



Office of Transport Safety Investigations

BUS SAFETY REPORT

BUS FIRES IN NEW SOUTH WALES IN 2014



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THE OFFICE OF TRANSPORT SAFETY INVESTIGATIONS

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.

BUS FIRES IN NEW SOUTH WALES IN 2014

Introduction

In June 2013, the Office of Transport Safety Investigations (OTSI) released an investigation report into common safety-related issues that had been revealed through its examination of the nature and circumstances of bus and coach fires in the period 2005 to 2012 inclusive (the 2005 - 2012 Report).¹ The 2005 - 2012 Report was followed by a report published in April 2014 summarising bus fire events in NSW in 2013.² Monitoring of the extent, origins and causes of bus fires reported to OTSI was continued through 2014.

During 2014 all reported fires were documented and included events which did not progress to a fire but involved excessive heat and the generation of smoke. Most fires were of a minor nature resulting in negligible damage. Additionally, in most cases the origin and cause of the fire was readily identifiable and did not require an in-depth investigation. Consequently, OTSI investigators were only required to attend and inspect vehicles on four occasions. Only one incident was considered to warrant further investigative action.

This report provides a summary of the information gathered in 2014 and provides commentary on comparisons with the information reported in 2013. These comparisons are provided for interest only, as the numbers of incidents in each category and in total are too small for any meaningful statistical analysis.

The report also briefly records further progress in implementation of recommendations made in the 2005 - 2012 Report. Data for this report comes primarily from information provided by operators using the same methodology as used for recording occurrences in 2013.

The Numbers

Twenty-nine fires were reported in 2014, and were distributed through the year as shown in *Figure 1*. Brief details of each incident are shown in *Appendix A*.

¹ OTSI Bus Safety Investigation Report, *An Investigation into Bus Fires in NSW 2005 - 2012*, available at www.otsi.nsw.gov.au

² OTSI Bus Safety Investigation Report, *Bus Fires in New South Wales in 2013*, available at www.otsi.nsw.gov.au

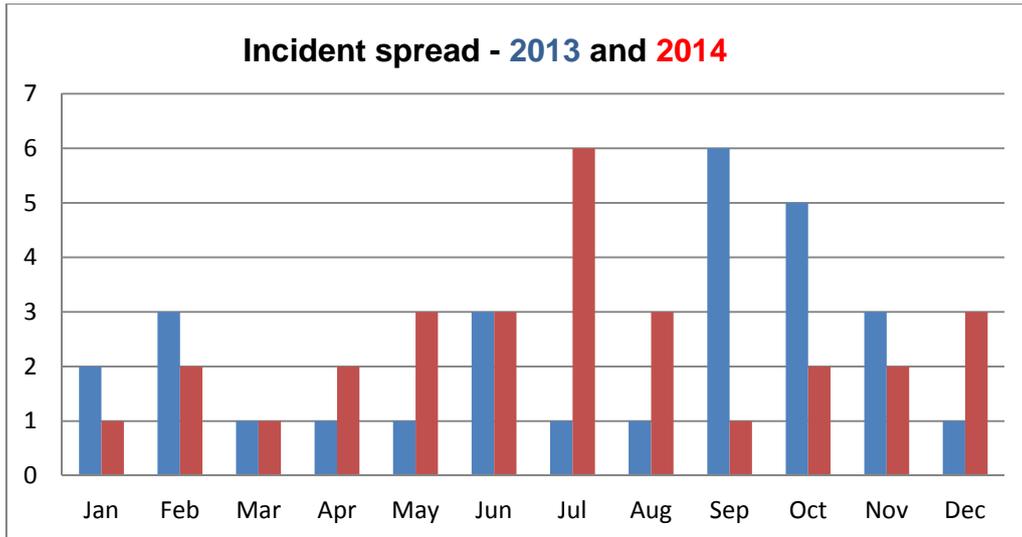


Figure 1

In 2013 eight (28%) coaches were involved in incidents; whereas in 2014 coaches only featured on three (10%) occasions. Apart from a 1989 coach and a 1993 model bus, the ages of the buses involved ranged between one and 17 years (see *Figure 2*). Seven different makes of vehicle were involved. Twenty-four of the buses were diesel-fuelled; the remaining five were CNG-fuelled. The CNG-fuelled buses all experienced fluid leaks which involved coolant or oil coming into contact with hot surfaces.

