signal BN 83U (about 1450m before BN 87U) was showing a stop indication, requiring both vehicles to stop. Source: Graham Vincent, Track and Signal, annotations by ATSB

As the vehicles travelled towards Greta, the operator of the lead vehicle observed a signal ahead that was displaying two red lights (a stop indication). The operator slowed the vehicle and prepared to stop, as he had not been authorised to pass any signals displaying a stop indication.

While approaching the signal, the lead vehicle operator was unable to see the signal identification sign due to the fading daylight conditions. While the operator assumed it was signal BN 87U, he contacted the TO by radio (at about 1717) and queried whether the signal immediately ahead of his position was BN 87U. The operator received a response from the TO, stating that he too thought the signal was BN 87U. The lead vehicle operator acknowledged the message and continued to approach the signal with the intention of stopping.

At about 1719, the TO contacted the NCO by telephone, to gain permission for both vehicles to pass the signal they had assumed to be BN 87U.

Meanwhile, the lead vehicle was now close enough for the operator to identify the signal, not as BN 87U but as BN 83U. Signal BN 83U was an intermediate signal located about 1450m before signal BN 87U at Greta. The operator radioed the TO, confirmed that the signal was BN 83U and asked for further instructions.

At that point in time, the TO was talking to the NCO by phone, so he could not respond to the radio communication. Consequently, the operator of the following vehicle replied to the radio communication with a 'copy that' response. Both operators then awaited instruction from the TO. The lead vehicle continued slowing to stop at signal BN 83U while the following vehicle continued to approach from behind.

As the ballast regulator approached the tamper, the TO continued talking to the NCO. The NCO confirmed that the signal at stop ahead was BN 83U and not BN 87U (track circuits confirmed the tamper and ballast regulator were approaching BN 83U). Having heard the radio communication from the lead vehicle operator, the TO agreed that they were approaching signal BN 83U.

While talking with the NCO, the TO sensed that their vehicle was not slowing and the gap to the vehicle ahead was closing. The TO then looked at the operator of their vehicle and noticed that he was looking back at him, rather than the track ahead.

Still talking on the phone, the TO reacted by using hand gestures to draw the operator's attention to the vehicle ahead and that it had stopped. Although the operator had started to slow the vehicle, he assumed that the TO had received instruction from the NCO and interpreted the hand gestures to mean 'keep going'.

It was about 1720 and the NCO was advising the TO that 112 points at Greta were set for the mainline to allow the vehicles to enter and stable on the Up Relief track.

At about the same time, the TO realised a collision was imminent and quickly called out 'STOP' to the operator. The operator immediately reacted by applying the service brake, however the brake application was too late and the ballast regulator collided with the rear of the tamper.

The NCO reported hearing the 'STOP' exclamation over the phone, followed by a 'rumbling' sound. About two seconds later, the phone connection terminated.

The collision occurred on a slight downhill grade, just before signal BN 83U (Figure 3). In the collision sequence, the front of the ballast regulator rode above the coupler on the tamper and came to rest partially on the rear deck of the tamper. The ballast regulator also derailed its lead axle.

**Figure 3: Signal BN 83U and the Plasser tamper**



Main image: Shows the location of the Plasser tamper following the collision, having previously stopped near signal BN 83U. Inset: Signal BN 83U and its corresponding signal identification sign. Source: Australian Rail Track Corporation and LS Rail.

Suspecting that something was not right or there had been an accident, the NCO attempted four times to call the TO to investigate. The NCO also tried to call the operator of the lead vehicle (tamper) without success. About five minutes after the disconnected phone call, the TO called the NCO to report the collision between the two vehicles. He advised that no persons were injured and that they would place protection measures on track to protect the accident site.

The ballast regulator was fitted with a data recorder that confirmed the collision speed was around 30 km/h. Both vehicles received moderate damage and obstructed the Up Main line.

The vehicles were cleared from the accident site the next day and damage to the track was minor.

The tamper operator later reported that he had a minor injury. The four employees (two operators, the TO and the NCO) were tested for the presence of drugs or alcohol. All returned negative results.

# Context

## Location

Greta is located at the 210.660 km mark<sup>3</sup> on the ARTC Hunter Valley Network in New South Wales. The point of collision was near the 208.135 km, about 2.5 km southeast of Greta and about 2.4 km from Allandale. The track alignment at this location is on a sweeping curve with a 1:103 falling gradient.

