



Office of Transport Safety Investigations

BUS SAFETY INVESTIGATION REPORT

**FATAL BUS ACCIDENT - JUBO TRAVEL
JAMBEROO MOUNTAIN ROAD**

5 SEPTEMBER 2005



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OTSI File Ref: 04190

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**Office of Transport Safety Investigations
Level 17, 201 Elizabeth Street
Sydney NSW 2000**

The Office of Transport Safety Investigations (OTSI) is an independent NSW agency whose purpose is to improve transport safety through the investigation of accidents and incidents in the rail, bus and ferry industries.

Established on 1 January 2004 by the *Transport Administration Act 1988*, the Office is responsible for determining the causes and contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence.

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OTSI's investigative responsibilities do not extend to overseeing the implementation of recommendations it makes in its investigation reports. OTSI monitors the extent to which its recommendations have been accepted and acted upon through consultation with the relevant Transport Safety Regulator.

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The Office of Transport Safety Investigations also provides a Confidential Safety Information Reporting facility for rail, bus and ferry industry employees. The CSIRS reporting telephone number is 1800 180 828.

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Glossary of Terms and Abbreviations

| | |
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| ABS | Anti-Lock Braking System |
| ADRs | Australian Design Rules |
| Bus Operator | A bus company accredited by the NSW Ministry of Transport |
| CCTV | Closed Circuit Television |
| CIU | NSW Police Crash Investigation Unit |
| DOTARS | Australian Commonwealth Department of Transport and Regional Services |
| ICAM | Incident Cause Analysis Method |
| MoT | NSW Ministry of Transport |
| OTSI | The Office of Transport Safety Investigations |
| RTA | NSW Roads and Traffic Authority |

EXECUTIVE SUMMARY

The Accident

At approximately 2:10pm on 5 September 2005, the Driver of a 24 seat mini-bus, operated by Jubo Travel, lost control of his vehicle when its brakes overheated while descending a steep and winding section of the Jamberoo Mountain Road in the Illawarra Region of NSW. The bus, which was towing a trailer, hit a section of Armco guard railing and scraped along it for approximately 20 metres before toppling onto its left side and then travelled a further 20 metres before hitting a second section of Armco. It subsequently crushed the second portion of railing, slid over it and rolled onto its roof, finally coming to rest against a small tree. In the process, two passengers were fatally injured and 15 persons sustained injuries that subsequently required them to be hospitalised. One of these persons died two days later.

Findings

In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

- a. **Causation.** The accident occurred when the bus's brakes failed, preventing the Driver from safely negotiating a corner on a steeply descending road. The brakes overheated as a result of the Driver's inappropriate selection of gears and poor braking technique for the section of road he was travelling.
- b. **Contributory Factors**
 - i. Although the Driver had held a Chinese driving license for 19 years and had operated heavy vehicles before moving to Australia, he had only resided in Australia since April 2005 and had only obtained his NSW bus license on 29 July 2005, i.e., his bus driving experience in Australia was limited to five weeks.

- ii. The Driver was required by Jubo Travel to operate over a route which was sign-posted as being unsuitable for coaches, and with which he was largely unfamiliar.

c. ***Emergency Response***

- i. Response agencies handled a situation involving fatalities, multiple serious injuries and difficult terrain exceptionally well and were well supported by the Kiama Council and local community.

d. ***Other Safety Matters***

- i. The bus was being driven with a defective air brake pressure alarm system.
- ii. The bus was registered by the RTA but did not meet its pre-registration requirements.
- iii. Prior to registration, the RTA received certification from a consulting Engineer which stated that the bus conformed to the requisite Australian Design Rules. The Engineer subsequently became concerned that he may have misinterpreted some of the rules and sought clarification from the RTA in relation to a number of matters. In the light of that clarification, the Engineer determined that the bus did not comply with *Australian Design Rules 59 and 68*. These rules required that the bus be shown to have met rollover strength parameters, and it had not, and that all occupants be provided with a three point or 'lap-sash' seat belt, and they were not.
- iv. The consulting Engineer produced documentation indicating that he subsequently wrote to Jubo Travel on two occasions advising that the bus, and a like one owned by Jubo Travel also certified on the same day, did not fully comply with the pre-registration standards and should not be operated. The Engineer also advised that, in the absence of a response, he later telephoned

Jubo Travel's Sydney office and conveyed the same advice. Jubo Travel insists it has no knowledge of such communication.

