



Office of Transport Safety Investigations

BUS SAFETY INVESTIGATION REPORT

COACH OVERTURNED

JINDABYNE

11 JUNE 2011



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Released under the provisions of
Section 45C (2) of the *Transport Administration Act 1988* and
Section 46BA (2) of the *Passenger Transport Act 1990*

Investigation Reference 04517

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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. OTSI investigations are independent of regulatory, operator or other external entities.

Established on 1 January 2004 by the *Transport Administration Act 1988*, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI 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. Importantly, however, OTSI does not confine itself to the consideration of just those matters that caused or contributed to a particular accident; it also seeks to identify any transport safety matters which, if left unaddressed, might contribute to other accidents.

OTSI's investigations are conducted under powers conferred by the *Rail Safety Act 2008* and the *Passenger Transport Act 1990*. OTSI investigators normally seek to obtain information cooperatively when conducting an accident investigation. However, where it is necessary to do so, OTSI investigators may exercise statutory powers to interview persons, enter premises and examine and retain physical and documentary evidence.

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Once OTSI has completed an investigation, its report is provided to the NSW Minister for Transport for tabling in Parliament. The Minister is required to table the report in both Houses of the NSW Parliament within seven days of receiving it. Following tabling, the report is published on OTSI's website at www.otsi.nsw.gov.au.

OTSI cannot compel any party to implement its recommendations and its investigative responsibilities do not extend to overseeing the implementation of recommendations it makes in its investigation reports. However, OTSI takes a close interest in the extent to which its recommendations have been accepted and acted upon. In addition, a mechanism exists through which OTSI is provided with formal advice by the Independent Transport Safety Regulator (ITSR) in relation to the status of actions taken by those parties to whom its recommendations are directed.

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ACRONYMS AND ABBREVIATIONS

ASAR	(BOAS) Annual Self Assessment Report
BOAS	Bus Operator Accreditation Scheme
DIP	Directly Involved Party
GVM	Gross Vehicle Mass
HC	Heavy Combination (licence)
HR	Heavy Rigid (licence)
HVIS	Heavy Vehicle Inspection Scheme
LHS	Left Hand Side
LR	Light Rigid (licence)
MR	Medium Rigid (licence)
OTSI	Office of Transport Safety Investigations
RHS	Right Hand Side (driver's side)
RTA	NSW Roads and Traffic Authority ¹
SMS	Safety Management System
TMC	Transport Management Centre
TNSW	Transport NSW ²
VMD	Vehicle Monitoring Device

¹ With effect 1 November 2011, the RTA, NSW Maritime and the elements of Transport NSW responsible for the issue of bus operator accreditations and driver authorities were amalgamated to form the Roads and Maritime Services NSW.

² With effect 1 November 2011, Transport NSW was restructured to form the core of Transport for NSW.

EXECUTIVE SUMMARY

Shortly after 6.00pm on Saturday 11 June 2011,³ a coach (NSW registered TV 3777) operated by Oz Snow Adventures Pty Ltd overturned into a four metre deep drainage ditch after failing to negotiate a right hand turn at the “T” intersection of Alpine Way and Kosciuszko Road approximately 3.5 kilometres West of Jindabyne in the Snowy Mountains Region of NSW. The driver claimed that “*the brakes had failed*” during the 1.8 kilometre descent to the intersection. The coach had been hired from Buses + 4WD Hire Pty Ltd for a two day ski tour and was returning from the ski fields at Thredbo to a motel resort at East Jindabyne.

Of the 52 persons on board TV 3777 at the time, 21 were transported to Cooma Base Hospital, four with serious injuries. The coach was extensively damaged.

The investigation determined that the coach overturned because the driver did not:

- maintain effective control of the vehicle at the commencement of, or during, the steep descent leading to the intersection; and
- control the vehicle in accordance with regulatory road signs, Road Rule 108 or Section 4 of the NSW Heavy Vehicle Driver Handbook.

The driver’s inability to effectively control the vehicle was attributed to his lack of experience driving this class of vehicle. This assessment was made on the bases that the driver:

- was unfamiliar with the coach, having driven it for only about one hour in covering 30 kilometres leading up to the accident; and
- had held his NSW Heavy Combination (HC) licence to drive this class of vehicle for only two days prior to the accident.

In addition, the risks to all those travelling in the coach were compounded by the facts that:

- the driver was not listed on the Hire Agreement and did not meet its age and experience terms; and

³ All times referred to in this report are in Australian Eastern Standard Time (UTC+10 hours).

- neither he nor the nominated driver possessed the necessary NSW Driver Authority or Snow Licence.

Contributing to the difficulties experienced by the driver in trying to control the descent of the coach effectively, was the fact that the rear brakes on TV 3777 were out of adjustment. This was established from post-accident testing and found to be consistent with a history of problems with their adjustment and performance.

The investigation also identified a number of safety issues associated with adherence to accreditation requirements, the wearing of seatbelts and vehicle inspection and maintenance arrangements.

Full details of the Findings and Recommendations of this bus safety investigation are contained in Parts 3 and 4 respectively.

PART 1 FACTUAL INFORMATION

Accident Synopsis

- 1.1 Shortly after 6.00pm on Saturday 11 June 2011, a coach (NSW registered TV 3777) operated by Oz Snow Adventures Pty Ltd impacted with a guard rail at the intersection of Alpine Way and Kosciuszko Road and rolled into a four metre deep drainage ditch beside the roadway. It came to rest on its roof after failing to negotiate a right hand turn at the “T” intersection approximately 3.5 kilometres West of Jindabyne. The driver claimed that, prior to his attempting to negotiate the “T” intersection, “*the brakes had failed*” on TV 3777 during its 1.8 kilometre descent to the intersection. The coach, which was on hire from a Sydney-based company, Buses + 4WD Hire Pty Ltd, was returning from the ski fields at Thredbo to a motel resort at East Jindabyne as part of a two day ski tour.
- 1.2 Emergency services were called and 21 of the 52 persons on the coach were transported to Cooma Base Hospital, four with serious injuries. The next day two other passengers contacted NSW Police from their accommodation at East Jindabyne and reported having sustained injuries in the accident.

Accident Location

- 1.3 The accident occurred at the “T” intersection of Alpine Way and Kosciuszko Road approximately 3.5 kilometres West of Jindabyne in the Snowy Mountains Region of NSW. Jindabyne, a small township with a population of 4400, is situated on the edge of Lake Jindabyne approximately 60 kilometres West of Cooma and 460 kilometres from Sydney (see *Figure 1*).
- 1.4 The intersection is the junction of the main roads leading to and from the ski fields at Thredbo and Perisher. It is located at the base of a 1.8 kilometre long descent from Thredbo (see *Photograph 1*) towards the lake and township on a gradient ranging between 5.1% and 10.2%.
- 1.5 A 100km/h speed limit applies on the Alpine Way which reduces to 80km/h 100 metres prior to the intersection. There are no heavy vehicle speed restrictions.

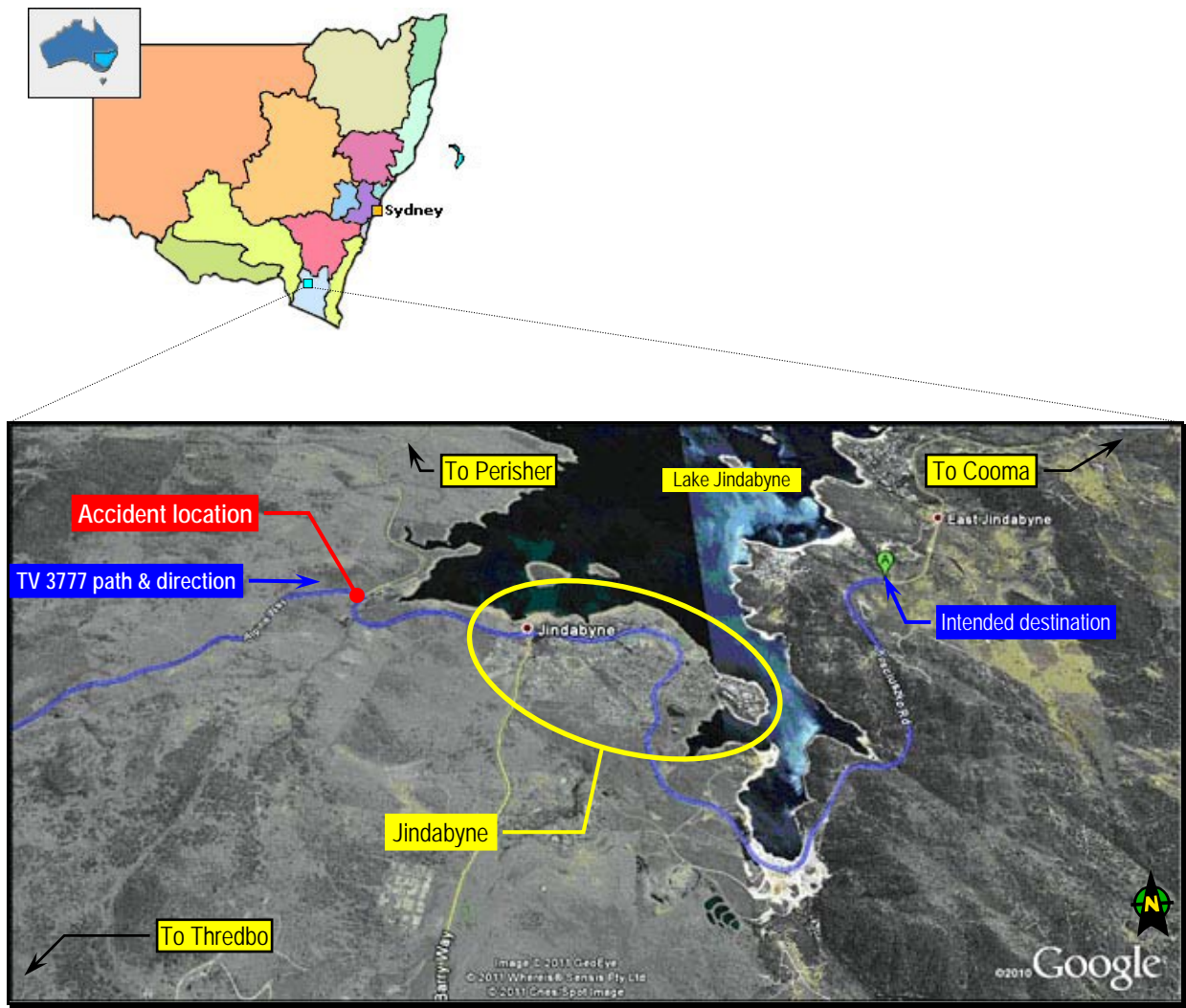


Figure 1: Accident location



Photograph 1: View of Alpine Way approach to intersection

The Trip

Overview

- 1.6 The accident occurred during a “Weekend 2 Day Snow Trip” operated by Oz Snow Adventures Pty Ltd. Oz Snow Adventures is an international company operating as all-in-one bus and tour operator, travel agent, hotel operator and resort complex manager based in Bondi, Sydney. As a bus operator, Oz Snow Adventures held accreditation under the Transport NSW (TNSW) *Bus Operator Accreditation Scheme* (BOAS).
- 1.7 The “Snow Trip” was marketed by Oz Snow Adventures as an adventure trip to the NSW snowfields in the Kosciuszko National Park for younger persons from local, interstate and overseas areas departing from Sydney on a Friday evening and returning late on Sunday night. The trip was all inclusive of accommodation, meals and travel to and from the ski fields.

The Coach

- 1.8 As Oz Snow Adventures did not own any large capacity coaches, it hired TV 3777 for the trip from Buses + 4WD Hire Pty Ltd, a vehicle hire company based nearby in the Sydney suburb of Alexandria. Buses + 4WD Hire also holds accreditation under the BOAS.
- 1.9 TV 3777 was a 54 seat diesel powered coach built by Coach Design, Brisbane, in October 1996. It was fitted with a M.A.N. engine and eight speed manual transmission. It was also fitted with seatbelts as required by Australian Design Rules (ADRs) and a vehicle monitoring device (VMD) in accordance with Part 5, Division 2 of the *Road Transport (Safety and Traffic Management) Act 1999*.

The Drivers

- 1.10 As an accredited operator, Oz Snow Adventures nominated to supply their own driver for the trip. This nominated driver (Driver 1) held an unrestricted Northern Territory Heavy Rigid (HR) licence. Although only his details were listed on the Hire Agreement, Oz Snow Adventures employed a second driver for the trip. This driver (Driver 2) held an unrestricted NSW Heavy Combination (HC) licence and had applied for a NSW Driver Authority.

Travel to Jindabyne on 10 June 2011

- 1.11 At approximately 3.00pm, Driver 1 arrived at the Buses + 4WD Hire premises to pick up TV 3777. Here, he conducted a walk round visual inspection of the coach for damage and defects, noting on the Hire Agreement only a number of minor marks and scrapes on various body panels. He then proceeded via a refuelling stop to the pickup point at Central Railway Station from which the trip to Jindabyne commenced at approximately 6.00pm with 48 paying passengers. On board also were the Director of Oz Snow Adventures (acting as tour guide), Driver 2 and a trainee tour guide.
- 1.12 On departure, the passengers were given a commentary on the trip by the tour guide from a tour guide schedule but the schedule made no mention of any safety requirements for the journey.
- 1.13 At approximately 8.30pm and some 130 kilometres later, they stopped at Sutton Forest (see *Figure 2*) for a meal break while Driver 1 took a compulsory rest break. They departed Sutton Forest at 9.00pm. At the Marulan RTA Heavy Vehicle Inspection Station, according to the driver, they were signalled to return directly to the highway rather than being inspected.⁴
- 1.14 The journey was completed shortly after 12.30am when they arrived at the Oz Snow Adventures resort at East Jindabyne where the passengers were disembarked. After cleaning the coach, Driver 1 signed off duty at 1.15am and commenced a rest period.
- 1.15 A small number of passengers were booked into other accommodation at Thredbo. These passengers were then transferred to a smaller coach parked at the resort and driven to Thredbo by Driver 2 who had travelled as a passenger from Sydney. He arrived back at the resort from Thredbo at approximately 2.30am where he then slept.