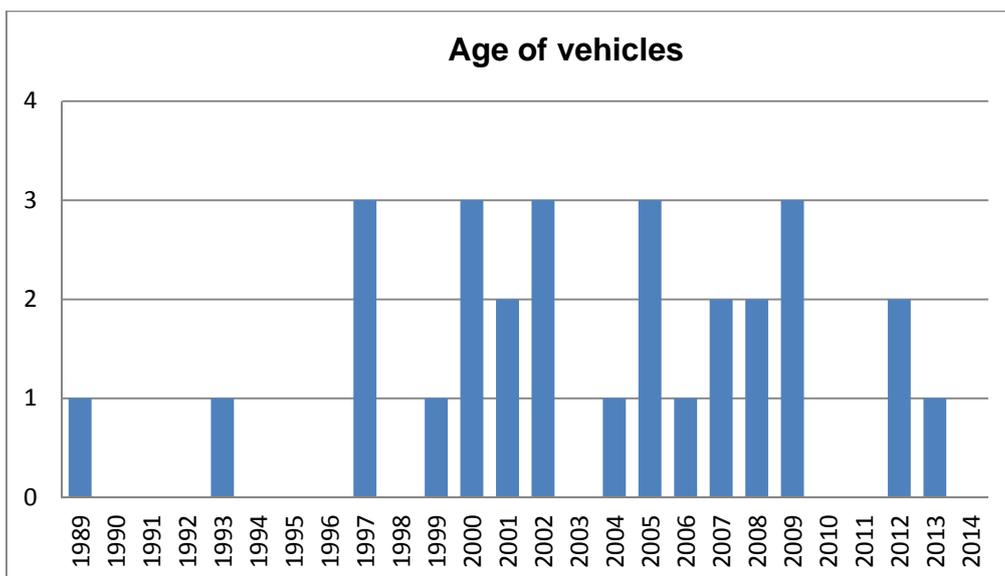


Figure 2

Only one vehicle suffered major damage. One suffered moderate damage. This was a very good result when compared with 2013 when five vehicles were effectively

destroyed and two vehicles were assessed as having suffered major damage. Based on operator reports, 15 incidents were assessed as resulting in minor damage and another 12 were reported as having resulted in nil or negligible damage.

Fortunately there were no casualties and, unlike the previous year, there were no reports of anyone suffering the effects of smoke inhalation. Approximately 301³ passengers had their travel affected by the incidents. On 11 occasions the bus was empty of passengers. The largest number involved in a single incident was 65 with the journey being in the morning peak.

Origins and Causes

Fourteen fires originated in the engine bay compared with 16 in 2013. Eleven originated in a wheel well. Ten of these were associated with brakes, the other with a tyre. This represents a marked increase on 2013 when six originated in the wheel well area. Four originated in another location within the body of the vehicle compared with five in 2013 (see *Figure 3*).