- v. Several months later, the Engineer observed one of the two Jubo buses he had incorrectly certified in operation. This prompted him to write to two different managers in the RTA, on 4 March 2005 and 11 April 2005 respectively, expressing his concerns over the continued operation of these buses. The Engineer included copies of the letters he had forwarded to Jubo Travel in this correspondence, but the RTA did not act on his advice.
- vi. Jubo Travel is one of four companies operating under the name of Jubo. The extent of interdependency between these companies is such that it is probable that any limitations in the operation of Jubo Travel will also be apparent in the other companies.
- vii. There are allegations within the tour bus industry in NSW that the arrangements under which second-hand buses are imported into Australia and subsequently certified, licensed and operated for commercial purposes are being circumvented by some operators.

Recommendations

To prevent recurrence of this type of bus accident, it is recommended that the specified responsible entity undertake the remedial safety action described below:

- a. **Kiama Council**
 - i. Undertake a safety audit of the Jamberoo Mountain Road to determine whether the road should be prohibited for use by passenger buses and other heavy vehicles; to ensure the adequacy of the signage in place and to examine the feasibility

of establishing one or more emergency 'run-offs' along the steeply descending and winding sections of the road.

b. **NSW Ministry of Transport (MoT)**

- i. As a matter of urgency, subject the four companies trading under the name of Jubo to a full compliance audit to determine their suitability to remain accredited operators.
- ii. Review whether the driver has the necessary competency to hold a bus driver's Public Passenger Vehicle Driver's Authority.

c. **NSW Roads and Traffic Authority (RTA)**

- i. Review its handling of the advice provided by the consulting Engineer.
- ii. Review its registration inspection procedures and the application of those procedures.
- iii. Assist Kiama Council, if requested, to conduct a safety audit of Jamberoo Mountain Road.

d. **Jubo Travel**

- i. Modify this model of bus and resubmit it/them to the RTA for inspection, or formally advise the RTA that it is no longer operating buses of this model.
- ii. Thoroughly review its approach to the identification and management of safety risk, with particular emphasis on its approach to route selection; route and vehicle familiarisation for drivers; competency testing and the identification and rectification of defects.

PART 1 INTRODUCTION

Notification and Response

- 1.1 At 3:00pm on 5 September 2005, the Office of Transport Safety Investigations' (OTSI) Duty Officer was notified by telephone from the RTA's Traffic Management Centre (TMC) of a bus accident on Jamberoo Mountain Road in the Illawarra Region of NSW. The accident had occurred at approximately 2:10pm but there was little information available about the consequences of the accident at the time of the report to OTSI.
- 1.2 Based on the information provided by the TMC and media reports, the Chief Investigator directed the initiation of a preliminary investigation.
- 1.3 As a result of the primary evidence collected by OTSI's Investigating Officers at the incident site, the Chief Investigator initiated a Bus Safety Investigation in accordance with s46BA of the *Passenger Transport Act 1990*.
- 1.4 On 12 September 2005, the Chief Investigator notified all Directly Involved Parties (DIPs) that OTSI was investigating the accident and requested that an officer be nominated in each organisation to act as the point of contact for all inquiries made by the appointed OTSI Investigator in Charge. The Terms of Reference for the Investigation were provided to the DIPs with this notification.

Terms of Reference

- 1.5 The Chief Investigator established the following Terms of Reference to determine why the accident had occurred and what to do to prevent recurrence:
 - a. Identify the factors, both primary and contributory, which caused the accident.

- b. Make safety recommendations, the implementation of which by the responsible parties would minimise the potential for a recurrence of this type of accident.
- c. Assess the adequacy of the emergency response and management and the level of safety and protection offered to all involved.
- d. Advise on any matters arising from the investigation that would enhance the safety of bus and coach operations.

Interim Factual Statement

1.6 An Interim Factual Statement notifying OTSI's investigation and describing the incident in terms of what had happened was published on the OTSI website on 29 September 2005.

Methodology

1.7 OTSI utilises the ICAM (Incident Cause Analysis Method) approach in the conduct of its investigations and applies the Reason Model of Active Failures and Latent Conditions to its analysis of causative and contributory factors.

1.8 The underlying feature of the methodology is the Just Culture principle with its focus on safety outcomes rather than the attribution of blame or liability.

Consultation

1.9 On 3 August 2006, a copy of the investigation Draft Report was forwarded to NSW MoT, NSW RTA, Jubo Travel and the Independent Transport Safety and Reliability Regulator (ITSRR). The purpose was to provide all DIPs with the opportunity to contribute to the compilation of this Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and providing any commentary that would enhance the structure, substance, integrity and

resilience of the Investigation Report. DIPs were requested to submit their comments by 18 August 2006. Submissions were received from NSW MoT, NSW RTA and ITSRR.