⁴ An inspection would have included examination of the driver's licence/s and log book.

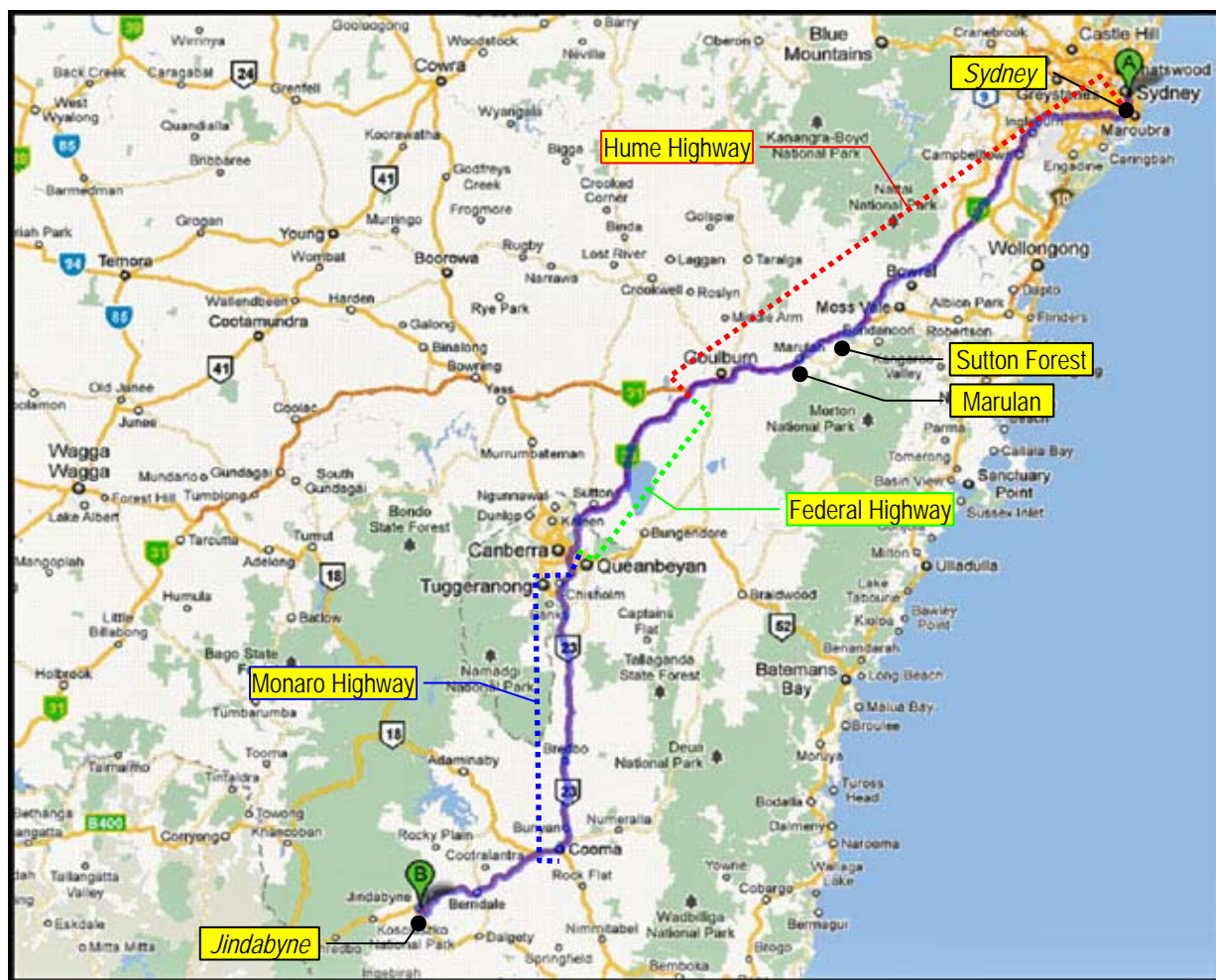


Figure 2: Route of TV 3777 from Sydney to Jindabyne

Trip to Thredbo on 11 June 2011

- 1.16 Between 7.30 and 8.00am Driver 1 conducted a visual safety inspection of TV 3777 then started the engine. Included in the inspection were the condition of the tyres, engine fluid levels and the operation of the external lights. No defects were identified during the inspection.
- 1.17 After loading the passengers and ski equipment, TV 3777 then departed the East Jindabyne resort shortly after 8.15am with a total of 52 persons on board. Significantly, no safety briefing, including the wearing of seatbelts, was given by either the tour guides or the drivers before, or as TV 3777 departed.
- 1.18 TV 3777 entered the National Park then arrived at Thredbo without incident some 35 kilometres later at approximately 9.00am. Here the passengers and ski equipment were unloaded before Driver 1 parked TV 3777.

At Thredbo

- 1.19 After parking TV 3777, Driver 1 handed over the keys to Driver 2 for the return journey to the East Jindabyne resort. He then commenced an extended rest period and went snowboarding. Although Driver 2 was not listed on the Hire Agreement, the driver change was planned by the Director of Oz Snow Adventures to enable Driver 2 to gain experience in driving large coaches. It was also planned that Driver 1 would mentor Driver 2 during the return journey.
- 1.20 Driver 2 stated that, after receiving the keys to TV 3777, he went to a rest area and commenced a three hour rest period. After this break, he went snowboarding until lunch time whereupon he returned and ate lunch in the company of a couple of passengers from the trip.
- 1.21 After lunch, he again went snowboarding before returning to TV 3777 at approximately 4.30pm. He stated that he conducted a walk round visual safety inspection of TV 3777 then started the engine. Again, no defects were identified during this inspection.

Departing Thredbo

- 1.22 At approximately 5.00pm, Driver 2 commenced loading the passengers and ski equipment for the return journey to the resort. TV 3777 then departed Thredbo at approximately 5.20pm driven by Driver 2. Significantly, again, no safety briefing was given to the passengers, including the wearing of seatbelts. Further, there were no exchanges between the drivers regarding the handling and braking characteristics of TV 3777 or the likely road conditions.
- 1.23 Driver 2 stated that, as they progressed along Alpine Way, it was dark and he drove TV 3777 at a conservative speed. He stated he had no issues with its brakes or handling although he considered it was slow to climb the grades.
- 1.24 A witness travelling one car behind TV 3777 later stated that he had observed TV 3777 struggle to maintain any sort of constant or expected speed along the winding and hilly sections of the Alpine Way. He also stated that, at a number of uphill grades, he observed TV 3777 slow to a near stop as its

driver appeared to attempt to find an appropriate gear to climb the grade, thereby causing a line of traffic to queue behind. However, once over the crest of the grade, TV 3777 then accelerated away at such a speed that the witness could not overtake safely at any locations where the opportunity normally arose.

- 1.25 Approximately 2.5 kilometres from the accident site, the witness again observed TV 3777 slow to a near stop travelling up the grade. Again, after cresting the hill approximately 1.8 kilometres from the intersection, he observed TV 3777 commence to accelerate away on the descending grade.
- 1.26 TV 3777 then passed regulatory heavy vehicle roadside signage indicating *“Trucks & Buses Must Use Low Gear”* and *“Steep Descent”* located approximately 1.6 kilometres from the intersection (see *Figure 3*). Driver 2 recalled that, as he passed the signs, he believed that he was travelling at approximately 40km/h in either 4th or 5th gear. He considered that, in either of these gears, he was in control of TV 3777 and complying with the requirements of the signage. However, the witness recalled that after passing the signs, TV 3777 appeared to increase speed and he did not see its brake lights illuminate. The witness also estimated TV 3777 was travelling at between 60 and 80km/h by this time.
- 1.27 Driver 2 claimed that he had then attempted to apply the brakes shortly after passing the signage. However, the brakes did not slow TV 3777 as he expected and he managed to immediately shift down one gear. He could not recall whether the exhaust brake⁵ was operating or not at the time.
- 1.28 Approximately 600 metres further on, TV 3777 passed another *“Beware Steep Descent”* sign. Again, Driver 2 claimed that, although he was still trying to slow TV 3777 with the brakes, he had now become hesitant to change to a lower gear. He believed that any attempt to change down gears which was unsuccessful would result in the loss of any remaining control he still had of TV 3777. The witness, as a local resident and having travelled the road for a

⁵ The exhaust brake is an engine braking system that provides retardation through the transmission to the wheels. It is controlled electrically by the movement of the brake pedal and restricts the exhaust flow from the engine when no throttle is applied.

number of years, recalled that TV 3777 was now travelling at a speed higher than any he considered safe for the remainder of the descent.

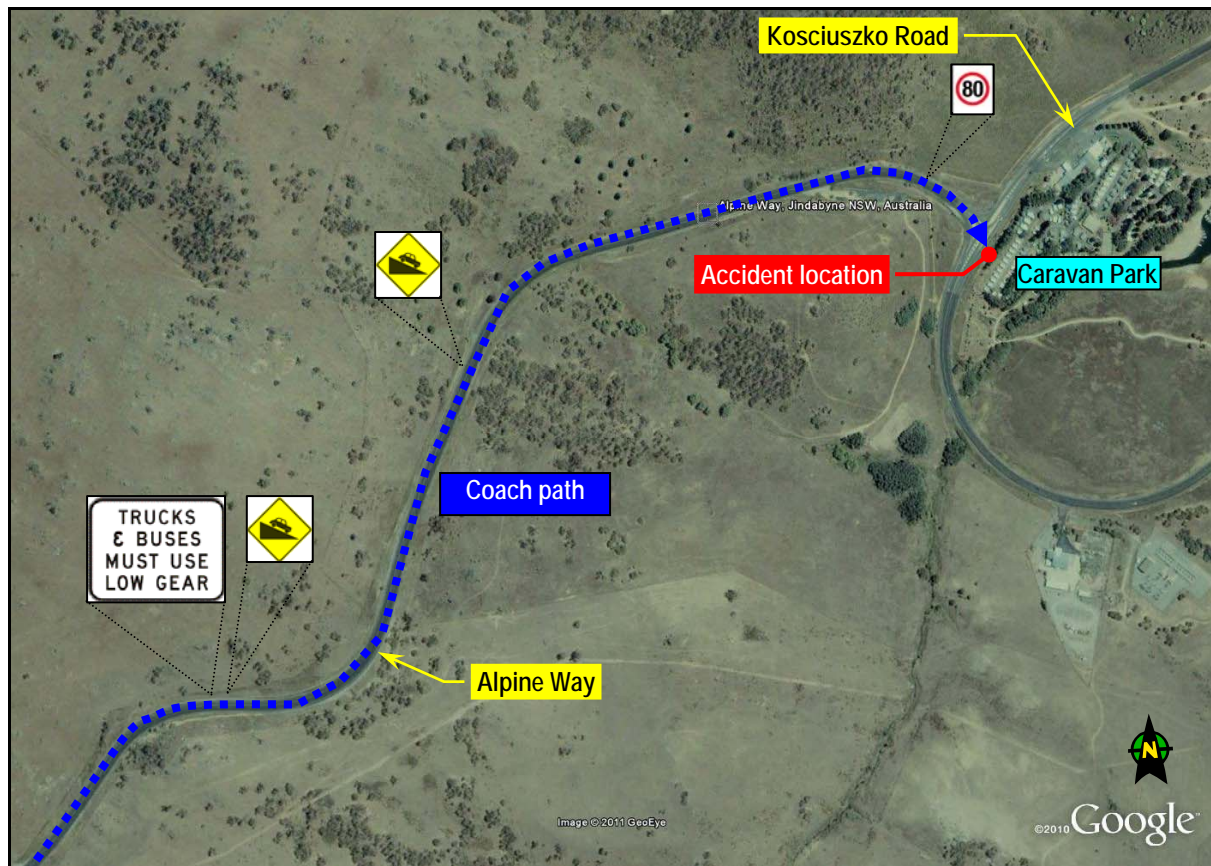
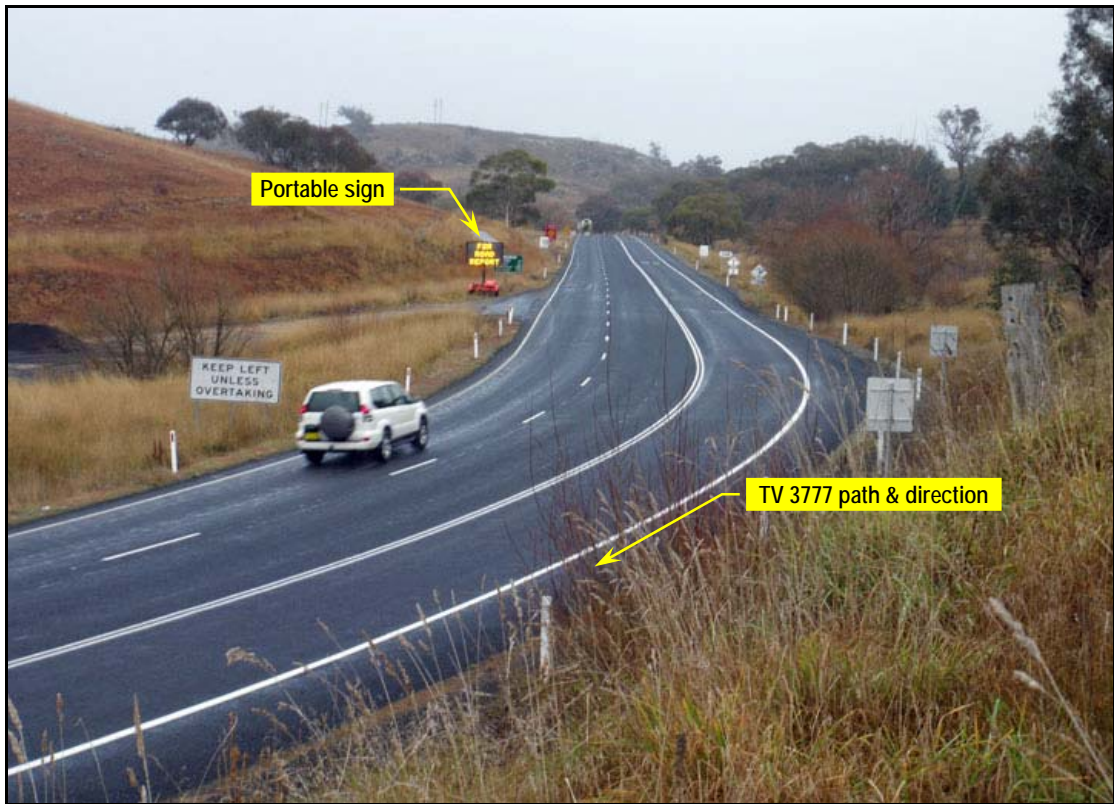


