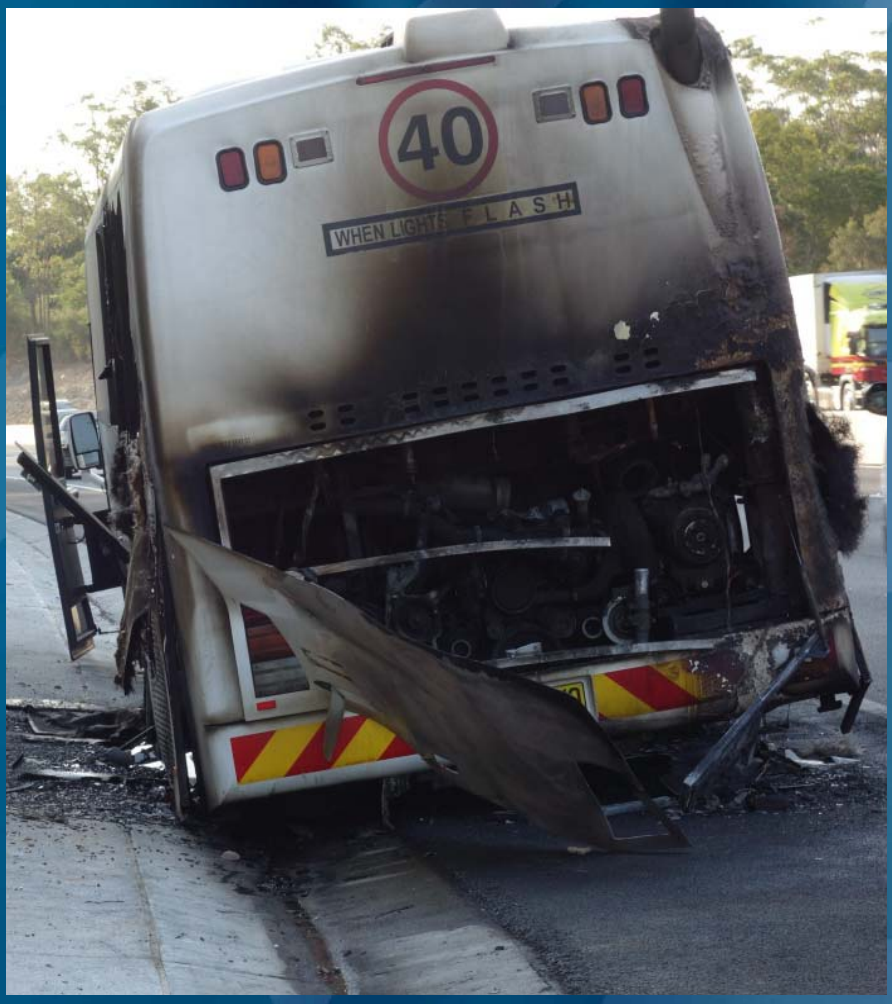
OTSI Office of Transport Safety Investigations

BUS SAFETY REPORT

BUS FIRES IN NEW SOUTH WALES IN 2013



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BUS FIRES IN NEW SOUTH WALES IN 2013

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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 2013

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 investigation also drew comparisons with the experience of other national and international jurisdictions.

During the preparation of the 2005 - 2012 Report, it became evident that the number of bus fires was not abating and, in fact, may have been increasing over time.[2] Consequently, it was considered important to continue monitoring the extent, origins and causes of bus fires reported to OTSI.

During 2013 all reported fires were documented, including so-called 'thermal' or 'smoke/ing' events. In the majority of cases, OTSI investigators inspected a vehicle as soon as practical after the event. When vehicles were not examined in detail with the resultant technical inspection findings published by OTSI, a proforma was used to collect basic information about the vehicles and the event. In straightforward cases where the deployment of an investigator was considered likely to be of limited added value, information was taken over the phone from the operator, e.g., in the case of overheating brakes not resulting in a fire, or where the cause was readily identifiable and the damage was only minor.

This report provides a summary of the information gathered over the 12 months and provides commentary on comparisons with the information recorded for the period 2005-2012. It also briefly records the progress on recommendations made in the 2005 - 2012 Report.