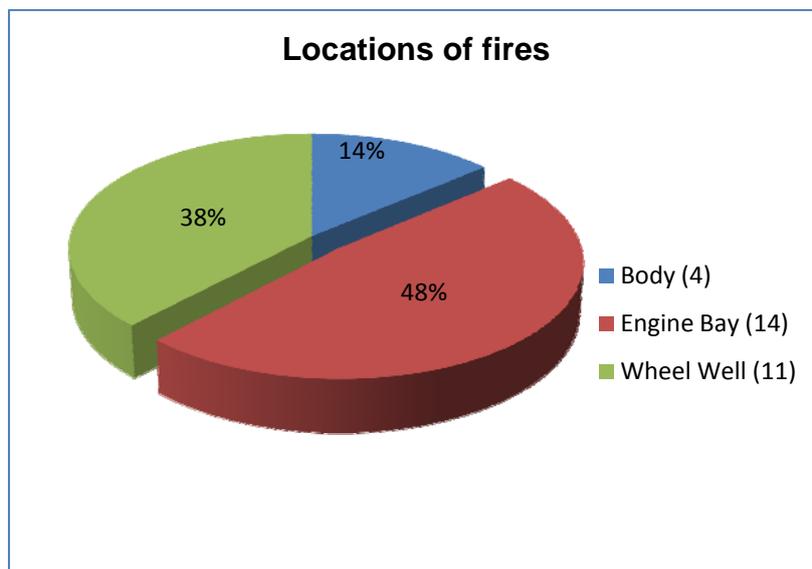


Figure 3

Indicative overseas experience recorded in the 2005 – 2012 Report was that 70-75% of fires originate in the engine bay and wheel wells combined, with the wheel wells contributing 20-25%. In NSW in 2013 the combination accounted for 78% of all

³ The number is approximate as some of the operators were only able to provide estimates of passenger numbers.

incidents with 21% originating in the wheel wells. In 2014 the figures were 86% and 38% respectively.

Fires linked to the turbocharger featured prominently in the 2005 - 2012 Report but none were reported in 2013. In 2014 there was one instance when the oil supply connection to the turbocharger unscrewed, and another when the oil supply line cracked. In both cases the result was that oil was sprayed under pressure around the engine bay, igniting on the hot exhaust.

The data for the causes of fires in 2014 are shown in *Figure 4*. The percentages are broadly consistent with previous experience but with small reductions in the number of fires caused by electrical faults and fluid leaks being off-set by the increased number of brake related incidents.

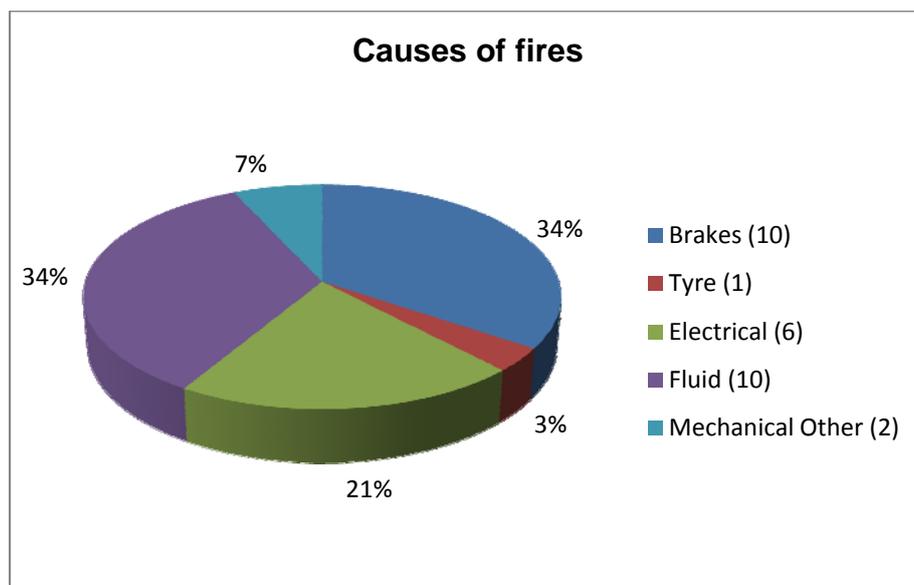


Figure 4

Reports by operators identified brake adjustment (3), sticking brake callipers (3) and driving technique (2) as the main reasons for brake related incidents. The exact mechanism that caused another was not clear. A tenth resulted from an air leak which caused the brakes to apply unintentionally. One report of sticking brake callipers stated there was a known fault, “subject to a manufacturer’s recall”. Of the incidents reported as driver-related, one was due to the manner in which the handbrake was used and the other was attributed to overheating caused by overuse of the brake on an extremely hot day.

The proportion of electrical fires (21%) has shown a reduction on previous years, 29% in 2013 and 27% in the 2½ years to 30 June 2012. Of the six electrical fires, three occurred in the engine bay. One of these resulted from a tree branch being caught up underneath the vehicle causing a short circuit near the alternator. The other three occurred elsewhere in the body, one in a circuit board behind the driver, one in a circuit board in the air-conditioning control unit and one in wiring under the dashboard caused by stray currents resulting from shorting in high tension cabling under the chassis near the transmission.