Figure 3: Position of heavy vehicle signage

- 1.29 TV 3777 continued with Driver 2 still attempting to gain effective control. He recalled that every time he made a brake application he “*could hear the front brakes operate*”. He also claimed that, at one stage, an alarm sounded and the brake pedal (treadle valve) went fully to the floor; the two conditions being symptomatic of a loss of air pressure for the brake system that should have resulted in the spring parking brakes being applied on all wheels. He stated that, despite these conditions, and in response to them, he had attempted to locate the switch for the exhaust brake to ensure it was switched on and working, but he was unable to find it.
- 1.30 Despite the alarm and likely depletion of air, Driver 2 continued “*pumping*” the brake pedal without slowing, and alerted the Director to the situation. Driver 1, who was sitting beside the Director, recalled that the first alert from Driver 2 came shortly after TV 3777 passed a portable electric roadside sign. The

position of this sign was later identified to be approximately 200 metres prior to the intersection (see *Photograph 2*).



Photograph 2: Position of portable electric sign

- 1.31 The Director recalled that, when he was alerted to the situation, he immediately noticed Driver 2 pumping the brake pedal and the engine revving very high. He also estimated TV 3777 was travelling at approximately 70km/h at the time.
- 1.32 While Driver 2 continued pumping the brakes, both he and the Director then commenced considering the options to negotiate the approaching intersection. There was no input on the part of Driver 1. Both Driver 2 and the Director decided the best option was to attempt to wipe off as much speed as possible and turn wide. However, neither considered another attempt to change-down in gears or apply the parking brake to achieve this; nor did they consider other crash mitigation strategies to stop TV 3777.
- 1.33 Driver 2 stated he first considered turning TV 3777 to the left at the intersection; however, his vision of approaching road traffic at the time was obscured by a gravel embankment. Instead, he opted to turn wide to the right

at the intersection because it gave him more visibility of approaching traffic. The witness travelling behind stated that he had still not seen the brake lights illuminate up to this point.

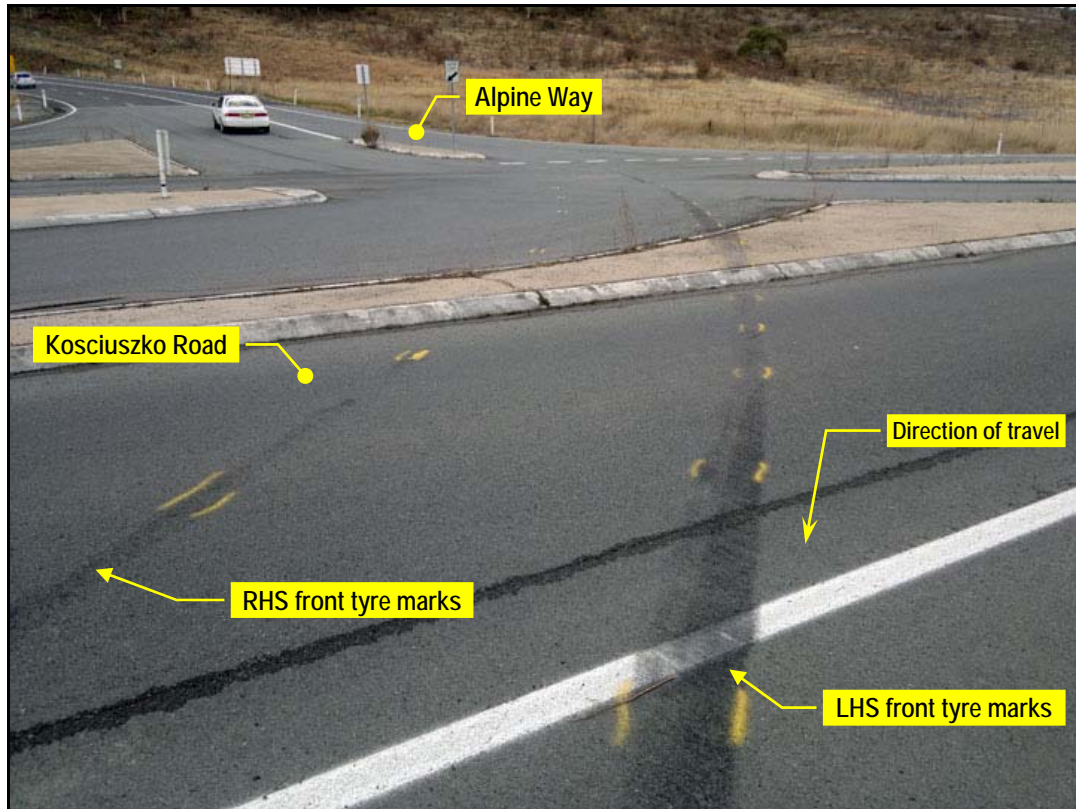
The Accident

- 1.34 Driver 2 stated that the Director yelled at him to turn as TV 3777 reached the raised median strip dividing the carriageways of Alpine Way. He recalled that he was still trying to slow TV 3777 using the brakes at the time.
- 1.35 Driver 2 recalled that, at near full right hand lock, the front wheels lost adhesion with the road surface and he was unable to steer TV 3777. Tyre scuff marks on the carriageway confirmed that the front wheels had lost adhesion at the beginning of the median strip dividing the Alpine Way. The scuff marks also indicated that the driver had not gone as wide as possible for the turn (see *Photograph 3*).



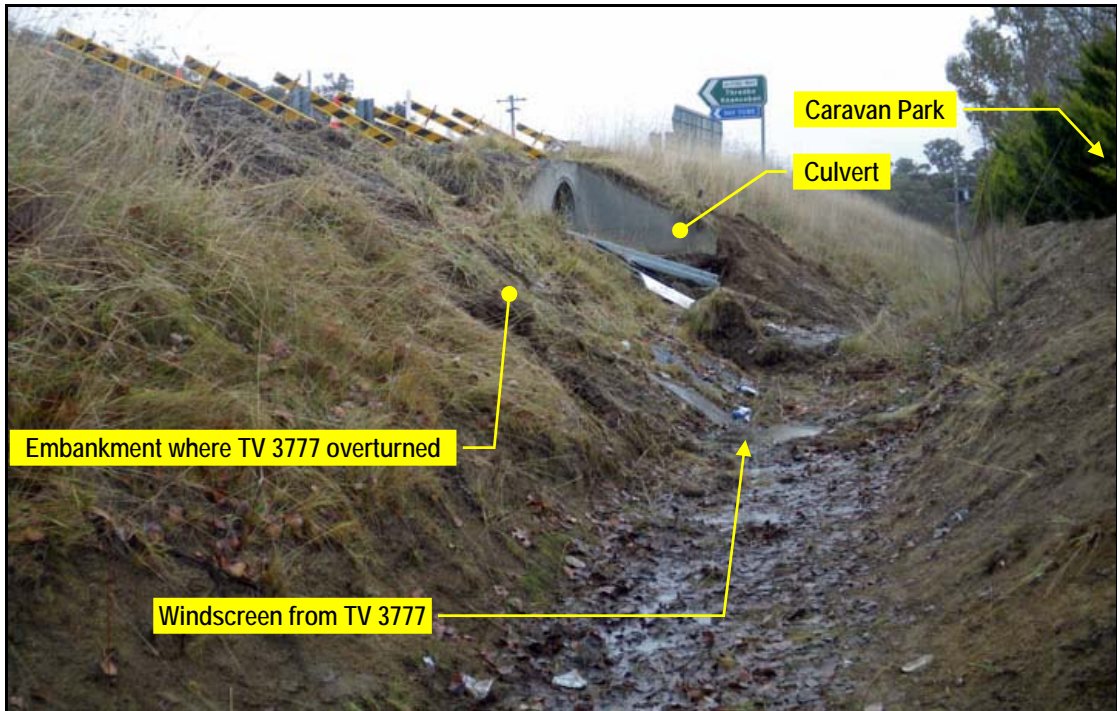
Photograph 3: Start of tyre markings from LHS front wheel

- 1.36 With the steering still turned to the right, TV 3777 then travelled across the raised median strip dividing the Kosciuszko Road carriageway (see *Photograph 4*). Continuing, TV 3777 travelled across the East-bound carriageway of Kosciuszko Road before colliding with a guard rail positioned on the road shoulder.



Photograph 4: Path of front wheels over median strip

- 1.37 TV 3777 then demolished the guard rail and veered part-way down the embankment of a four metre deep drainage ditch separating Kosciuszko Road from a caravan and cabin park. Here, still upright, it crossed the top of a concrete culvert which emptied into the drainage ditch (see *Photograph 5*).
- 1.38 Now at a virtual standstill, the combination of a high centre of gravity and a steep embankment then caused TV 3777 to roll and land on its roof in the ditch (see *Photograph 6*).



Photograph 5: Drainage ditch where TV 3777 overturned and came to rest



Photograph 6: TV 3777 overturned in drainage ditch

After the Accident

- 1.39 TV 3777 remained structurally intact after overturning. Although various body panels were damaged, there was very little crush damage to its roof structure and the cabin space remained unaltered.

- 1.40 Driver 2 claimed he lost consciousness momentarily in the accident. When he came to, he recalled hearing the wheels of TV 3777 still turning. He attempted to knock the vehicle out of gear but was unsure whether he managed to do so.
- 1.41 The Director of Oz Snow Adventures stated that he too lost consciousness momentarily in the accident as a result of not wearing a seatbelt and striking his head on the luggage rack. When he came to, he directed the passengers to the front of the coach where one of them had smashed out the front left hand side windscreen to provide egress from the overturned vehicle. He and the two drivers then assisted passengers to exit TV 3777 reporting “*everybody walked off the bus*” before commencing to assess the injured. As this was occurring, he recalled a person from the caravan park informed him that the emergency services had been called.
- 1.42 In the statements made by the Director and the drivers, and during interview, OTSI noted a lack of comment or description about the release of passengers from their seatbelts while TV 3777 was upside down. The Director later admitted that most of the passengers had not been wearing seatbelts at the time and so had not required any assistance to be released.

Weather Conditions

- 1.43 Weather conditions at the time of the accident were described as dark, damp, cold and overcast with sunset occurring at 4.47pm. A temperature of 8.5°C was recorded at Cooma at 3.00pm on the day while 3.6mm of rain was also recorded in the region bounded by Cooma, Perisher and Thredbo.

Emergency Response

Accident Notification to Emergency Services

- 1.44 Emergency Services were alerted to the accident by numerous calls received via the “000” telephone number commencing at 6.04pm. Assessing the potential for numerous passengers to be injured, a large scale response was commenced by officers from NSW Police, Fire and Rescue NSW, Ambulance Service of NSW and a Traffic Commander from TNSW. The first emergency

response personnel arrived on scene at 6.19pm and commenced assessing the injured who had now all exited the coach.

- 1.45 To permit recovery of the injured passengers and retrieval of the coach, NSW Police, in conjunction with the TNSW Traffic Commander, then commenced managing traffic around the site. This was in the absence of any alternative routes.
- 1.46 Fire and Rescue NSW employed a number of Stokes Litters (portable, lightweight stretchers) to lift the injured passengers up to the roadway for medical assessment. A Fire and Rescue NSW Hazmat unit also attended to stem a fuel leak from TV 3777. Once the leak was stemmed, the Hazmat unit assisted in the recovery of injured passengers to the roadway.

Passenger Injuries

- 1.47 Of the 52 persons onboard, 21 were transported to Cooma Base Hospital by the Ambulance Service of NSW for treatment for a variety of injuries. Four passengers suffering fractures or more serious injuries were later transferred to Canberra Hospital for specialist treatment.
- 1.48 Two overseas passengers, expecting medical treatment to be available at the accommodation, later contacted NSW Police reporting that they also had received injuries in the accident.