The Numbers

A total of 28 fires were reported in the year (see Appendix A for brief details). Interestingly, half occurred in the Spring months – six in September, five in October

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

2 The term 'bus' is used throughout to cover both buses and coaches except where it is necessary or appropriate to differentiate.

and three in November (see Figure1). This is not a pattern that has been identified previously so may be purely coincidental.

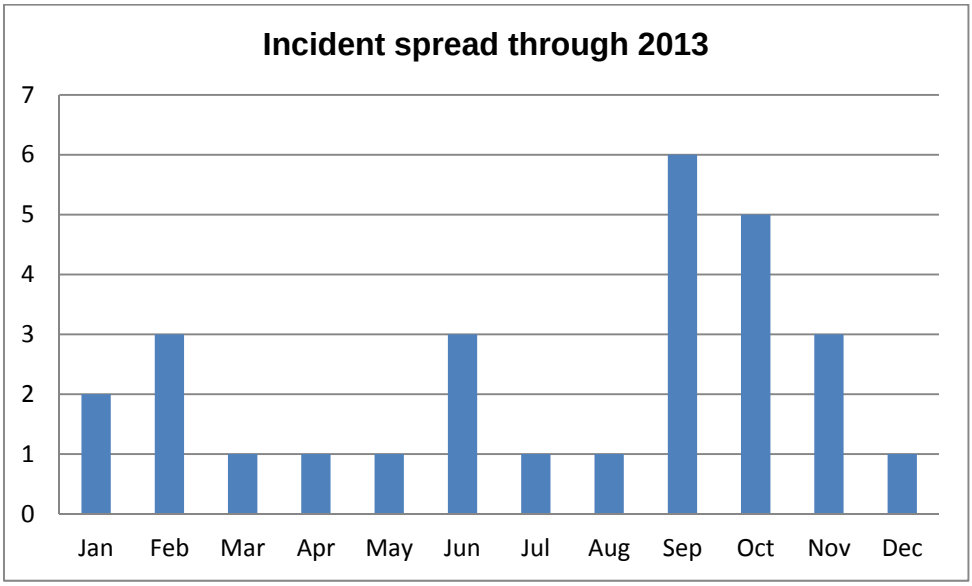

Figure 1

Apart from one 1987 model bus, the ages of the buses involved ranged from three to 20 years (see Figure 2) and eight different makes of vehicle were involved. The majority of buses (75%) were diesel-fuelled; the remainder were CNG-fuelled. There were no incidents involving fuel on the seven CNG-fuelled buses; six of those fires involved the coolant system and the other involved sticking brakes.