## Track maintenance vehicles

The ARTC had appointed LS Rail<sup>4</sup> as the principal contractor for the track maintenance works. The effective control and management of the vehicles were the responsibility of LS Rail.

The track maintenance vehicles were a:

- Tamper – Plasser model 08/275 3S (fleet number DR 73114)
  - The tamper weighed about 64 t, was 20.7 m long, and was restricted to a maximum speed of 80 km/h.
- Ballast regulator – Plasser model PBR 203 (fleet number BX-045)
  - The ballast regulator weighed about 22.5 t, was 11 m long, and was restricted to a maximum speed of 50 km/h.

Both vehicles were fitted with flashing lights. The ballast regulator's lights operate continuously and the tamper's operate in work mode and during brake applications. The flashing lights were operating on the vehicles at the time of the collision.

An inspection of the ballast regulator brakes at the collision site found all four brake shoes were poorly adjusted. Although adjustment was required to reduce the gaps between the brake shoes and wheel treads to conform to the maintenance specification, the brakes remained operable, with the larger than specified gaps expected to have produced only a small increase in stopping distance.

## Traffic Officer

The ARTC Network Rules (NSW), *Work on Track – Track Vehicles ANWT 316* required the safe-working qualified worker to travel in the rear vehicle of the convoy. Duties of the Traffic Officer (TO) included notifying the NCO when track vehicles had entered or cleared a track section or running line. The rules stated that when track vehicles were travelling in convoy they:

- must travel as closely as is safely practicable
- must maintain effective communication, and
- must close up if the leading vehicle stops.

In accordance with Rule *ANWT 316*, the TO was travelling in the ballast regulator (the rear vehicle). The TO regularly communicated with the NCO and the tamper operator (in the lead vehicle) about the safe working arrangements.

Before the vehicles departed the Allandale worksite, the TO briefed both operators that they would be travelling up to and stop before signal BN 87U near Greta. The TO did not mention the presence or location of BN 83U signal even though this signal was shown on the Worksite Protection Plan. This omission may have lead the crews of both vehicles to believe that there were no other network-controlled signals before signal BN 87U at Greta.

<sup>3</sup> All track distances in this report are referenced from the Sydney Central Railway Station.

<sup>4</sup> LS Rail is a joint venture between Leighton Contractors and Swietelsky Australia.



## Safe working arrangements

The works carried out by the tamper and ballast regulator near Allandale were part of broader track maintenance activities. The safe working method applied was a Local Possession Authority (LPA).

An LPA closes a defined portion of track for a specified period. A Possession Protection Officer (PPO) is then responsible for coordinating all the works and track machine movements. Trains, other than those authorised by the PPO, are excluded from the LPA section of track.

In this case, the TO had contacted the PPO and requested permission to travel to Greta. Permission was granted subject to the TO liaising with the NCO with regard to passing lineside signals. The TO subsequently communicated with the NCO to facilitate travel from the worksite to Greta. These actions were all consistent with the ARTC rules and procedures.

## Track vehicle operator distraction

Distraction can be described as a type of inattention, where a person's attention is diverted by a particular event or object. Operator distraction has been more specifically defined as 'the diversion of attention away from activities critical for safe driving, toward a competing activity (occurring) voluntarily or involuntarily'<sup>5</sup>.

The ARTC Network Procedure ANPR 748 advises track vehicle operators to remain vigilant<sup>6</sup>. That is, an operator should not engage in any activity that distracts from their attention to safety. In this case, the ballast regulator operator was aware that the vehicles would be stopping at signal BN 87U near Greta before stabling overnight. Having overheard a conversation between the TO and the tamper operator, he was aware that the tamper ahead was approaching a stop signal and that the signal was BN 83U.

At about the same time, the TO had commenced a conversation with the NCO, to facilitate the continued travel and stabling of the track machines at Greta. Expecting further instructions, the ballast regulator operator had diverted his attention to the conversation between the TO and the NCO. He also misinterpreted the TO's hand gesturing before his attention was brought back to the driving task and looking ahead.

When the operator became aware of the stationary vehicle ahead, he immediately applied the brakes. However, given the speed of the vehicle, there was insufficient time for the ballast regulator to stop before it collided with the tamper.