- 1.10 The Chief Investigator considered all representations made by DIPs and where appropriate, reflected their advice in this Final Report. On 24 August 2006, the Chief Investigator informed DIPs which matters from their submissions had been incorporated in this Final Report and where any proposal was excluded, the reasons for doing so.

Investigation Report

- 1.11 This report describes the circumstances of the accident on Jamberoo Mountain Road on 5 September 2005 and explains why it occurred. The recommendations that are made are designed to contribute to the maintenance of safe bus operations and to minimise the potential for a recurrence of this type of accident.

PART 2 FACTUAL INFORMATION

Before the Accident

2.1 At approximately 8:00am on 5 September 2005, a group of 21 Taiwanese tourists and a tour guide departed Canberra, where they had stayed over-night, enroute to the Nan Tien Buddhist Temple near Wollongong. The group was travelling in a 24 seat bus, towing a trailer, operated by Jubo Travel. The bus was crewed by a Driver and Co-driver. Having passed through Goulburn and Moss Vale, the bus turned off the Hume Highway onto the Illawarra Highway, as shown in *Figure 1*. Approximately 3kms from Robertson, the bus turned in an Easterly direction and travelled along Pearson Lane before stopping at the 'Farmgate Lavender Farm' for lunch, at approximately 11:30am. At approximately 1:30pm, the bus resumed its journey and passed through Robertson before turning onto Jamberoo Mountain Road.