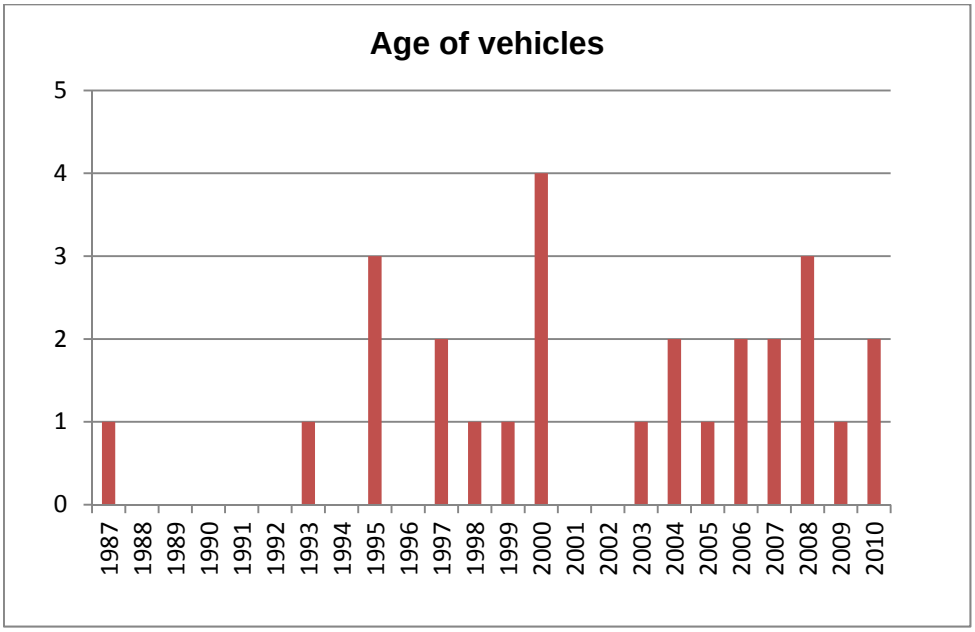

Figure 2

Based on OTSI investigators' observations, 18 (64%) of the vehicles were assessed as having suffered only negligible to minor damage and could be readily returned into service. Five vehicles were effectively destroyed; four coaches and a minibus. The minibus was the only one where it was not possible to identify the cause and seat of the fire with any degree of confidence. Two vehicles were assessed as suffering major damage; one was a coach and the other was a bus which was deliberately set on fire at its depot. There were no readily identifiable factors that would explain the severity of damage to coaches compared to buses. Such disproportionate representation was not experienced in the previous two years.

Fortunately there were no casualties, although there were a few occasions when passengers were reported as suffering minor effects of smoke inhalation. The total number of passengers travelling on buses that experienced fires was 477. On eight occasions the bus was travelling empty. The largest number involved in a single incident was 52, being a school group returning home from an excursion.

Origins and Causes

Sixteen fires originated in the engine bay, six in a wheel well and five in another location within the body of the vehicle (see Figure 3). (The vehicle destroyed in an arson attack has not been included in these figures.) There were no instances of fires caused by debris being caught up in a vehicle as had occurred on several previous occasions.

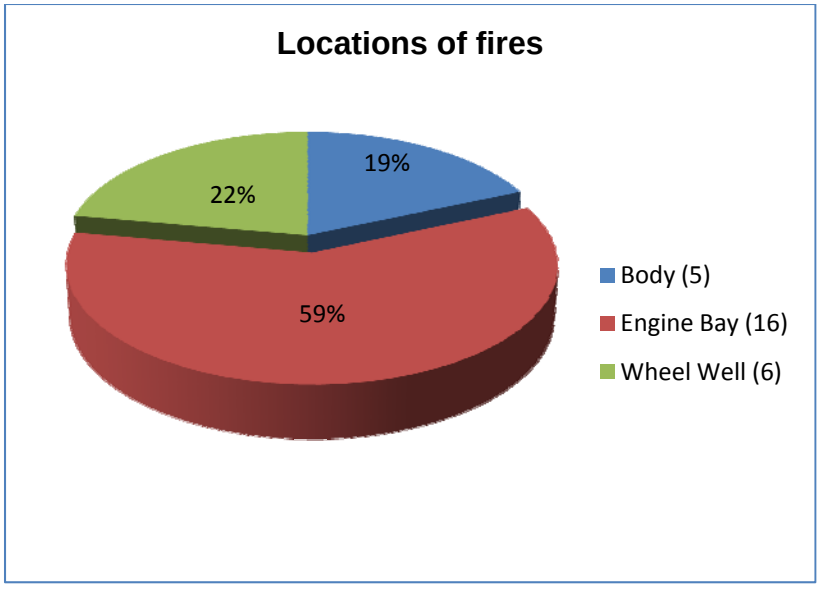

Figure 3

The proportion of fires by location of origin is generally consistent with previous experience. A review of claims from 2007 to 2011 by a leading US insurance company found that approximately 60% started in the engine bay and approximately 20% in the wheel wells.[3] In Finnish studies, 52% of fires originated in the engine compartment over the two years 2000 and 2001, while the proportion was approximately 50% over the two years 2010 and 2011, with approximately 25% in the wheel wells in the same period.[4]

The five fires originating in the body were all caused by faults associated with the electrical wiring. Only two of these were in the passenger compartment – a short circuit in the cruise control unit and in the dashboard or the wiring harness under the floor.

Fires linked to the turbocharger featured prominently in the 2005 - 2012 Report but the turbocharger was not mentioned in any of the reports of fires received in 2013.

