

Interim Rail Investigation Report



Derailment of Cairns Tilt Train VCQ5 North of Berajondo, Queensland 15 November 2004

16 February 2005

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Overview

This is an interim report, into the derailment of Queensland Rail's diesel tilt train and is based on information that has been gathered during the initial stages of the joint independent accident investigation being undertaken under the chairmanship of the Australian Transport Safety Bureau (ATSB) in conjunction with Queensland Transport (QT). The investigation is being conducted under the Queensland *Transport Infrastructure Act 1994* (as amended), herein after referred to as The Act.

The ATSB was formed in July 1999 and is an operationally independent body within the Australian Government Department of Transport and Regional Services. The bureau is entirely separate from transport regulators and service providers.

Rail safety in Queensland is regulated by QT. All railway managers and/or railway operators within Queensland are required to be accredited in accordance with The Act. QT's role in rail safety also includes investigation of transport accidents and other safety occurrences.

Upon completion of the accident investigation a final report will be published that could possibly amend some of the information contained in this interim report.

Queensland Rail (QR) is the principal manager/operator of rail transport services in Queensland. As part of its regular passenger services QR operates two high speed diesel tilt trains on the North Coast Line between Brisbane and Cairns, the 'Spirit of Cairns' and the 'Spirit of Townsville' over a distance of 1,655km with a scheduled journey time of approximately 24hr 55min.

At 2355 Eastern Standard Time on 15 November 2004 the 'Spirit of Townsville', VCQ5, a 'down movement', derailed 419.493km from Brisbane (Roma Street), north of Berajondo on the Bundaberg to Gladstone line. The lead power car, No. 5403 and all remaining seven trailer cars derailed. The trailing power car No. 5404 was the only unit to remain substantially upright although the leading bogie set (in direction of travel) was partially derailed.

There were 157 passengers and crew on board the train. No one was fatally injured; however, there were some significant injuries.

Terms of Reference

In pursuance of the powers given to me under Section 216(2) of the *Transport Infrastructure Act 1994*, I hereby require you to (investigate/chair) an independent investigation and report on the circumstances and cause of the accident involving the derailment of QR's diesel tilt train which occurred on the main north coast line approximately 50km north of Bundaberg and report your findings in writing to the Executive Director, Land Transport & Safety Division, Queensland Transport by 16 February 2005 (should a full report be unable to be provided by this date an interim report must be submitted).

The investigation will:

- Clearly establish the factual circumstances of the accident.
- Identify the direct cause or causes of the accident and any other contributing factors.
- Assess human factors to identify any underlying matters which may have caused or contributed to the accident.
- Provide an estimate of direct and associated costs with the accident.
- If necessary make appropriate recommendations designed to prevent a recurrence.

The investigation report should be based on a systemic style investigation approach and should not be written in a manner that apportion blame.

The inquiry team will be comprised of members of the Australian Transport Safety Bureau (ATSB) and Queensland Transport. The investigation is to be chaired by the ATSB.

A/Executive Director (Land Transport & Safety)

Queensland Transport

1.0 Factual Information

1.1 The Occurrence

On Monday 15 November 2004, the ‘Spirit of Townsville’ departed Brisbane, Roma Street at 1825 as scheduled. The first part of the journey, Brisbane to Bundaberg was operated by two drivers. A rostered crew changeover occurred at Bundaberg at approximately 2258. The second section, Bundaberg to Mackay was also operated by two drivers in accordance with QR standard operating procedures. The crew changeover occurred normally, with the previous drivers reporting the earlier part of the journey to be uneventful with no vehicle defects being identified.

The train departed Bundaberg at 2314, one minute late, with 157 passengers and crew on board. The section of track from Bundaberg through to Gladstone is undulating with curves and straight sections; there is opportunity for high speed operations of up to 160km/h over certain sections of the track. Just prior to the accident site, speeds of up to 150km/h are posted, but there is a need to reduce the train speed to 60km/h at 419.41km before a series of curves in advance of Cabbage Tree Creek.