Staff Identification

- 1.49 None of the Oz Snow Adventures staff on TV 3777 were wearing any sort of uniform or clothing that provided for ready identification, particularly in the dark. NSW Police reported that they experienced difficulties initially trying to identify and find the coach driver. As neither driver was in possession of a TNSW Driver Authority card to display in the coach in accordance with *Clause 92 of the Passenger Transport Regulation 2007* (the '*Regulation*'), NSW Police were unable to use this to assist their search. Driver 2 was subsequently identified to Police by passengers in vehicles conveying the injured to Cooma Base Hospital. He was then subjected to mandatory post-accident blood and urine tests at the Hospital.

Vehicle Recovery

- 1.50 TV 3777 was retrieved from the ditch and righted by local heavy vehicle towing contractors. It was then towed to a holding yard at Jindabyne for storage and initial inspection by NSW Police.
- 1.51 Traffic restrictions on Alpine Way and Kosciuszko Road were lifted by NSW Police at 3.11am on 12 June 2011.

Accident Reporting to Regulatory Authorities

- 1.52 *Clause 88 (3) of the Regulation requires “An operator of a bus service who becomes aware that a bus being used to provide the service has been involved in an accident or incident must notify the Chief Investigator of the accident or incident, in accordance with this clause, if the accident or incident:*
- (a) involved or resulted in any one or more of the following:*
 - (i) a person being injured,*
 - (ii) the driver of the bus being incapacitated,*
 - (iii) a mechanical or electrical fire or an explosion on the bus,*
 - (iv) a failure of the steering or brakes of the bus,*
 - (v) a bus being in motion while not under the effective control of a driver,*
 - (vi) the bus being unable to continue its journey,*
 - (vii) a person being caught in the doors of the bus and being dragged by the bus, or*
 - (b) is, in the reasonable opinion of the operator of the service, otherwise likely to arouse serious public concern”.*
- 1.53 *Clause 88 (4) requires “A notification under subclause (3):*
- (a) must be given immediately after the operator becomes aware of the accident or accident concerned, and*
 - (b) must be given by telephone or by such other means as the Chief Investigator may reasonably require, and*
 - (c) must include such details of the accident or accident as the Chief Investigator may reasonably require”.*

- 1.54 The accident was initially reported to the Transport Management Centre (TMC) by NSW Police at 6.08pm. After verifying the details of the accident, the TMC then notified nominated officers from TNSW at 7.25pm. However, despite OTSI being listed in the TMC notification procedure, the TMC did not notify OTSI about the accident.
- 1.55 Although a Category “A” type accident, OTSI’s Duty Officer only became aware of its occurrence at approximately 8.15pm via an information release on the NSW Police Media website. The Duty Officer then liaised with NSW Police from Cooma Local Area Command seeking details of the accident.
- 1.56 Despite being onboard TV 3777 at the time, the Director of Oz Snow Adventures did not report the event to OTSI in accordance with the *Regulation* until the afternoon of 14 June 2011 by which time OTSI had commenced an initial investigation of the accident. While aware of the reporting requirements in the *Regulation* through having previously reported a fatal bus accident to OTSI in December 2008, the Director claimed that he had a three day timeframe in which to do so. He also claimed that it was his understanding accidents were reported only on business days, the first after the accident being Tuesday 14 June 2011. However, it should be noted that his report to OTSI was only made at the direction of TNSW. At the time of finalising this investigation, the accident details had still not been entered into the TNSW Bus Accident Management database despite this being an accreditation requirement.

Accident Reporting to Owner

- 1.57 The accident and subsequent location of TV 3777 was not notified to Buses + 4WD Hire by Oz Snow Adventures until the afternoon of 12 June 2011.

Toxicology Results

- 1.58 Driver 2 submitted to mandatory post-accident blood and urine analysis at Cooma Base Hospital. The presence of alcohol and other banned substances was not detected.

- 1.59 Driver 1 was not subjected to any mandatory post-accident blood and urine analysis as it was considered by NSW Police that he was a passenger at the time and so had no control over the coach when it overturned.

Immediate Action by Transport NSW

- 1.60 TNSW suspended the accreditation of Oz Snow Adventures as a bus operator because of a number of breaches of their accreditation requirements that came to light as a result of the accident. Oz Snow Adventures' accreditation was subsequently cancelled on 26 August 2011 due to the accident and the failure of the company to disclose information about it for an independent audit conducted on the company on 13 June 2011.
- 1.61 On 16 June 2011, TNSW suspended the Driver Authority which had been issued to Driver 2 on 14 June 2011, three days after the accident.

PART 2 COACH OPERATION AND CONDITION ISSUES

Introduction

2.1 Initial analysis of the circumstances of the accident identified two aspects of primary concern:

- the way in which TV 3777 was being operated at the time, and
- the condition of its rear brakes.

Coach Operation

BOAS

2.2 Under their BOAS accreditation, both Buses + 4WD Hire and Oz Snow Adventures were required to have developed and implemented a Safety Management System (SMS) which “*is an integrated set of work practices and procedures for monitoring and improving the safety of a bus operation*”. The SMS is required to address a number of key safety elements including:

- policy and commitment;
- safety responsibilities;
- risk management;
- procedures and documentation;
- employee monitoring (including fatigue and drug and alcohol);
- training;
- accident management and monitoring; and
- audit and evaluation.

2.3 The SMS is also required to undergo an independent audit, in accordance with *Clause 90* of the *Regulation*, every three years. As well as the independent audit, operators are also required to conduct a self-audit annually and compile an Annual Self Assessment Report (ASAR). Copies of independent audit reports and certification that ASARs have been conducted are required to be submitted to TNSW.

- 2.4 TNSW records for Oz Snow Adventures indicated that the company had submitted ASARs for 2008, 2009 and 2010 in accordance with the accreditation requirements. TNSW records also indicated that a scheduled 2011 independent audit had been conducted on 13 June 2011 (two days after the accident). However, details of the Jindabyne accident were not provided by Oz Snow Adventures to the auditor for inclusion in the section related to accident reporting. This omission contributed to TNSW's subsequent decision to cancel Oz Snow Adventures' accreditation.
- 2.5 Although the three ASARs and the independent audit report indicated that Oz Snow Adventures was generally complying with its SMS, the company was unable to produce sufficient information or details on nominated records or procedures relating to this accident from its SMS when requested by OTSI. These included documented pre-trip inspection and testing requirements for hire vehicles, defect reporting and management procedures for hire vehicles, and accident reporting and management procedures. Yet, from the records provided by TNSW and post-accident inspections of TV 3777, OTSI noted a number of significant non-conformances with accreditation requirements:
- no temporary signage was attached to the side of TV 3777 listing its accreditation details in accordance with *Clause 78* of the *Regulation*;
 - no driver records as required to be kept in accordance with *Clause 21* of the *Regulation* were produced;
 - neither driver held a NSW Driver Authority or Snow Licence;
 - despite claims by the Director and the drivers that TV 3777 had contained a tachograph card in the VMD⁶ when it departed Sydney, the card could not be produced upon request. Therefore, TV 3777 was either operating without a card at the time of the accident or it had been removed by persons unknown after the accident. Further, the absence of the card and the presence of a key in the VMD indicated that Oz Snow Adventures was not complying with the requirements in Part 5, Division 2 of the *Road*

⁶ An event recorder integrated into the speedometer of the vehicle to record various aspects of its operation, e.g., braking, ignition, time, speed.

Transport (Safety and Traffic Management) Act 1999 for card security, post-accident retrieval and statutory retention of cards;

- Oz Snow Adventures had not sought, and Buses + 4WD Hire had not offered, documentation to the effect that the vehicle was safe and in a roadworthy condition as required by *Clause 15 (a)* of the *Regulation*; and
- no safety briefings or directions had been given to passengers, in accordance with *Clause 89* of the *Regulation*, at the commencement of each part of the journey regarding the requirement to use seatbelts. Additionally, in its seven pages of instructions for tour guides, Oz Snow Adventures' tour guide itinerary did not contain any reference to the content and making of safety briefings or the requirements to wear seatbelts.

2.6 TNSW records for Buses + 4WD Hire indicated that the company had submitted ASAR reports in accordance with its accreditation requirements and an independent audit report in July 2011. The reports indicated that Buses + 4WD Hire was complying with its SMS with only minor non-conformances noted. Buses + 4WD Hire complied with all record and information requests for the purposes of this investigation.

Bus Hire Agreement

2.7 The following were noted on the Hire Agreement between Oz Snow Adventures and Buses + 4WD Hire:

- Oz Snow Adventures only nominated one driver on the Agreement. No particulars were given for Driver 2 who was driving at the time of the accident;
- Buses + 4WD Hire required drivers of vehicles seating 24 persons or more to be over the age of 25 years and have had three years experience at the required level of drivers licence for the vehicle. Driver 2 was aged 23 years and had only held the required licence for two days at the time of the accident; and
- for all buses seating 13 and over, Buses + 4WD Hire required a bus/truck endorsement or equivalent licence to drive in Australia. However, no

NSW Driver Authority details were provided to Buses + 4WD Hire; nor were there any provisions in the Hire Agreement to record this information.

Defect Reporting by Oz Snow Adventures

- 2.8 While unable to provide any documented defect reporting procedures from its SMS, Oz Snow Adventures stated that it reported defects on hire vehicles by either leaving a note on the dashboard of the vehicle upon its return or, in more serious instances, ringing the hire company to report any issues.
- 2.9 A wide variety of road and traffic conditions were experienced during the 546 kilometres after departing Sydney. They ranged from peak hour city and high speed open highway conditions to traversing a number of steep climbs and descents. On the day of the accident, drivers had two opportunities to examine TV 3777 and report any concerns they had with its braking; at start up at East Jindabyne and at the parking area at Thredbo. Neither driver reported any operational or mechanical problems with TV 3777 at any stage.

Licence Requirements in NSW

- 2.10 Under *Section 11* of the *Passenger Transport Act 1990*, drivers are required to hold a Driver Authority issued by TNSW before being permitted to drive a public passenger vehicle. *Clause 106 (2)* of the *Regulation* also requires interstate drivers holding equivalent authorities to hold a NSW Driver Authority when driving on routes wholly within NSW. [The route between Jindabyne and Thredbo is wholly within NSW.] Further, drivers operating in the Kosciuszko National Park between June 1 and October 15 are required to have a Snow Licence in accordance with *Clause 43 (1) (c)* of the *Regulation* (and NSW Department of Transport Accreditation Bulletin No.1 dated June 1992). This licence is only issued after drivers have completed an accredited training course which addresses the additional risks encountered by coach drivers operating in the snow region.

Driver Licensing and Experience

- 2.11 **Driver 1.** The nominated drivers' Northern Territory HR licence was issued in September 2009 and allowed him to drive a bus with a three axle

configuration. He had previously held a Light Rigid (LR) licence which only allowed him to drive a rigid vehicle in a two axle configuration with a gross vehicle mass (GVM) less than eight tonnes or any towed trailer not weighing greater than nine tonnes GVM. He was an experienced bus driver.

- 2.12 **Driver 2.** Driver 2 had only gained his HC licence for this class of vehicle two days prior to the accident after passing the requisite driver knowledge test, which included knowledge of random road signs applicable to heavy vehicles, and a practical test. The licence enabled him to drive a bus with a three axle configuration. Since April 2009, he had held a Medium Rigid (MR) licence which was equivalent to the nominated driver's LR licence. His experience was primarily with driving trucks. The journey from Thredbo to Jindabyne on 11 June 2011 was the first time he had driven TV 3777.
- 2.13 TNSW records indicated Driver 2 had submitted an application for a Driver Authority on 26 May 2011. However, his application was still pending awaiting the results of various checks when the accident occurred. TNSW records also noted that they had received a number of telephone inquiries relating to the issue of his Driver Authority at its Newcastle Branch prior to the accident by both Driver 2 and a person later identified as an employee of Oz Snow Adventures.
- 2.14 Oz Snow Adventures contended that Driver 2 had been given permission by TNSW to drive as his application was being processed. This was rebutted by TNSW who advised that Driver 2 had been informed not to drive a public passenger vehicle without being issued with a Driver Authority card.
- 2.15 The Driver Authority was issued and posted to the driver after he again contacted the Newcastle Branch on 14 June 2011. However, he did not disclose his involvement in the accident and the Driver Authority was subsequently suspended on 16 June 2011 when full details of the accident became known to TNSW. He stated that his non-disclosure was a result of his belief that TNSW would receive automatic notification from NSW Police of the accident and his involvement.

Driving Technique

2.16 Pages 50 to 52 of the NSW RTA Heavy Vehicle Driver Handbook (*Basic driving techniques*) state the following:

Hills

Before going down a hill

*Reduce speed and select the correct gear before beginning the descent. See section 5 Heavy vehicle road rules and in this section, the information under the heading **Going down hills**. It is very important to select a gear low enough to slow down the vehicle.*

Note: *If you try to gear down but you miss the gear, stop the vehicle with the brakes immediately, then select the correct gear. Attempting to coast while you struggle with the gears is very dangerous. Do not try to change gears while going downhill as you can lose control of the vehicle.*

Braking going down hills

Brake failure can be prevented by good driving techniques. If you use the brakes to slow a vehicle travelling down hill it can cause overheating. This leads to brake fade, or brake burn-out in which the brake linings completely lose their grip and are no longer effective.