The data for the causes of fires is shown in Figure 4. Apart from the main three causes and arson, one could not be established definitively due to the extent of damage and one was caused by mechanical failure of the intercooler bearing.

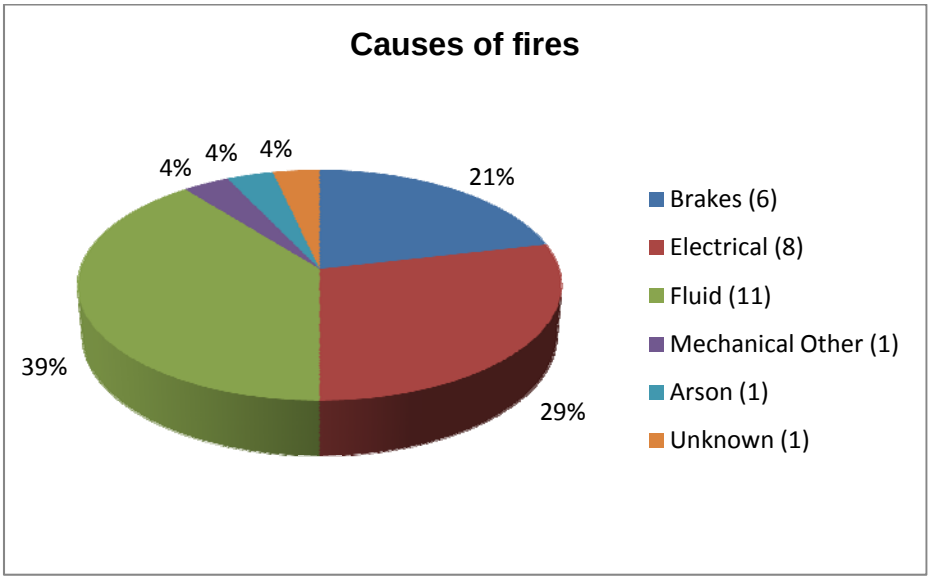

Figure 4

By comparison with the 15 fires examined by OTSI in the 2½ years to 30 June 2012, the proportion of electrical fires has remained about the same (29% compared with

[3] OTSI Bus Safety Investigation Report, op.cit., p.27
[4] ibid., pp.30,32

27%); the proportion of brake 'thermal incidents' has almost doubled, but the proportion of fluid (fuel, oil, coolant) related fires has dropped by a third. The increase in brake issues may be due to improved reporting more than any other reason as 'thermal' and 'smoking' incidents were not necessarily treated as potential fire risks until relatively recently.

Fires due to fluid leaks remain a concern despite the significant reduction in the relative proportion of their occurrence. Coolant was involved in six instances and split hoses were responsible for five of them. Of the five fires caused by fuel and oil leaks, at least three resulted from fuel line failure or loose connections.

Detection of Fire

The mode of detection of the fires in 2013 varied significantly from what was recorded in previous years. The 2005 - 2012 Report found that in most cases:

> ... the bus drivers were unaware of the fire until alerted by other motorists, by passers-by or by passengers as smoke appeared in the rear window and/or commenced entering the interior of the bus.[5]

By comparison in 2013, it was the bus driver who either saw or smelt smoke or saw flames before anyone else on 17 (63%) of the 27 occasions. On four occasions it was the passengers who alerted the driver and on another four occasions it was a person external to the vehicle who raised the alarm. On the two other occasions it was the alarm associated with an installed fire suppression system that activated in the first instance.

Fire Fighting

An onboard portable fire extinguisher was used on 16 occasions. The sole use of the portable extinguisher was completely successful on eight of those occasions. It was unsuccessful on one occasion and only partially successful on another. On one occasion the use was reportedly successful but the fire subsequently reignited. On another occasion a portable extinguisher was used in conjunction with the installed fire suppression system. The water mist system suppressed the fire satisfactorily, leaving minimal residual fire which was well within the capacity of the portable extinguisher to handle. It was the only incident reported which involved the activation

[5] ibid., p.8

of a fire suppression system. A retrofitted fire suppression system was reported as installed in a bus on another occasion but it was not activated due to the fire being located in the wheel well.