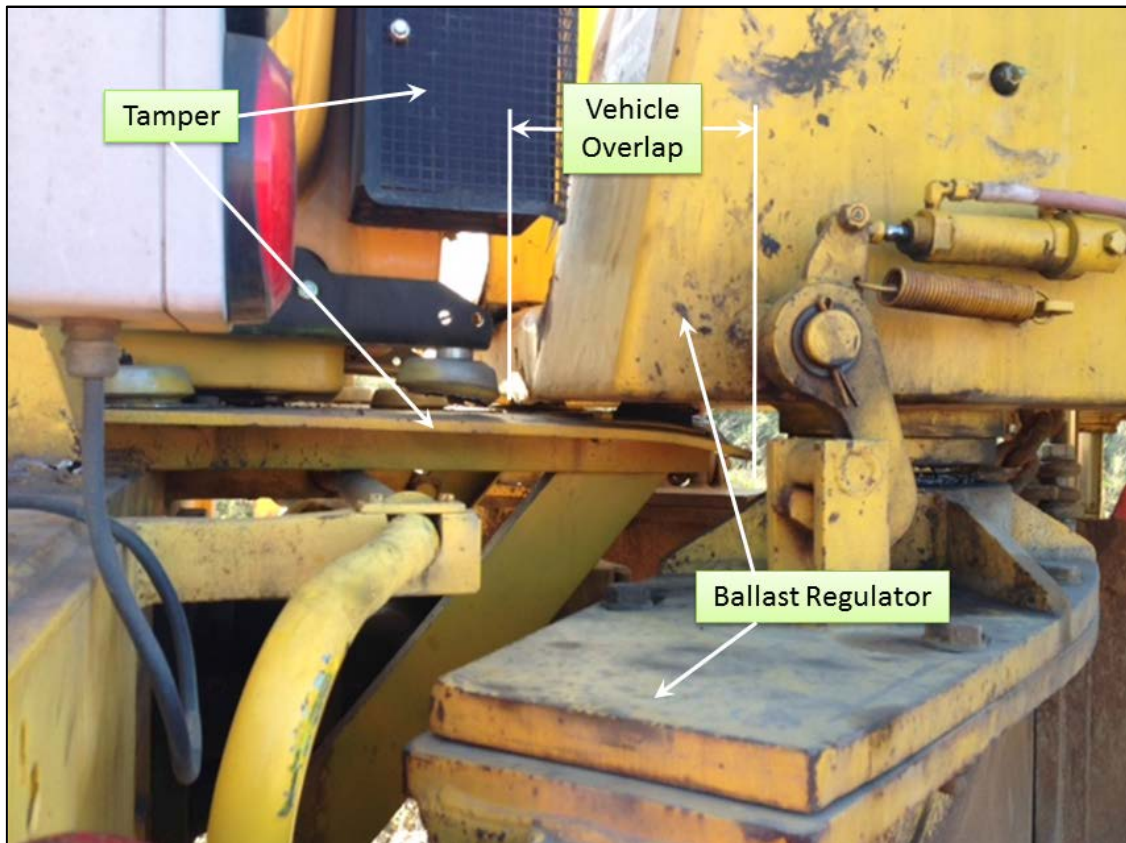
Analysis of data log information from the ballast regulator showed the travel speed was 30 km/h, about two minutes before the collision. The collision was recorded as a sudden deceleration from 30 km/h to 0 km/h in less than 2 seconds.

A graph of the data also showed vertical accelerations of up to 2 g at the time of the collision – consistent with the ballast regulator riding above and then falling onto the rear platform of the tamper (Figure 4).

<sup>5</sup> Regan, M.A., Hallett, C. & Gordon, C.P. (2011). Driver distraction and driver inattention: Definition, relationship and taxonomy. *Accident Analysis and Prevention*, 43, 1771-1781.

<sup>6</sup> ARTC ANPR 748, Transferring Track Vehicles, Network Procedures, Track vehicle operators, Section 4.

**Figure 4: Detail of ballast regulator resting on the rear deck of the tamper.**



The ballast regulator remained overlapping and resting on the tamper's rear deck where ancillary equipment was damaged during the collision. The ballast regulator suffered a broken front towing 'A' frame and a deformed front chassis cross beam. Image Source: The Australian Rail Track Corporation.