Going down hills

- *Select a gear low enough to slow down the vehicle without the constant use of brakes.*
- *If you miss the gear when trying to gear down, stop the vehicle with the brakes immediately, then select the correct gear. It is very dangerous to coast while you struggle with the gears.*
- *Use auxiliary brakes to help control the vehicle speed.*
- *Reserve your service brakes for coping with emergencies, traffic conditions or sharp corners.*
- *Try to brake on straight sections of road where possible as this reduces the chance of skidding.*
- *Avoid fanning (repeatedly applying and releasing) the brakes as this leads to an increase in brake temperature and failure due to brake burn out. In air brake systems, fanning wastes compressed air, reducing the reserve available for an emergency.*

2.17 A theoretical gear change chart supplied by MAN Automotive Imports (Australian engine/transmission supplier) indicated that the following maximum speeds were likely to be achieved in each gear on TV 3777 as follows:

Gear	1	2	3	4	5	6	7	8
Speed (km/h)	14.8	20.5	27.5	36.6	50.9	70.2	94.7	125

2.18 The manner in which the bus was driven on the descent to the intersection was not consistent with the guidance provided by the Handbook and displayed a lack of driving experience. This is evidenced by:

- not selecting an appropriate gear to limit the speed of the coach without the use of a primary brake;
- a reliance on the brakes rather than the gears;
- “*pumping*” or fanning of the brakes which only served to deplete the air supply to the brake system, an action which also degrades the operation and effectiveness of the exhaust brake by it being continually switched on and off by the movement of the brake pedal;
- apparent unawareness of the operation of the exhaust brake and how to utilise it; and
- the decision not to use crash mitigation strategies such as applying the park brake earlier in an attempt to slow the speed of TV 3777.

Road Rules and Signage

2.19 On his approach to the intersection, Driver 2 passed a *TRUCKS & BUSES MUST USE LOW GEAR* (R6-22) sign and two *STEEP DESCENT* (W5-12) symbolic signs (see *Figures 3 and 4*). The R6-22 sign and one W5-12 sign were positioned approximately 1600 metres prior to the intersection. The other W5-12 sign was positioned 1000 metres from the intersection.



R6-22 type sign



W5-12 type sign

Figure 4: Traffic signage types

2.20 A RTA post-accident inspection of the heavy vehicle signage on Alpine Way noted that the signs were in a clean, reflective and legible condition. They were compliant with Australia Standards AS 1742.1 (*Supplementary 1*) Clause

5.7 and AS 1742.2 (Devices) Clause 4.9.2(a) for size, detail and design as well as height and positioning on their posts⁷.

- 2.21 The NSW RTA Road Users' Handbook, Section 5, *General Road Rules* defines white background signs as regulatory signs and yellow background signs as warning signs:

Regulatory signs

Regulatory signs tell you about laws that must be obeyed. Except for STOP, GIVE WAY and ROUNDABOUT signs, most regulatory signs are rectangles. They are usually black on a white background. Sometimes they also have a colour such as red. Some parking signs are green on white.

Warning Signs

Warning signs tell you that there may be dangers ahead. They are usually black on a yellow background and are mostly diamond shaped.

- 2.22 At the **TRUCKS & BUSES MUST USE LOW GEAR** sign, it was a regulatory requirement for the driver to bring his vehicle under control in accordance with **NSW Road Rule 108 (2008)** which states:

108 Trucks and buses low gear signs

- (1) *If the driver of a truck or bus is driving on a length of road to which a trucks and buses low gear sign applies, the driver must drive the truck or bus in a gear that is low enough to limit the speed of the truck or bus without the use of a primary brake.*

*Offence provision: 20 points Note **Bus**, **length of road** and **truck** are defined in the dictionary.*

- (2) *Subrule (1) does not apply to the driver of a bus if information on or with the sign indicates that it applies only to trucks.*

*Note **With** is defined in the dictionary.*

- (3) *A trucks and buses low gear sign on a road applies to the length of road beginning at the sign and ending:*

(a) if information on or with the sign indicates a distance — at that distance on the road from the sign; or

(b) in any other case — at an end trucks and buses low gear sign on the road.

- (4) *In this rule:*

primary brake means the footbrake, or other brake, fitted to a truck or bus that is normally used to slow or stop the vehicle.

⁷ AS 1742.1 and AS 1742.2 are part of the Australian Standard 1742 *Manual of uniform traffic control devices set*

- 2.23 Driver 2 claimed that he first believed that the brakes had failed as he passed the *TRUCKS & BUSES MUST USE LOW GEAR* sign and he managed to change down one gear. Despite claiming to be in fifth or fourth gear before the gear shift, he still did not select a gear that was “*low enough to limit the speed of the truck or bus without the use of a primary brake*”; particularly with the Director estimating that, at the time he was alerted to the situation, TV 3777 was travelling at approximately 70km/h.⁸ At this speed, the MAN gear change chart indicates TV 3777 was most probably in sixth gear or higher (see *Paragraph 2.17*).
- 2.24 Despite there being a distance of 1600 metres between the sign and the intersection, Driver 2 did not undertake any additional actions to slow or stop TV 3777, other than to continue to pump the brakes, until he reached the intersection. Further, he did not give any alert to the impending situation until TV 3777 was within 200 metres of the intersection.
- 2.25 The continual pumping of the brakes by the driver would have depleted the air supply to the air brake system resulting in the spring parking brakes automatically applying on the vehicle.⁹ Being controlled by the movement of the brake pedal, the action would have rendered the exhaust brake ineffective by continually switching it on and off.

Coach Condition

Introduction

- 2.26 Post-accident inspection and testing of TV 3777 identified that there was an imbalance in braking effort across both rear axles. The imbalance on the drive axle was caused by the lack of adjustment and setting of the slack adjuster after the right (driver's) side brake chamber had been replaced. The imbalance on the tag axle¹⁰ was caused by wear in the brake linings and the lack of regular adjustment of the manual slack adjusters on the axle.

⁸ It is also noted that an awkwardness exists in the gear shift movement, because of the splitter arrangement in the gearbox, which affects the time it takes to change from fifth gear to fourth gear.

⁹ In the absence of the VMD card, it could not be verified that this occurred.

¹⁰ A tag axle, also called a dead or lazy axle, is a freely rotating axle used for load-bearing purposes. It is situated behind the drive axle but is not part of the drivetrain.

Brake System

2.27 TV 3777 was fitted with a compressed air brake system operating an S cam type foundation drum brake arrangement on each wheel (see *Figure 5*).

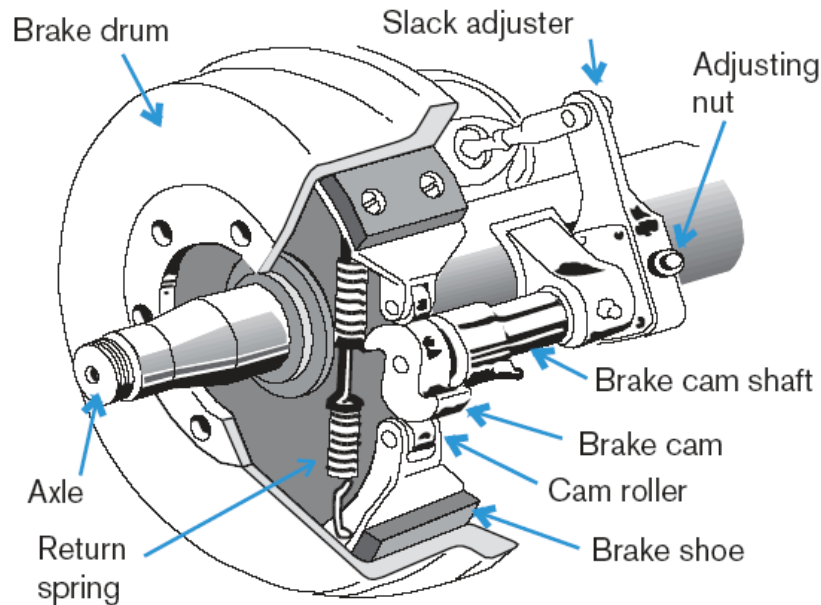


Figure 5: Diagram of S Cam type brake assembly

2.28 The brake chambers on TV 3777 were dual action, European type, combination service brake/spring parking brake units (see *Photograph 7*). Air pressure is required to release the spring parking brakes. They are not fitted with any manual release mechanism, as found on other types, should the vehicle be unable to build up or hold sufficient pressure in its air system.



Photograph 7: Brake chamber type fitted to TV 3777

- 2.29 Each S cam was fitted with a slack adjuster (either manual or automatic) to compensate for wear in the brake linings and drums. The S cams on the drive axle were fitted with automatic slack adjusters while those fitted on the steering and tag axles were manual type slack adjusters which require regular adjustment to compensate for wear in the brake linings and drums.
- 2.30 If operating correctly, automatic slack adjusters do not require any further adjustment once set after renewal or reassembly of the brake components on the wheel hub. They work on a one way clutch mechanism which senses the clearance between the brake linings and drums (see *Figure 6*). Once the clearance reaches predetermined limits set by the control arm, the slack adjuster body readjusts the clearance by turning the S cam. This continues until the brake linings are replaced.

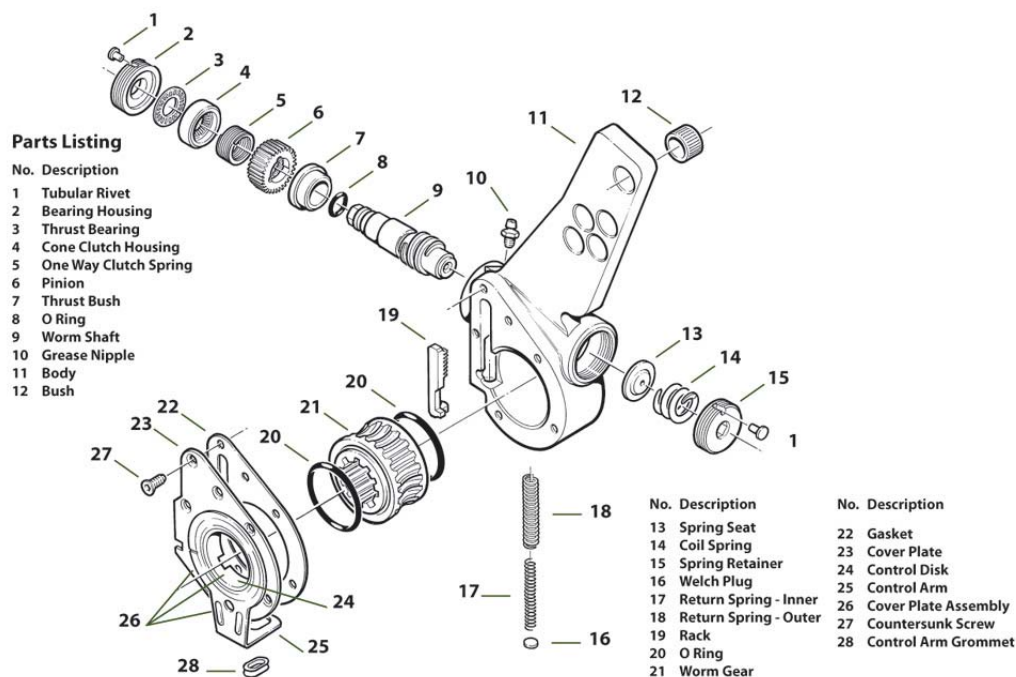


Figure 6: Exploded view of an automatic slack adjuster

Post-Accident Inspections

- 2.31 TV 3777 was recovered to a holding yard at Jindabyne on 12 June 2011 where it was quarantined by NSW Police. A preliminary inspection of the vehicle was conducted by OTSI investigators in the presence of Detectives from Jindabyne on 14 June 2011. On 17 June 2011, it was towed to the RTA

Heavy Vehicle Inspection Station at Queanbeyan for inspection and testing by RTA Heavy Vehicle Inspectors. In addition, on 15 June 2011, OTSI investigators conducted an examination of the Alpine Way intersection where the accident occurred.

2.32 At the completion of the RTA inspection, TV 3777 was towed to the NSW Police Vehicle Engineering Investigation Branch facilities at Zetland, Sydney, for inspection by NSW Police Engineering Investigators. OTSI investigators observed the inspections both at Queanbeyan and at Zetland.

2.33 The RTA also conducted an inspection of the condition of the heavy vehicle signage positioned on Alpine Way in late July 2011.