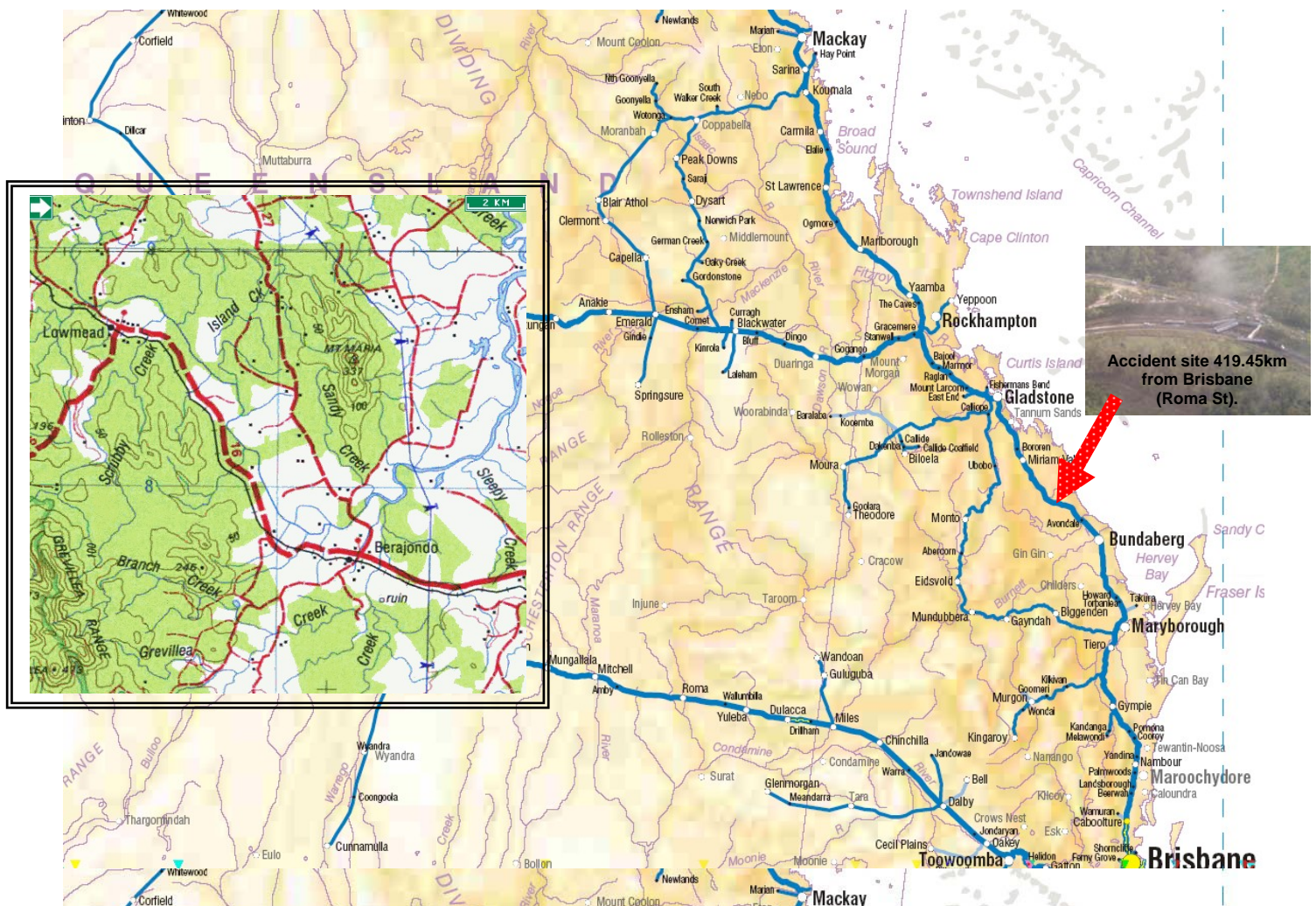


Figure 1. Location of Berajondo Accident Site, Queensland (Railways of Australia NATMAP)

The drivers' cab consists of two compartments, the forward driving compartment and the rear vestibule containing tea/coffee making facilities. A doorway connects the two compartments. The co-driver told the investigation team that shortly after departing Berajondo he exited the drivers' compartment and entered the rear vestibule to make coffee (this is normal practice for two driver crews). While doing so, at approximately 2355 the 'Spirit of Townsville', VCQ5 derailed on the first of the 60km/h curves commencing at 419.411km, travelling at a speed recorded on the train's data logger of 112km/h.