# Findings

From the evidence available, the following findings are made with respect to the collision between ballast regulator (BX-045) and tamper (DR 73114) about 2.5 km southeast of Greta, on the Middle Hunter Valley rail corridor in New South Wales.

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

- The Traffic Officer's telephone conversations distracted the ballast regulator operator, drawing his attention away from the driving task and the location of the tamper ahead.
- When the operator became aware of the stationary vehicle ahead, there was insufficient time for the ballast regulator operator to react and bring the vehicle to a stop before it collided with the tamper.
- The operator of the ballast regulator interpreted the Traffic Officer's forward pointing hand gesture as 'keep going' rather than a gesture intended to draw attention to the vehicle stopped ahead.
- The Traffic Officer's instruction and communication to the regulator operator by way of an ambiguous hand gesture was not explicit in its intended message.

## Other factors that increased risk

- The briefing given by the Traffic Officer before the movement of vehicles at the Allandale worksite did not mention controlled signal BN 83U, later leading the operators to believe that the signal showing a stop indication was signal BN 87U at Greta.

# Additional safety actions

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

## ***Proactive safety action taken by Leighton Swietelsky Rail Joint Venture (LS Rail)***

Action number: RO-2015-012-NSA-011

LS Rail have advised that actions undertaken to mitigate against the risk of further collisions between track maintenance vehicles include:

- Worksite Planning  
Amend the existing planning procedure for working on multiple sites where the Traffic Officer undertakes a detailed review of the planning documents before travelling to the next worksite.
- Communication of safe working arrangements  
Amend communication procedures for safe working arrangements to ensure track vehicle operators are fully aware of the travel route using track diagrams that identifies key features including controlled signals.
- Work hazard identification  
Undertake a review of Pre-start/Pre-work Briefs to ensure the identification of all relevant high-risk work/hazards.
- Workforce awareness briefing  
Provide awareness briefings to the LS Rail workforce to ensure the contributing factors of this occurrence is well understood and to reinforce the requirements for detailed pre-work briefings and the effects of distraction in the workplace.
- Route knowledge  
Establish a LS Rail route knowledge database and the assessment criteria for Traffic Officers.

## ***Response to Proactive safety action taken by LS Rail***

Action number: RO-2015-012-NSA-011

## ***ATSB comment in response***

The ATSB is satisfied that the actions advised by Leighton Swietelsky Rail Joint Venture will reduce the risk of further collisions between track maintenance vehicles.



# General details

## Occurrence details

Date and time:	14 July 2015 – 1721 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision – Running Line	
Location:	About 2.5 km south-east of Greta Railway Station	
	Latitude: 32° 42' 16.5" S	Longitude: 151° 24' 09.5" E

## Train details

Train operator:	Leighton Swietelsky Rail Joint Venture	
Registration:	DR 73114, BX-045	
Type of operation:	Rail Infrastructure	
Persons on board:	Crew – 2 Tamper (DR 73114), 2 Ballast Regulator (BX - 045)	Passengers – N/A
Injuries:	Crew – 1 minor	Passengers – N/A
Damage:	Moderate	

# Sources and submissions

## Sources of information

The sources of information during the investigation included the:

- Leighton Swietelsky Rail Joint Venture,
- The Australian Rail Track Corporation,
- The Office of the National Rail Safety Regulator.

## References

The Australian Rail Track Corporation, Rules (NSW), *ANGE 204, Network Communication, General Rules*.

The Australian Rail Track Corporation, Rules (NSW), *ANPR 748, Transferring Track Vehicles, Network Procedures, Track vehicle operators*.

The Australian Rail Track Corporation, Rules (NSW), Network, *ANWT 316 Work on Track – Track Vehicles*.

Regan, M.A., Hallett, C. & Gordon, C.P. (2011). *Driver distraction and driver inattention: Definition, relationship and taxonomy. Accident Analysis and Prevention*, 43, pp.1771-1781.

## 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:

- Leighton Swietelsky Rail Joint Venture,
- The Australian Rail Track Corporation,
- The Office of the National Rail Safety Regulator
- The operator of the ballast regulator,
- The operator of the tamper.

Submissions were received from:

- Leighton Swietelsky Rail Joint Venture,
- The Australian Rail Track Corporation,
- The Office of the National Rail Safety Regulator.

The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

# Australian Transport Safety Bureau

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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.

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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.

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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.

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## Investigation

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