There was a small reduction in the number of incidents due to fluid leaks. Coolant was involved on five occasions, oil on four and diesel fuel on the other. The majority of incidents did not progress beyond the production of smoke from fluids coming into contact with hot surfaces, the manifold in five instances (see *Photograph 1*). No actual fires due to fluid leaks gained a hold before being extinguished by drivers with onboard portable fire extinguishers. Two fires extinguished without any intervention.



Photograph 1: Fluid leak onto manifold lagging

Of the two incidents referred to as ‘mechanical other’, one was caused by dust and/or debris coming into contact with internal heater motor brushes. Smoke ceased being generated when the engine was turned off. The other resulted from a seized bearing in a fan belt drive.

Detection of Fire

The 2005 - 2012 Report found that in most cases the bus drivers were unaware of a fire until alerted by another party. By comparison in 2013, it was the bus driver who either saw or smelt smoke or saw flames before anyone else on 17 (63%) occasions. This trend of vigilance on the part of drivers continued in 2014 when drivers were the first to become aware of a problem on 23 (79%) occasions. On one of these occasions it was due to a warning light and audible alarm indicating an electrical fault and on another it resulted from the investigation into the reason for an observed low coolant indication. Passengers alerted the driver on only one occasion and passers-by on four occasions including one involving a bus parked and unattended in a repairer's yard. On another occasion it was the driver of a following bus who raised the alarm on observing smoke and flames emanating from the engine bay of the bus in front. There were no reported instances of activation of an alarm associated with an installed fire suppression system.

Fire Fighting

Portable fire extinguishers were used on 19 occasions. The sole use of portable extinguishers was successful on 17 of those occasions. On one occasion the portable extinguisher served to suppress the fire until emergency services arrived. The other occasion involved the unattended bus in a yard when six extinguishers proved insufficient, but emergency services arrived promptly and saved the vehicle from destruction.

Use of a fire extinguisher was found to be unnecessary on 10 occasions. This was usually where smoke was associated with brake problems. Conversely, portable extinguishers were used on several occasions as a precaution only when there was smoke but no fire emanating from wheel wells. Three instances were reported of fires "self-extinguishing", two when the vehicle's ignition was switched off and one when the emergency gas shut off was engaged. Fire extinguishers were not used on any of these three occasions even as a precautionary measure.

Driver Training

Driver training in the supervision of vehicle evacuation and use of onboard fire fighting equipment was not examined in detail though operators were asked if the drivers involved in the incidents being reported were so trained. No issues were

identified. Some of the more detailed incident reports added an outline of the actions taken by drivers and these demonstrated effective and efficient evacuation procedures had been implemented.

Progress on Implementing Recommendations

Based on advice from Transport for NSW (TfNSW), the Bus Industry Confederation (BIC) and the Roads and Maritime Services (RMS), the status of action in response to the key recommendations contained in the 2005 - 2012 Report is as set out below.

The BIC released its *Fire Mitigation Advisory* at its national conference in October 2014. It has been distributed widely in both hardcopy and on-line. The BIC estimates more than 90% of bus operators have received the publication and are either implementing or reviewing the recommendations contained in the Advisory. The Advisory has been endorsed by the Transport Industry Senior Officers Committee (TISOC) and was also presented to the Strategic Vehicle Safety and Environmental Committee (SVSEG) meeting, in December who are reported by BIC to be “overwhelmingly supportive” of the publication and its approach. TfNSW contributed funding towards the development of the Advisory and was represented on the Steering Committee.

Buses purchased under the Sydney Metropolitan and Outer Metropolitan Bus contracts are supplied under the TfNSW Bus Procurement Panel. The key findings and recommendations relating to bus manufacturing techniques and options to mitigate fire and fire damage have been incorporated into the revised TfNSW Bus Specifications. The bus specifications have adopted the risk-based approach outlined in the Advisory to minimise likelihood of bus fire and the severity if one should occur.