Evidence suggests that the force of the derailment propelled the driver against and partially through a cab window. He was pulled from the cab in a seriously injured condition by the co-driver. After allowing some time for him to partially recover he was interviewed in mid January, his statement is being analysed along with all evidence to further the investigation.

In understanding the mechanism of this derailment it is important to recognise that rollover will occur when the centre of gravity of the train acts just beyond the vertical on the outer running rail. Computer modelling undertaken to date, suggests that 100% wheel unloading for the lead power car through the first 60km/h curve would have occurred at 97km/h. The modelling, supported by speed/centre of gravity calculations and field observations indicate that the lead power car probably rolled and then dragged the remaining trailer cars off the track before all units came to rest. While the principal causal factor for the derailment is speed related, the reason for the over speed is the subject of ongoing investigation. Figure 2 below, is a graph of 'Wheel Unloading, (front left)' vs 'Speed' for the CTT on a 235m radius curve with 51mm cant as per the accident site. 100% wheel unloading represents theoretical commencement of rollover. Further work is being conducted to validate the computer modelling.

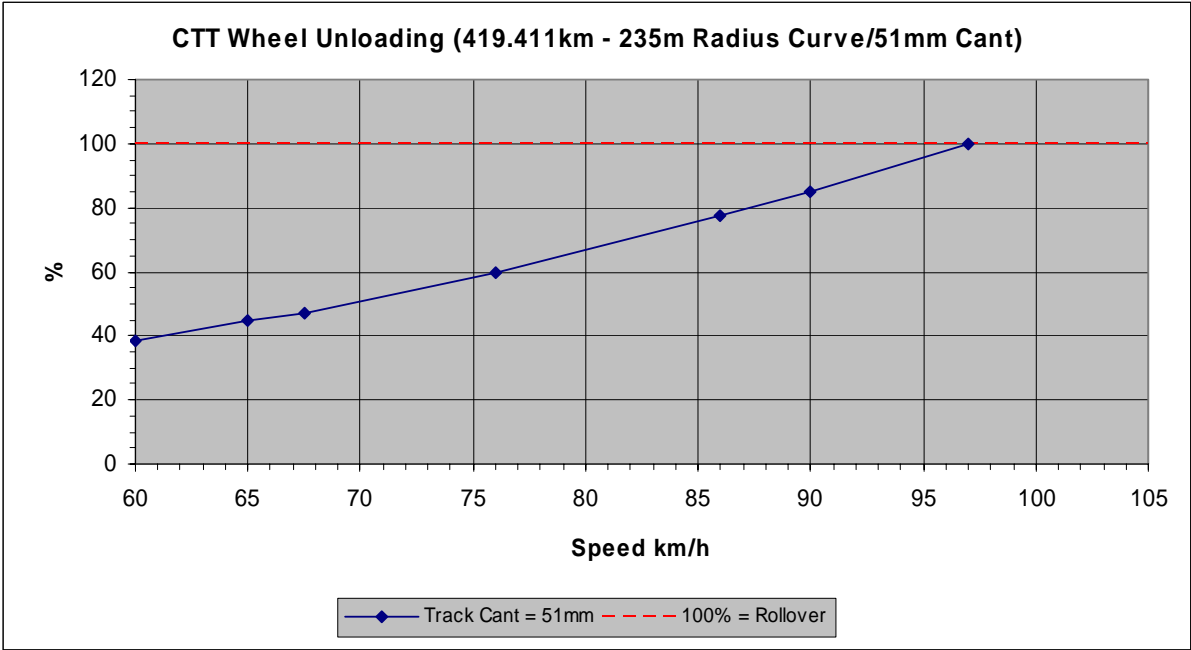


Figure 2. Wheel Unloading vs Speed

1.2 Fixed Infrastructure

1.2.1 Track

The section of track from Bundaberg through to Gladstone is single line 1067mm narrow gauge. The track nominally comprises 47kg/metre and 50kg/metre continuous welded rail (CWR) fastened to concrete sleepers using Pandrol clips. Sleeper spacing is 670mm. Prior to the accident site, speeds of up to 150km/h have been posted, however there is a need to reduce the train speed to 60km/h at 419.411km, in advance of Cabbage Tree Creek, due to a series of curve speed restrictions. The track at this location is laid and maintained in accordance with QR design standards.