Preliminary Inspection of TV 3777 at Jindabyne

2.34 The preliminary inspection of TV 3777 at Jindabyne on 14 June 2011 noted the following:

- all passenger effects, barring litter, had been removed;
- the park brake was in the release position;
- the transmission, an eight speed split arrangement, appeared to be in 6th or 8th gear (see *Photograph 8*);



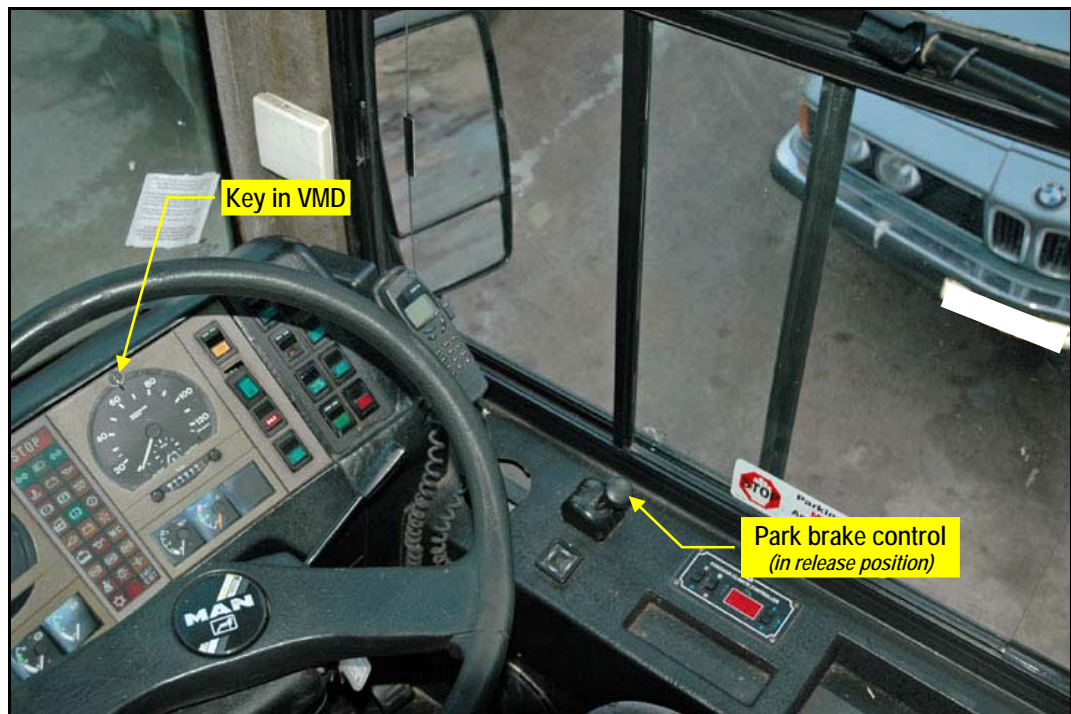
Photograph 8: Position of gear shift after TV 3777 was righted at Jindabyne

- the damage to the bodywork, including broken passenger windows, was consistent with the low speed overturn into the ditch (see *Photograph 9*);



Photograph 9: External damage to TV 3777

- all tyres appeared to be in a serviceable condition with tread thicknesses within specified wear limits;
- there was no evidence of flat spotting on any tyres that would indicate wheels had locked up under brakes and skidded;
- the brake chamber on the right hand side (RHS) drive axle had recently been renewed but its piston was fully extended; and
- the VMD was not secured, with a key was still in its lock (see *Photograph 10*).



Photograph 10: Vehicle monitoring device not secured, with key still in lock

2.35 The majority of seatbelts were found to be engaged and clipped. It was later established that this had been done by a RTA Heavy Vehicle Inspector who, with the assistance of the TNSW Traffic Commander, tested the seatbelt operation prior to the arrival of OTSI investigators. They had found only two belts defective due to their being tight to clip (see *Photograph 11*).



Photograph 11: Interior view of TV 3777 with seatbelts engaged

Inspection of Alpine Way Intersection

2.36 The inspection of the intersection on 15 June 2011 noted the following:

- there were no safety ramps or vehicle arrest pits on the descent;
- there were no tyre scuff marks found on the roadway surface between the top of the grade and those commencing at the intersection median strip to indicate that the wheels on TV 3777 had slid or locked up at any stage prior;
- there were no damaged white posts or tyre scuff marks on the gravel road shoulders that would indicate TV 3777 had swung wide at speed off the roadway at any stage during the descent;
- there was no cracking or visible defects on the road surface;
- all road signage, including the heavy vehicle specific signage, was in a clean, clear and legible state. There were no issues with visibility or vegetation obscuring the signage (see *Photograph 12*);



Photograph 12: Heavy vehicle signage at top of grade

- there was no distinguishable evidence of lockup or skidding from the rear wheels on the road surface at the immediate approaches to the intersection. Dual tyre skid marks near to the front tyre scuff marks from TV 3777 were subsequently identified as not being related to this accident;
- loose road material had built up against the median strips but was not in the path taken by TV 3777;
- the collision had demolished four posts and three sections of the guard rail at the intersection (see Photograph 13); and
- there were various damaged vehicle panels and passenger effects still littering the drain where TV 3777 came to rest.



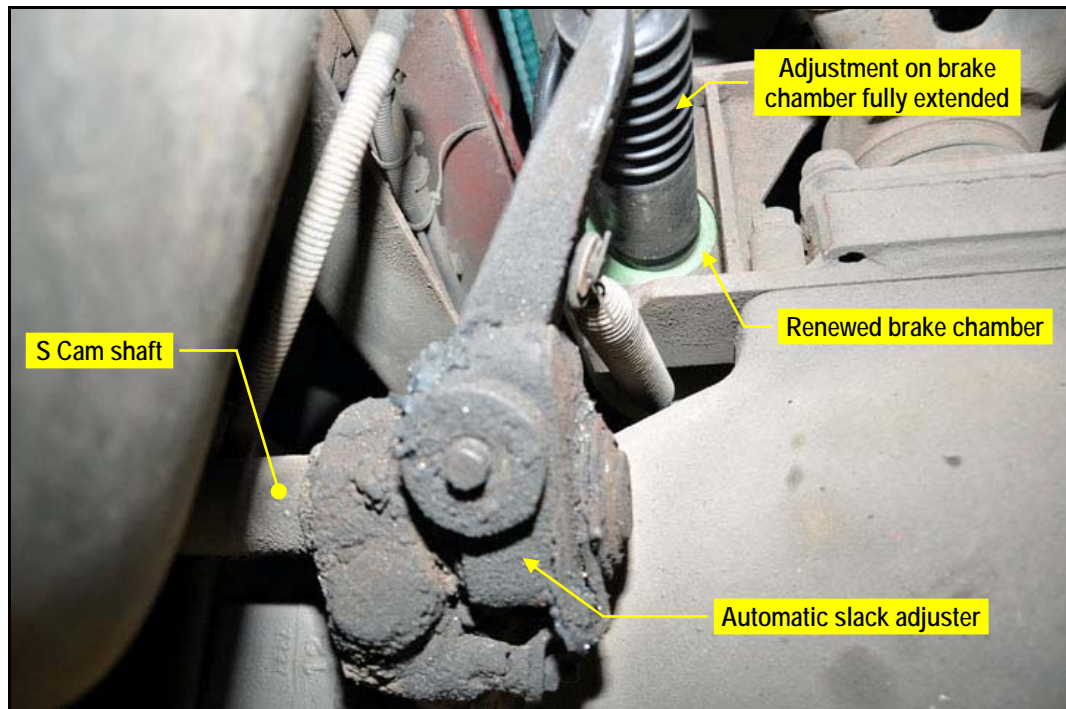
Photograph 13: Damaged guard rail

RTA Inspection of TV 3777 at Queanbeyan

2.37 RTA Heavy Vehicle Inspectors inspected TV 3777 and tested its brakes at Queanbeyan on 17 June 2011. The brake testing was conducted using a MAHA-brake test rig, in accordance with Section 2 of RTA Vehicle Inspectors

Bulletin No. 14 dated 2 April 2009 - *ADR 35 or ADR 35/00 heavy vehicles equipped with compressed air brake systems*. A shore air supply was utilised as the vehicle's engine was seized. The inspection and testing revealed the following:

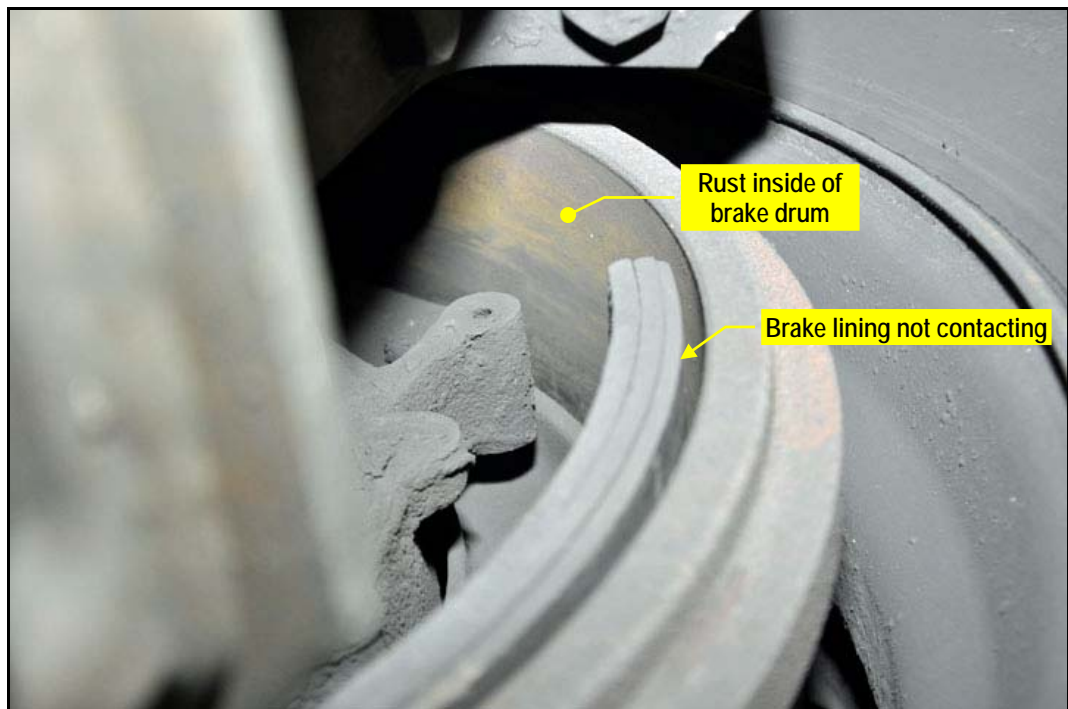
- there was heavy accident damage to its front and left hand side;
- there was no discolouration on any of the brake drums or linings indicating overheating;
- the RHS drive axle brake chamber had recently been renewed but its adjustment was fully extended (see *Photograph 14*) with both the service and spring parking brake functions not working due to “*shoes jumped overcam*”;



Photograph 14: Extended adjustment on brake chamber on RHS drive axle at Queanbeyan

- there was an 11% imbalance in braking forces recorded between the wheels on the No.1 (steering) axle which is within the 30% maximum allowable limit;
- there was a 95% imbalance in braking forces between the wheels on the No.2 (drive) axle caused by “*excess travel*”;

- there was a 80% imbalance in braking forces between the wheels on the No.3 (tag) axle caused by “*excess and uneven travel*”. However, despite the excessive braking force differentials on the drive and tag axles, the overall braking performance was still within minimum specifications for this class of vehicle;
- there was rust on the inner surface of the No.2 axle RHS brake drum indicating that the brake linings had not recently contacted the drum (see *Photograph 15*);

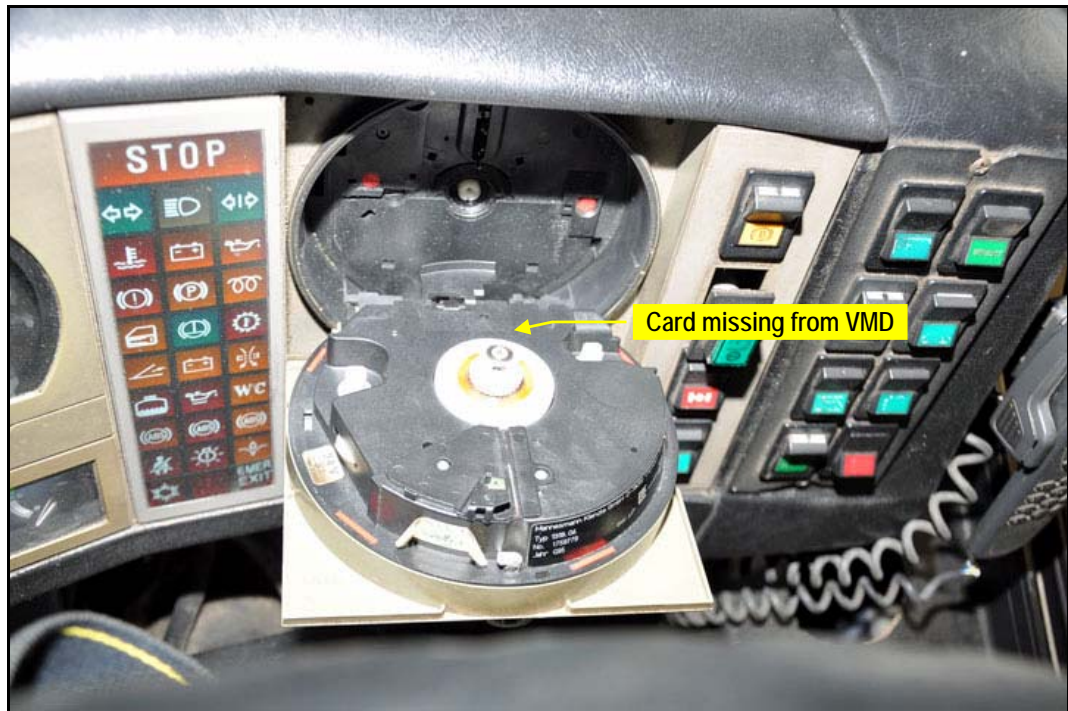


Photograph 15: Rust on the inner surface of the No.2 axle RHS brake drum

- the left side sway bar bush on the No.2 axle was worn;
- the key to the lock of the VMD was in the lock compromising the security of the tachograph card; and
- there was no card in the VMD when the unit was opened (see *Photograph 16*).

2.38 Subsequently the RTA inspectors attached a red label to TV 3777 and ‘Major Grounded’ the vehicle in Defect Notice No. 5500501427. Such a defect notice is required to be cleared by a full vehicle inspection at an Authorised Heavy

Vehicle Inspection Station before the subject vehicle is placed back into service.