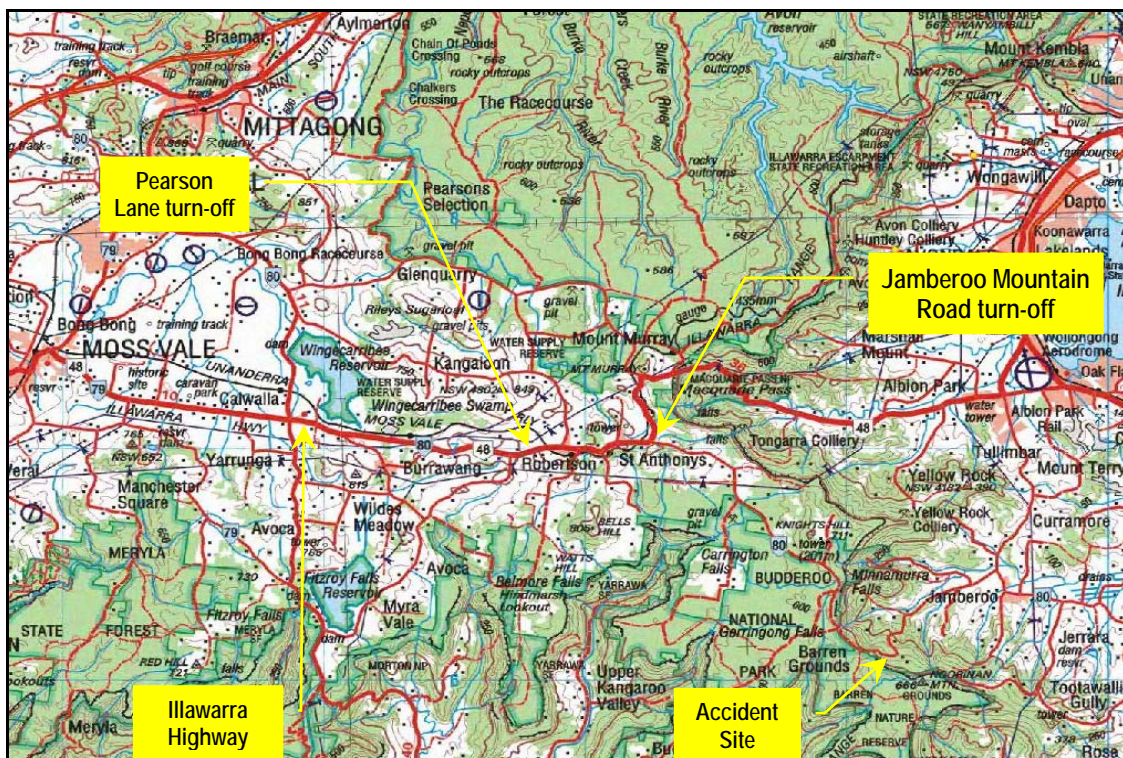
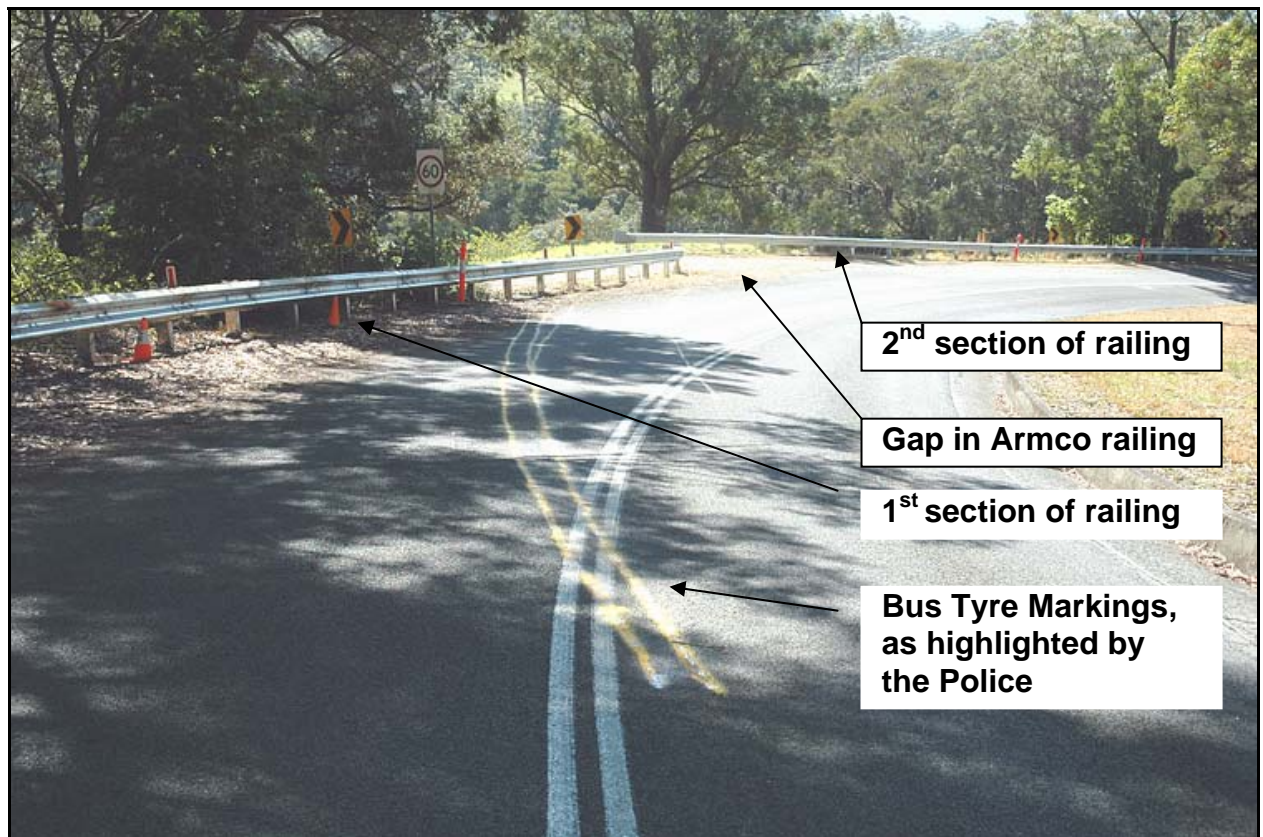


Figure 1: Map section depicting the route taken by the bus on the day of the accident

The Accident

2.2 The Driver lost control of the bus as he approached a sharp right-hand bend at the end of a 7km section of steeply descending and winding road. The bus collided with a section of Armco guard railing and remained in contact with the railing for approximately 20m before rolling onto its left side and impacting with a second section of railing. It subsequently crushed the second portion of railing, slid over it and rolled onto its roof, coming to rest against a small tree. The immediate area of the accident is depicted in *Photograph 1*.



Photograph 1: Immediate area of the accident

2.3 Local residents heard the accident and phoned 000 to alert the local country fire brigade and emergency services. The first emergency response vehicle, an ambulance, arrived at the scene 15 minutes later. Over a short period of time, representatives from the Ambulance, Police, Fire and State Emergency Services also arrived, along with a

fleet of five rescue helicopters and 14 ambulances. Two passengers were found to be deceased at the scene and 15 persons were evacuated to hospitals, with seven of these being airlifted to Sydney. One of the 15 died as a result of her injuries two days later. Rescue and recovery operations continued throughout the night with the bus eventually being lifted by crane onto a low-loader before being transported to an RTA holding compound at Unanderra.