To facilitate the crossing of trains, 'Passing Loops' are located strategically along the section of line from Bundaberg to Gladstone. There is one passing loop located at each end of Berajondo and Baffle respectively.

1.2.2 Signalling System

The signalling system on the North Coast Line between Bundaberg and Gladstone comprises three-aspect colour light route signalling. A Centralised Train Control (CTC) system provides monitoring and control of field hardware (signals, points, etc) and tracking of train movements operating over the network.

At the time of the accident, train protection comprised a philosophy of having a driver/co-driver team supported by a Vigilance Control System that periodically tests for driver alertness.

1.2.3 Communications

Train to base radio communications is available through QR's Mt Watalgan microwave radio repeater. This site incorporates Train Control Radio, Maintenance Radio and Trunked Radio facilities.

1.2.4 Overhead Wiring

The section of track from Brisbane to Rockhampton is electrified at 25,000V volt AC to support the operation of electric rollingstock but the diesel tilt trains do not require this to provide traction power.

1.3 Rollingstock

1.3.1 Cairns Tilt Train 'Spirit of Townsville' VCQ5

The Tilt Trains were built by EDI Rail, Maryborough, Queensland and commenced service in June 2003. Each train comprises two high performance diesel power cars operating in a push-pull configuration with seven air conditioned trailer cars. Baggage is carried in a luggage/staff car located immediately behind the lead power car. Behind the luggage car, are three passenger cars that can each accommodate up to 39 passengers. A club car is located immediately behind the third passenger car, with a further two passenger cars located behind the club car. The train can achieve a design speed of 160 km/hr, track permitting. The train is operated by a crew of two drivers and five passenger service assistants.

The Cairns Tilt Train is fitted with a data logger, the investigation team will further review and evaluate this information as part of the investigation process.

1.4 Environmental Conditions

The Bureau of Meteorology (BoM) weather data for the night of 15-16 November in the locality of Bundaberg was as follows:

Local Time	Wind Direction (degrees from true north)	Wind Speed (km/hr)	Maximum Wind Gust (km/hr)	Temperature (degrees Celsius)	Relative Humidity (%)	Cumulative Rainfall from 9am (mm)
2300	040	13	17	24.5	85	0
0001	050	11	17	24.6	86	0

Berajondo is approximately 63km north of Bundaberg.

1.5 Damage

1.5.1 Fixed Infrastructure

Approximately 120m metres of track sleepers and ballast was damaged, three overhead traction support poles and associated overhead wiring was destroyed and required replacement.

1.5.2 Rollingstock

Damage to the rollingstock was extensive but initial indications are that all cars are repairable.

1.6 Injuries

There were 157 passengers and crew on board the train. No one was fatally injured; however, there were some significant injuries. ATSB is conducting a survey of passengers aimed at gaining a greater understanding of passenger safety. To date 94 responses have been received.

1.7 Emergency Response

Emergency Services responded quickly and efficiently, given the locality and time of night, with passengers being treated on site and transported to local area hospitals for treatment.

2.0 Safety Action

2.1 Local Safety Action

The second of the two diesel tilt trains, the one not involved in the accident, was temporarily withdrawn from service on Friday 19 Nov 04 as a precautionary measure to examine bogies for potential stress cracking. The train was returned to service the following Monday, 22 Nov 04 as no issues were identified.

The speed of the tilt trains (2 electric and the 1 remaining diesel) have been limited to 100km/h with incremental speed increases to be subject to risk assessment and QT approval.

QR is currently investigating implementing Automatic Train Protection (ATP) with the view to including it on the tilt trains in the long term.

QR has provided train crews with a list of speed critical curves where there is a changeover from high speed to medium speed. Both drivers are to remain in the drivers cab while the train is traversing these curves and the curve speed is to be called between the drivers prior to entering the curve

3.0 On-going Investigation

3.1 Key areas of on-going investigation

The investigation continues to examine the contributing causal factors that led to the train over-speed. This will include, but not be limited to:

- any track or rolling stock factors that may have been present on the day
- working and rostering arrangements
- training
- communications
- the effectiveness of safety measures and procedures.

In addition, the investigation will analyse the response of passengers to the questionnaire and assess how the answers may assist in the further improvement of rail safety.