Photograph 16: Vehicle monitoring device (without card) when opened at Queanbeyan

Inspection by NSW Police Vehicle Engineering Investigation Branch

2.39 NSW Police Engineering Investigators noted the following during their inspection of TV 3777 at Zetland on 13 July 2011:

- the engine could not be started as it was seized and consequently the exhaust brake could not be tested;
- the transmission was now in the neutral position indicating that it had been moved during the towing process;
- all rear brake lamps were operative when the service brake was applied;
- the low air pressure alarm and light were both operational;
- the rubber grips on the brake and clutch pedals were in a serviceable condition;

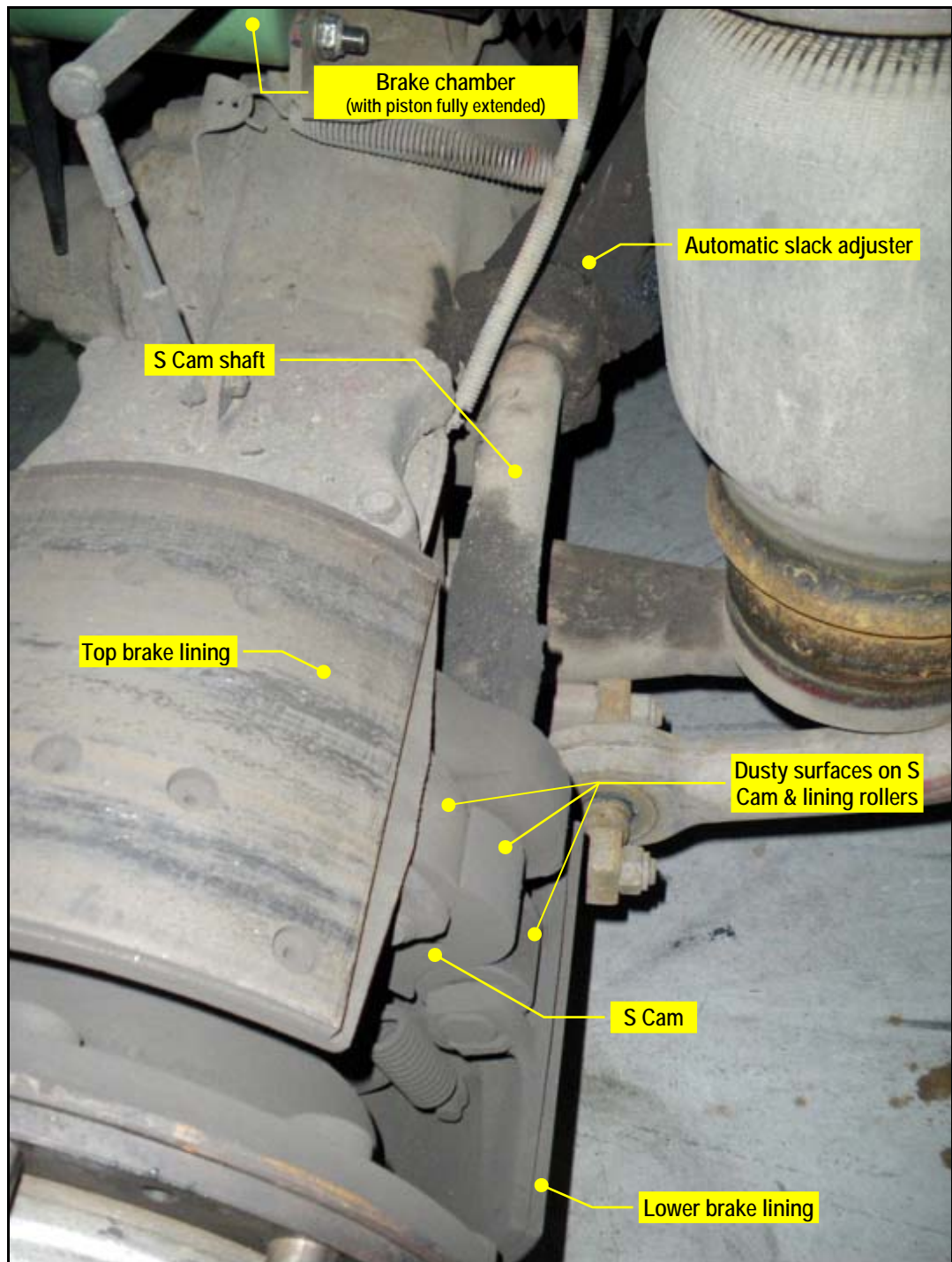
- all brake chamber pistons extended when the air brake system was charged and the service brakes operated from the brake treadle (foot) valve;
- the brakes on the No.1 (steering) axle were serviceable;
- the stroke length for the brake chamber pistons on the No. 2 (drive) and No. 3 (tag) axles measured as follows:

Axle No.	Length (brakes released)		Length (brakes applied)		Effective Stroke Length
No. 2 (Drive)	<i>LHS</i>	40mm	<i>LHS</i>	62mm	22mm
	<i>RHS</i>	170mm (Full stroke)	<i>RHS</i>	170mm (Full stroke)	0
No.3 (Tag)	<i>LHS</i>	111mm	<i>LHS</i>	136mm	26mm
	<i>RHS</i>	58mm	<i>RHS</i>	65mm	7mm

The measurements on the No.2 LHS axle and the No.3 LHS axle indicated that, although working, the brakes were not properly adjusted. The measurement on the No.2 RHS axle indicated the brakes were not operating on the wheel;

- the No.3 axle LHS wheel could still be rotated with the spring parking brake applied;
- when the brake drum was dismantled from the No.2 axle RHS hub, the S cam was observed to be in the fully retracted and released position despite the brake chamber being fully extended (see *Photograph 17*);
- the S cam and lining rollers were covered in dust indicating a lack of recent operation;
- the diameter of the No.2 axle RHS brake drum measured 410.97mm (new 410mm) indicating minimal wear;
- the thickness of the No.2 axle RHS brake linings measured between 6.3mm and 9.8mm. Although within specification, these measurements were at the lower end of the limits. All other brake linings were of serviceable condition and thickness;
- the inner surface of the No.2 axle RHS brake was rusty indicating that the brake linings had not recently contacted the drum (see *Photograph 18*);

- there was no evidence of overheating on any of the brake drums or linings;
- the control arm on the No.2 axle RHS brake automatic slack adjuster was damaged which prevented the slack adjuster clutch from functioning and the full stroke of the body. (This damage presented as a pre-accident condition. The slack adjuster operated as designed after the control arm was straightened); and
- continuous pumping of the brake pedal could not identify a reason for its reported travel to the floor by Driver 2.



Photograph 17: Condition of brake assembly on No.2 axle RHS when dismantled



Photograph 18: Condition of inner surface on No.2 axle RHS brake drum when dismantled

RTA Inspection of Heavy Vehicle Road Signage

- 2.40 A night-time inspection by the RTA verified that the heavy vehicle signage was in order and compliant with Australian Standards. The RTA also advised that Alpine Way (MR 677) at Jindabyne was the only location where these signs are positioned between Sydney and Thredbo.

Vehicle Maintenance

- 2.41 The maintenance history of TV 3777 indicated that it had been serviced regularly and within the manufacturer's recommended timeframes. It had last been serviced on 22 March 2011 at 965,831kms and had travelled 6,126kms since.
- 2.42 The records also indicated that the maintenance on TV 3777 had been outsourced regularly to licensed repairers; mostly to a single local heavy vehicle repairer although other parts suppliers and service providers had been used on different occasions. Buses + 4WD Hire explained that the maintenance had been outsourced because they did not have suitable

facilities or equipment available at their site to maintain large vehicles such as TV 3777.

Relevant Maintenance Records

Brake Chamber Renewal on 8 June 2011

- 2.43 On 6 June 2011, after being hired for work in the Parramatta area, TV 3777 was collected by a Buses + 4WD Hire staff member for return to the depot at Alexandria. When the staff member started TV 3777, he observed that the air system could not build up sufficient pressure to release the park brake and he notified the depot. The depot requested a local mechanical business send a mechanic to attend to TV 3777.
- 2.44 The mechanic diagnosed an air leak coming from the brake chamber on the RHS of the drive axle. Closer inspection by the mechanic identified that the leak was coming from within the brake chamber and could not be repaired. Without a replacement chamber on hand, he then removed the chamber and plugged its air supply. The removal of the brake chamber disabled both the service brake and the park brake on the wheel but enabled TV 3777 to be driven back to the Buses + 4WD Hire premises at Alexandria to await the supply of a replacement brake chamber. A new brake chamber was subsequently supplied by the business to Buses + 4WD Hire at its depot on 7 June 2011.
- 2.45 As TV 3777 was considered unfit to be driven from the depot for replacement of the brake chamber at its usual maintenance provider, Buses + 4WD Hire organised for a mechanic from another nearby licensed mechanical repair business to attend on site and fit the replacement brake chamber. This repair business had previously conducted maintenance and repairs on various smaller vehicles in Buses + 4WD Hire's fleet.¹¹
- 2.46 A mechanic, identified by Buses + 4WD Hire as the repair business owner, allegedly attended the depot on 8 June 2011 and fitted the new brake chamber. However, the repair business owner has subsequently denied fitting the new chamber stating that he is not a qualified heavy vehicle

¹¹ The mechanical business was licensed under the *Motor Vehicle Repairs Act 1980*.

mechanic and that he and his staff are not insured to conduct any work outside of his premises. This is despite details regarding onsite work being contained in an invoice received by Buses + 4WD Hire from the business for the renewal of the brake chamber.

- 2.47 Regardless of whoever fitted the new brake chamber, it was fitted to TV 3777 without issue. However, the person did not jack the wheel from the ground to adjust and set the slack adjuster after fitting the new chamber. Although it was claimed that the service brake and the park brake were tested for air leaks and operation from the cabin after TV 3777 was started, the length of the piston stroke on the new brake chamber was not measured or verified. Had this length been verified when the brakes or spring park brake were applied, it should have alerted those responsible for replacing the brake chamber that the brakes were not properly adjusted or operating on the wheel.
- 2.48 TV 3777 was not subjected to any further road or dynamic tests after the brake chamber was renewed. It remained in the depot until 10 June 2011 when it was sent for a replacement tyre on the RHS wheel of the tag axle before being hired to Oz Snow Adventures.
- 2.49 Although Oz Snow Adventures' Driver 1 conducted a pre-rental visual inspection when hiring TV 3777 at 971,411kms, he did not detect the long stroke on the new brake chamber. No problems or defects were reported until Oz Snow Adventures notified Buses + 4WD Hire of the accident on 12 June 2011. At the time of the accident, the odometer reading on TV 3777 was at 971,957kms indicating that it had travelled 546 kilometres since it was hired.

Brake Lining Renewal on 22 March 2011

- 2.50 The brake linings on both the drive and steering axles were renewed during a 'B' Service carried out on 22 March 2011 by the usual maintenance provider.¹² The linings on the wheels of the tag axle were not replaced.

¹² The maintenance provider was licensed under the *Motor Vehicle Repairs Act 1980* to carry out the work concerned. He was also an authorised heavy vehicle examiner in accordance with the requirements of the RTA Authorised Inspection Station (AIS) Scheme.

- 2.51 Although there are general items listed on the 'B' Service tick sheet requiring inspection of the brake pedal and park brake, brake pads and discs and a road test, there are no specific items requiring measurement of the brake piston travel lengths during this inspection. As such, there is no evidence to the effect that the brakes were adjusted after the linings were replaced.
- 2.52 There were no reported issues with TV 3777 after the road test following the service. However, no dynamic testing was conducted to detect any braking imbalances across the axles.
- 2.53 OTSI noted that, when TV 3777 was inspected post-accident by NSW Police, the linings on the No.2 axle RHS had worn to near wear limits despite being reportedly renewed during the 'B' service some 6,000 kilometres beforehand. In comparison, the linings on the No.2 axle LHS and both sides of the No.3 axle were significantly less worn.
- 2.54 Given the relative short time-span and distance travelled between the service and the accident, it may be assumed that one or more of the following contributed to the elevated wear on the brake linings of the RHS wheel on the No.2 axle:
- the brakes were used heavily during this period;
 - the brakes were not properly adjusted after the linings were renewed;
 - the composition of the linings used was not to specifications; or
 - contrary to the service record, the linings on this wheel had not been renewed during the 'B' service.

Brake Repairs on 10 June 2010

- 2.55 On 10 June 2010, at 938,400kms, both slack adjusters on the drive axle and a bush in the sway bar were renewed by the usual maintenance provider. The replacement of these parts related to defects found during a RTA Heavy Vehicle Inspection Scheme (HVIS) inspection conducted on 7 June 2010 in preparation for registration renewal on 20 July 2010. (Refer to paragraph 2.60) The defects were cleared by the maintenance provider in his capacity as an authorised heavy vehicle examiner.

- 2.56 TV 3777 had travelled a further 1114kms when a 'B' service was carried out on 23 June 2010 at 939,514kms. During this service, the brakes were again inspected in accordance with the service requirements.
- 2.57 The records also indicated that a 'C' service had been carried out on TV 3777 at 947,327kms by the usual maintenance provider on 3 August 2010, some seven weeks later. This service required the inspection of the brake items from the 'B' service plus the additional inspection of the brake drums, the brake linings, the brake pipes and brake hoses. No defects relating to these items were recorded as being repaired during the service.