The Operator

2.4 Jubo Travel is one of four Sydney-based travel companies trading under the name Jubo. The four companies, Jubo Buses, Jubo Coaches, Jubo Tours and Jubo Travel are individually accredited with the NSW Ministry of Transport, with Jubo Travel being accredited in August 2001 and being due for reaccreditation in April 2006. The four companies, which share vehicles, staff and premises, are collectively permitted to operate up to 35 buses on long distance charter tours. The companies are currently operating 22 buses and employ four administrative staff and 25 drivers, some of whom are employed part-time.

The Driver and Co-driver

2.5 The Driver of the bus was a 44 year old Chinese national who has resided in Australia since April 2005. He had been issued with his NSW MR Class¹ driver's licence, with a condition B², by the RTA, on 21 June 2005. He had previously held a Chinese driving license for 19 years and that license had entitled him to operate heavy vehicles. The driver had been employed by Jubo Coaches since 1 April 2005. He was transferred to Jubo Travel after securing his Public Vehicle Authority number from the MoT on 29 July 2005 and commenced his bus driving duties on 1 August 2005. The Driver had driven on

¹ Medium Rigid, small, non-articulated vehicles over 4 tonnes. Includes rigid vehicles with two axles and a gross vehicle mass of more than 8 tonnes. Any towed trailer must not weigh more than 9 tonnes GVM. Also includes vehicles in class 'LR'.

² Condition 'B' restricts a driver to the operation of vehicles having an automatic or a synchromesh gearbox.

Jamberoo Mountain Road on only one previous occasion, and that was in a motor car.

- 2.6 The Co-driver, who is the brother of the Driver, arrived in Australia in June 2000 and was employed by Jubo Coaches as a depot manager and accompanied drivers periodically to observe their performance. He had held a NSW MR Class driver's licence since 21 August 2000.
- 2.7 The driver of the bus was charged by NSW Police with a number of driving offences. These matters are the subject of continuing court action and are outside the scope of OTSI's Just Culture jurisdiction.

Bus and Trailer Information

- 2.8 The bus was a 1988 model Hino Rainbow and had been imported into Australia in 2004. The bus was fitted with seating for 24 passengers, a six cylinder diesel engine and a six (forward) speed manual gear box. The four wheel drum brakes were hydraulic air-assisted and were supplemented by an exhaust brake. This brake, operated by a small lever on the driver's left-hand side of the steering column, is intended to slow rather than stop the bus and is typical of such systems on medium-sized vehicles. A floor-mounted ratchet type handbrake was also fitted to the bus, which acted on a driveshaft mounted drum.
- 2.9 The box trailer had a tare and gross weight of 280kg and 750kg respectively. The trailer did not require, and was not fitted with, brakes.

Road Conditions

- 2.10 Jamberoo Mountain Road is classified as a 'regional' road which means that the control and maintenance of the road is vested in a Council, in this case Kiama Council, rather than the RTA. The driver of the bus passed signs, approximately 100m before the intersection of the Illawarra Highway and Jamberoo Mountain Road, on both the Highway and the Road, warning that Jamberoo Mountain Road was not

suitable for caravans, trucks and coaches, as shown in *Photographs 2* and *3*. Although the signage on Jamberoo Mountain Road was partially obscured by foliage, the signage on the Highway was not.



Photograph 2: Signage on the Illawarra Highway, approximately 100m before its intersection with Jamberoo Mountain Road



Photograph 3: Signage on Jamberoo Mountain Road, approximately 100m after having turned onto the road from the Illawarra Highway.

Photograph 4 depicts road signage further along Jamberoo Mountain Road, approximately 8.5km from the accident site.



Photograph 4: The "7km Winding Road" sign, including the sign depicting the steep grade ahead.

Further down the grade, there are other signs indicating difficult driving conditions and speed restrictions, as depicted in *Photograph 5*.



Photograph 5: Jamberoo Mountain Road location approximately 800m before the accident site.

Environmental Conditions

- 2.11 The road was wet at the time of the accident, with 10mm of rain having fallen the previous day and a further 1mm falling earlier on the day of the accident. The sun was at an elevation of approximately 37° and was setting in the North-West at the time of the accident.