RMS has implemented and resourced a competent capability within its Accreditation Branch to collect, analyse and respond to bus safety data, including bus fires as a particular focus of attention. The State-wide incident reporting database is constantly reviewed by bus safety officers and investigations are generated when required. National contacts have been established for the distribution of information.

RMS is providing bus safety information to the Department of Infrastructure and Regional Development who have undertaken to distribute information to other states on a needs basis.

The Bus Operator Accreditation Scheme administered by RMS requires operators to have “thorough routine and scheduled inspection, maintenance and servicing plans and programs”. The implementation and effectiveness of these are reviewed during the onsite and self-assessment audits undertaken on and by bus operators.

Conclusions

Though the number of bus fires reported in 2014 is similar to 2013, the severity of the damage to the vehicles in 2014 is noticeably less. The increasing trend over recent years of drivers being the first to detect smoke and/or flames has continued. The increase in the number of fires in wheel wells is worthy of monitoring to determine whether or not a trend is developing or 2014 represents a statistical anomaly.

In the BIC's *Fire Mitigation Advisory*, the industry as a whole now has a very valuable set of guidelines and tools to assist in implementing a risk-based approach to fire mitigation.

Appendix A

BUS FIRES RECORDED IN 2014

MONTH	VEHICLE TYPE	YEAR	LIKELY FIRE SOURCE LOCATION	LEVEL of DAMAGE	ONBOARD FIRE EQUIPMENT USED
Jan	Bus	2002	Leak in oil supply to turbocharger	Minor	Self extinguished when ignition turned off
Feb	Bus	2005	Coolant leak onto manifold	Nil	Not used
Feb	Bus	2000	Leak from injector pump fitting	Minor	Depot extinguishers used, successfully
Mar	Bus	2002	Short circuit near alternator	Minor	Yes, successfully
Apr	Bus	2004	Seized bearing in fan belt drive	Minor	Yes, successfully
Apr	Bus	2005	Air leak activated brakes	Nil	Not used
May	Bus	1993	Cracked oil line to turbocharger	Minor	Yes, successfully
May	Bus	2000	Coolant leak onto manifold	Nil	Yes, successfully
May	Bus	2009	Hand brake	Nil	Not used
Jun	Bus	2012	Brakes locked on	Nil	Not used
Jun	Bus	2007	Front callipers	Minor	Yes, successfully
Jun	Double Deck Bus	1997	In circuit board behind driver	Minor	Yes, successfully
Jul	Bus	2007	Badly adjusted brakes	Nil	Yes, successfully
Jul	Bus	2009	Offside rear tyre	Minor	Yes, successfully
Jul	Bus	2001	Coolant leak onto engine block	Nil	Not used
Jul	Bus	2009	Stray currents under dashboard due to shorting in HT cabling	Minor	Yes, successfully
Jul	Bus	1997	Dust/debris in contact with internal heater motor brushes	Minor	Self extinguished when ignition turned off
Jul	Bus	2006	Sticking brakes	Nil	Not used
Aug	Bus	2001	Engine oil leak from head gasket	Nil	Not used. Emergency gas shut off engaged
Aug	Coach	1997	Suspected electrical	Major	Yes, unsuccessfully
Aug	Bus	2000	Oil leak from valve cover gasket	Minor	Yes, successfully
Sep	Bus	2008	Sticking brake calliper	Nil	Not used
Oct	Coach	1989	Branch lodged under bus caused arcing near starter motor	Minor	Yes, successfully
Oct	Bus	1999	Coolant leak onto exhaust manifold insulation	Nil	Yes, successfully

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Nov	Bus	2002	Coolant spray onto manifold from head gasket	Minor	Yes, successfully
Nov	Coach	2012	Overheated brakes	Nil	Yes, successfully
Dec	Bus	2005	Faulty air-conditioning replacement component	Moderate	Yes, suppressed fire
Dec	Bus	2008	Sticking brake calliper	Minor	Yes, successfully
Dec	Bus	2013	Brakes locked on	Minor	Yes, successfully