Brake Lining Renewal on 10 February 2010

- 2.58 On 10 February 2010, a 'B' Service was carried out at 924,992kms by the usual maintenance provider during which time the brake linings and drums were renewed on both the drive and tag axles. The brake chamber on the No.2 axle LHS was also renewed and a number of defects related to a HVIS inspection cleared.
- 2.59 Again, only the general items are listed on the 'B' Service tick sheet and there is no evidence that the brakes were adjusted during this service. Further, there were no reported issues with TV 3777 after the road test following this service. However, no dynamic testing was conducted to detect any braking imbalances across the axles.
- 2.60 It is noted that the linings replaced on the drive axle during this service lasted only 40,000kms before being replaced on 22 March 2011.

HVIS Inspections

- 2.61 As a registered public passenger vehicle, TV 3777 was required to undergo regular inspections under the HVIS conducted by RTA Heavy Vehicle Inspectors. Two inspections are required each registration period; the first three to six months following registration renewal and the second no more than three months before the next registration renewal. Records for the previous three HVIS inspections indicated that TV 3777 had undergone the inspections within the specified timeframes. The records also indicated that all defects located as part of the HVIS inspections had been cleared by TV

3777's usual maintenance provider in his capacity as an authorised heavy vehicle examiner.

- 2.62 Records from the last HVIS inspection, conducted on 5 January 2011, indicated that TV 3777 had been defected after the inspection because of a defective sway bar bush on the No.2 axle, defective S cam bushes on one wheel of the tag axle and an imbalance in braking across both the tag and drive axles. The records also indicated that these defects had been cleared by the authorised vehicle examiner on 6 January 2011 (at 960,705kms). However, when TV 3777 was examined by the RTA Heavy Vehicle Inspectors at Queanbeyan on 17 June 2011, these same defects were still apparent.
- 2.63 Records for the previous HVIS inspections of 7 June 2010 (938,391kms) and 12 February 2010 (925,065kms) also indicated that TV 3777 had been defected on each occasion for imbalances in braking across the drive and tag axles. However, again, the defects had been subsequently cleared by the usual maintenance provider on the day after TV 3777 was inspected. Further, despite braking imbalances, no dynamic testing was conducted after the defects were cleared.
- 2.64 While the HVIS is a risk mitigation strategy by the RTA, it has no direct linkage to the BOAS to enable identification and recording of repeat defects on vehicles; nor is there any requirement for operators to report repeat defects found during HVIS inspections in the ASARs or independent audit reports. This limits regulatory oversight of vehicle condition by TNSW.

Road and Intersection

- 2.65 No issues were observed with road width or the condition of the road surface on the approach to and at the intersection. However, it was observed that, despite being designated an area where heavy vehicles were required to use low gear, there was no reduced speed limit for heavy vehicles, no arrest pits or any safety ramps to arrest vehicles in case of brake failure or runaway situations. This is also despite the risk of brake failure being highlighted in the RTA Heavy Vehicle Driver's Handbook.

- 2.66 The guard rail installed at the intersection afforded little protection against TV 3777 from running off the road and into the ditch. Thus, it is concluded it was not designed to contain or deflect heavy vehicles colliding with it.
- 2.67 A media report on the accident indicated a similar accident had occurred at the intersection in the 1990's involving a fuel tanker rollover causing damage to a number of cabins in the caravan park. As a result of that accident, the width of the ditch and the height of the ditch wall on the park side were increased to provide increased protection against vehicle intrusion into the property.

Seatbelts

- 2.68 *Clause 89 of the Regulation states that "the operator of a bus service must take reasonable steps to ensure that every passenger on a bus operated by the operator is made aware that the passenger is required to wear a seatbelt (if fitted) in the bus unless the passenger is exempt from that requirement under rule 267 of the Australian Road Rules".* This was the responsibility of the Director of Oz Snow Adventures who was also the tour guide for the trip.
- 2.69 It is unknown how many passengers were wearing seatbelts. However, from the evidence, it is likely few, if any, were wearing them at the time of the accident. Had passengers been wearing seatbelts, injury may have been avoided even though they would have become caught in a precarious upside-down position after TV 3777 overturned.

PART 3 FINDINGS

Causation

- 3.1 Coach TV 3777 overturned at the intersection of Alpine Way and Kosciuszko Road because the driver did not maintain effective control of the vehicle at the commencement of, or during, the 1.8 kilometre steep descent leading to the intersection.

Contributory Factors

- 3.2 **Driver experience.** The driver was both inexperienced and unfamiliar with the coach, having only driven it for approximately one hour in covering 30 kilometres leading up to the accident. He had also only held his licence to drive this class of vehicle for two days at the time of the accident. His inexperience and unfamiliarity was evidenced by:

- less than optimum gear selection in response to regulatory road signage requiring buses to use low gear;
- uncertainty about the operation of the exhaust brake and the location of its switch;
- driving in a manner involving significant retardation in speed on climbs and rapid acceleration away on level or downhill sections;
- driving in a manner not strictly in accordance with Road Rule 108;
- not giving any alerts of brake problems until approximately 200 metres prior to the intersection despite claiming he first believed there were brake problems at the top of the grade; and
- not considering any other crash mitigation strategies earlier during the descent.

- 3.3 **Braking technique.** The driver stated that he pumped ('fanned') the brakes in his attempt to slow TV 3777. However, this technique is contrary to the guidelines contained in the NSW RTA Heavy Vehicle Driver's Handbook. The fanning action serves only to exhaust the vehicle air supply and negate the operation and effectiveness of the exhaust brake. A witness following the bus

in his car stated that he did not see the brake lights illuminate at any stage during the descent to the intersection. However, as the brake lights were later proven to be operational after the accident, they should have lit up every time the driver pumped the brakes.

3.4 **Brake maintenance.** Although the maintenance on its brakes was conducted by licensed repair businesses, there had been a history of problems with the brake adjustment and performance on TV 3777. Post-accident inspections identified reduced performance of the brakes on the rear axles of TV 3777 which could be attributed to:

- less than rigorous inspection and testing to confirm the operation and effectiveness of the brakes after the brake chamber on the drive axle was renewed on 8 June 2011; and
- inadequate adjustment, inspection and testing of the brakes on all three axles after brake linings were renewed during the 'B' service carried out on 22 March 2011 approximately 6,000 kilometres beforehand. [Recommendation 4.2]

3.5 Although drivers had inspected the vehicle on three occasions after it was hired, brake testing was not rigorous and no examination was undertaken of the length of the piston strokes on the brake chambers of the drive and tag axles. Further, the drivers did not identify any reduced braking performance that may have been evident during the 546 kilometres driven in the hire period. [Recommendation 4.2]

3.6 **Defences.** There were insufficient defences on the approach to, or at, the intersection to contain or redirect heavy vehicles on the roadway and prevent them from crashing through the guard rail. Additionally, there were no speed limitations directed at heavy vehicles descending the grade. [Recommendation 4.3]

Effectiveness of Risk Management Strategies

3.7 Despite being an accredited operator, Oz Snow Adventures did not adhere to its Safety Management System or conditions of accreditation in accordance with a number of requirements of the *Passenger Transport Regulation 2007*.

- 3.8 The mentoring of Driver 2 by Driver 1 did not eventuate as planned either prior to or after his taking charge of the coach.
- 3.9 No investigation was undertaken by the maintenance provider, Buses + 4WD Hire or the RTA into the reasons for repeated defecting of TV 3777 at successive HVIS inspections for braking imbalances across the drive and tag axles. [Recommendation 4.2]
- 3.10 The brake inspection requirements contained in Buses + 4WD Hire's maintenance schedule were generalised and did not provide specific information regarding inspection requirements, limits or procedures for its vehicles; nor was there a requirement for HVIS-style testing after any brake maintenance. [Recommendation 4.2]
- 3.11 No safety briefings were provided to passengers during the journeys taken in the coach. Given the number of injuries, it is likely that few, if any, passengers were wearing their seatbelts at the time of the accident.
- 3.12 BOAS audits of both operators did not reveal any significant non-compliance issues with accreditation or SMS requirements.
- 3.13 There is no direct linkage of the HVIS scheme to the BOAS which highlights repeat defects; nor is there a requirement for operators to report repeat defects identified during HVIS inspections in the ASARs or independent audit reports. Consequently, this limits any regulatory oversight of vehicle condition by TNSW. [Recommendation 4.4]

Effectiveness of the Emergency Response

- 3.14 The recovery of the injured passengers and the coach was timely and efficient.
- 3.15 None of the Oz Snow Adventures staff were wearing any sort of identification or uniform at the time of the accident; nor did the drivers have NSW Driver Authority cards to display inside the coach. This led to difficulties in identification of the driver by NSW Police, resulting in delays to the transport of injured passengers to hospital. [Recommendation 4.5]

Other Safety Matters

- 3.16 Oz Snow Adventures did not implement appropriate procedures for the management, security and recovery of tachograph cards from the VMD in accordance with Part 5, Division 2 of the *Road Transport (Safety and Traffic Management) Act 1999*. This resulted in evidence that could have assisted the investigation not being available. It could not be established whether a card had been fitted to TV 3777 for the journey or was removed intentionally after the accident.
- 3.17 Oz Snow Adventures did not report the accident in accordance with legislative requirements.

Other Issues

- 3.18 Driver 2 was hired and tasked by Oz Snow Adventures to drive TV 3777 despite not meeting the age and experience terms of the Hire Agreement with Buses + 4WD Hire. [Recommendation 4.1]
- 3.19 Neither driver was in the possession of the necessary NSW Driver Authority or Snow Licence.

Oz Snow Adventures – Contrary Conclusions

- 3.20 As part of OTSI's standard practice of consultation with Directly Involved Parties, Oz Snow Adventures was provided with the opportunity to comment on both initial and final drafts of the Investigation Report. On both occasions, the Company strongly and consistently disagreed with OTSI's finding as to the cause of the accident. It is OZ Snow Adventures' firm contention that the "root cause of the accident was brake failure". The Company has advised that this conclusion is supported by consulting forensic engineers from a firm engaged to assist with its review of the initial draft report. The Company agreed that driver inexperience was a contributing factor.

PART 4 RECOMMENDATIONS

To prevent a recurrence of this type of accident, it is recommended that the following remedial safety actions be undertaken by the specified responsible entities.

Buses + 4WD Hire Pty Ltd

- 4.1 Review its Hire Agreement for large capacity vehicles to ensure all relevant Driver Authority and licence details are identified and recorded.
- 4.2 Review its bus inspection and maintenance procedures to ensure:
 - all brake inspection, maintenance and testing requirements are clearly defined and implemented; and
 - repeat defects or faults are investigated and rectified as a matter of priority.

Roads and Maritime Services NSW

- 4.3 Examine the feasibility of:
 - upgrading the crash barrier system at the intersection of Alpine Way and Kosciuszko Road to ensure heavy vehicles that fail to negotiate the intersection are contained on the roadway or directed away from the drainage ditch;
 - installing vehicle safety ramps or arrest pits at strategic locations down the grade; and
 - specifying a reduced speed limit for heavy vehicles descending the grade.
- 4.4 Revise the Bus Operator Accreditation Scheme processes so as to ensure repeat safety critical defects on vehicles identified through the twice yearly Heavy Vehicle Inspection Scheme inspections are highlighted in Annual Self Assessment Reports and independent audit reports.

Transport for NSW

- 4.5 Review the *Passenger Transport Regulation 2007* to include a requirement that, in conjunction with the Driver Authority, drivers are also to wear clear

personal identification at all times while in control of a public passenger vehicle.

Oz Snow Adventures Pty Ltd

- 4.6 No recommendations are directed to Oz Snow Adventures as its accreditation as a bus operator was suspended by Transport NSW on 16 June 2011 and subsequently cancelled on 26 August 2011.

PART 5 APPENDICES

Appendix 1: Sources, Submissions and Acknowledgements

Sources of Information

- Ambulance Service of New South Wales
- Buses + 4WD Hire Pty Ltd
- Fire and Rescue New South Wales, Jindabyne
- Geoscience Australia
- NSW Centre for Road Safety
- NSW Police Local Area Command, Cooma
- NSW Police Vehicle Inspection Branch, Zetland
- Roads and Traffic Authority;
- Transport NSW

References

- Australian Design Rules
- Australian Standard 1742; Parts 1742.1 and 1742.2
- Passenger Transport Act 1990
- Passenger Transport Regulation 2007
- Road Transport (Safety and Traffic Management) Act 1999
- RTA Heavy Vehicle Driver Handbook

Submissions

The Chief Investigator forwarded a copy of the Draft Report to the Directly Involved Parties (DIPs) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:

- Buses + 4WD Hire Pty Ltd
- Oz Snow Adventures

- Transport for NSW
- Independent Transport Safety Regulator
- NSW Police
- Drivers 1 and 2

Submissions were received from:

- Oz Snow Adventures
- Transport for NSW
- Independent Transport Safety Regulator

The Chief Investigator considered all representations made by DIPs and responded to the author of each of the submissions advising which of their recommended amendments would be incorporated in the Final Report, and those that would not. Where any recommended amendment was excluded, the reasons for doing so were explained.

Acknowledgements

- *Figures 1, 2 and 3* were sourced from *Google*.
- *Figure 4* was sourced from the NSW RTA Road Users Handbook.
- *Figure 5* was sourced from SGI (Canada) Air Brake Manual.
- *Figure 6* was sourced from www.meislackadjusters.com.
- *Photograph 6* is reproduced with the permission of the Transport NSW.
- *Photograph 7* was sourced from Shintones (manufacturer).
- *Photograph 8* is reproduced with the permission of the Transport NSW.

OTSI would like to record its appreciation for the cooperation and assistance provided by the members of the NSW Police Vehicle Inspection Branch and Cooma Local Area Command, the RM & S Heavy Vehicle Inspectors at Queanbeyan and the Transport NSW Southern Region Traffic Commander.