PART 3 ANALYSIS

Causation

Speed

- 3.1 OTSI was unable to interview either the Driver of the bus or any of the passengers at the scene of the accident. Subsequently, the Driver refused to be interviewed by OTSI and those passengers who were not hospitalised had left Australia within a matter of days after the collision. Access to those hospitalised was restricted because of the severity of their injuries. However, NSW Police subsequently provided OTSI with an overview of the statements made to the Police, both by passengers and by a number of drivers who had followed or passed the bus while it travelled down Jamberoo Mountain Road. OTSI was also provided with a download of the bus's tachograph and was present when key mechanical functions were tested.
- 3.2 The passengers had varying recollections of the accident. Some of them were sleeping and were only awoken when the bus hit the Armco railing. The common elements in the statements of the passengers were that the vehicle appeared to be travelling too fast; that there was the smell of overheated brakes and/or tyres and that the Driver appeared to be wrestling with the steering wheel and grinding the gears. A number of passengers reported that they heard the Driver shouting to the Co-driver that the brakes had failed and that they saw the Co-driver apply the hand brake. Following drivers reported smelling the bus's brakes and/or tyres and seeing indications from the bus rear brake lights that were consistent with rapid and frequent brake applications.
- 3.3 The data obtained from the tachograph allowed a Chart Analysis to be conducted by an independent expert and the Police Crash Investigation Unit. The analysis showed that:

- 930m prior to the accident, the vehicle reduced speed from 37km/h to 18 km/h over a distance of approximately 60m, which based on a relatively constant descent, indicates a brake application.
- 870m prior to the accident, the vehicle further decelerated for a distance of 70m, before increasing speed.
- 800m prior to the accident, the bus reached a speed of 34km/h.
- 720m prior to the point of first impact, the vehicle decelerated, consistent with a further application of the brakes.
- 630m prior to the point of impact, the bus's speed was 25km/h.
- 430m from the point of impact, the bus had reached a speed of 45km/h but then there was a slight deceleration. This is consistent with witness accounts of the hand brake being applied and the Driver shouting to the Co-driver advising him that the brakes had failed.
- 320m from the point of impact the bus was travelling at 43km/h and subsequently built up to 55km/h.
- At the point of impact, the tachograph 'spiked' at 95km/h which might be explained by the force of the impact and a loss of wheel contact with the road.

3.4 Approximately 800m before the point of impact, there was a road sign advising "Trucks Use Low Gear", as previously indicated in *Photograph 5*. There were a number of other signs between this point and that of the accident indicating speed restrictions of 20km/h. Several days after the accident, OTSI observed buses and trucks travelling on this section and it was apparent from their engine noise that they were being driven in a low gear and with the benefit of exhaust brakes. However, as revealed by the tachograph, the bus was operated at speeds well in excess of 20km/h without the benefit of the exhaust brake and was found to be in 4th gear when examined immediately after the accident.

Load

3.5 The bus had a tare weight of 6420kg and a maximum permitted gross weight of 8700 kg. The bus had 16 female and eight male occupants whose average weight was estimated to be 47kg and 60kg respectively.³ On this basis, the gross weight of the bus would have been in the order of 7700kg which, even allowing for stowed and hand luggage, was below the permitted maximum weight.

Mechanical Function

3.6 The Police Vehicle Examination Unit and OTSI examined the bus. Notwithstanding the damage from the accident, it was apparent that the bus had been in generally sound mechanical condition. Having established that the condition of the tyres had not contributed to the cause of the accident, considerable attention was paid to the braking system. OTSI noted that the handbrake had been applied but that the exhaust brake had not.

3.7 The primary braking system was dependent on a regulated flow of air to act on the hydraulic master cylinder, which distributes hydraulic pressure to each wheel cylinder. The air is stored under pressure in a reservoir which is supplied by an engine-driven compressor. A single gauge on the dash panel indicates the air available at the reservoir and the air pressure being applied to the system. The air gauge scale indicates a range of zero to 15, with each increment representing 100Kg/cm² of air pressure.

3.8 OTSI and Police investigators utilised a standard procedure to test the efficiency and integrity of the air supply the bus's brakes. It took approximately three minutes and twenty seconds to fully pressurise the reservoir to approximately 700kPa⁴. It subsequently took 37 depressions of the brake pedal to deplete the reservoir to the point at

³ Body weights based on data in "Bodyspace: Anthropometry, Ergonomics and the Design of the Work", 2nd Edition by Stephen Pheasant

⁴ 1kg/cm² = 1kPa