On one occasion the extinguisher was used as an extra precaution after the fire had 'self-extinguished'. On another, it was used only against a localised grass fire ignited by the fire on the bus. On two occasions they were used in conjunction with another hand held extinguisher provided by a motorist who had stopped to assist.

In those cases where the onboard extinguisher was not used, the reasons were varied. Circumstances of non-use included such factors as the extent and intensity of the fire being clearly beyond the capacity of a portable device; an extinguisher not being accessible to the driver due to its storage location vis-a-vis the location and spread of the fire, or there were no flames such as in the case of overheated brakes.

All extinguishers used were 2 - 2.5kg in capacity, with the exception of one 3.1kg extinguisher. All extinguishers complied with the requirements of *Australian Design Rule 58/00 – Requirements for Omnibuses Designed for Hire and Reward* and, in the majority of cases, they were used successfully to the extent that comparatively minor damage resulted from the fires.

The matter of the rear-mounted extinguishers on coaches not being accessible due to a combination of their proximity to, and the intensity of, the fire arose on several occasions. ADR 58/00 requires buses to be equipped with a readily accessible fire extinguisher selected and located in accordance with Australian Standard (AS) 2444—2001, *Portable fire extinguishers and fire blankets – Selection and location*. For a coach, one has to be mounted 'near the under-floor area or engine'.

There are no best practice guidelines on locations for fire extinguishers and hence the rear appliances on coaches may be found in the engine bay, on the off side of the vehicle and/or stowed in locked compartments. One operator commented that:

> 'Fire extinguisher location by some bus manufacturers seems to be an afterthought in the manufacturing process' ... placing them where ... 'they will fit with no real thought going into the placement of extinguishers'.

This operator intends fitting 4.5kg extinguishers to the luggage bin area of its long distance vehicles.

Driver Training

The extent of driver training in the supervision of vehicle evacuation and use of onboard fire fighting equipment was not examined in detail. It was indicated on only one of the 16 occasions information was provided that the driver had not been trained. However, the nature and extent of such training may be worthy of further investigation. During one investigation, it was found that during training of new drivers, the only scheduled activity in fire fighting and use of a portable fire extinguisher consisted of watching a video of an extinguisher being used on a burning timber pallet. However, another operator indicated an intention, in conjunction with a sister company, to develop training in the use of fire extinguishers which will involve a short practical training exercise and form part of their driver's induction package. Yet another conducts a day of refresher training for drivers annually which covers emergency procedures and the operation of a 2.3 kg dry chemical fire extinguisher.

Disabled Evacuation

During its investigations, OTSI encountered two coaches where disabled access was achieved through the use of a wheelchair lift installed in the rear of the underfloor luggage compartment on the nearside, just to the rear of the centre of the vehicles (see Photograph 1). While this might meet accessibility requirements, it is questionable if the arrangement would facilitate rapid evacuation in an emergency especially in the case of more than one wheelchair-bound passenger being involved.

Photograph 1: Wheelchair lift deployed

Progress on Implementing Recommendations

Based on advice from Transport for NSW (TfNSW) and the Bus Industry Confederation (BIC), the status of action in response to the key recommendations contained in the 2005 - 2012 Report is as follows:

TfNSW plans to enter into discussions with the Roads and Maritime Services (RMS) on the matter of establishing a permanent resource dedicated to building a comprehensive State-wide bus fire reporting regime, maintaining the database, and undertaking research and analysis of causes, effects and trends in bus fires. RMS administers the current bus incident database. The Bus Fire Advisory Steering Committee is advocating for the BIC to manage a national database.

The subject of bus fires, likely causes and possible solutions raised with the Australian Motor Vehicle Certification Board (AMVCB) and the Technical Liaison Group (TLG) in February 2012 was deferred to a proposed single issue working group (SIWG) to be convened to review a range of bus-related items and ADR 58 in particular. The SIWG is yet to convene. The Centre for Road Safety will ensure it is discussed at forthcoming Strategic Vehicle Safety and Environment Group and AMVCB meetings. Neither Government nor industry support the State independently introducing changes to design rules and standards.

The Bus Fire Advisory being prepared by the BIC is in final draft form and is expected to be released in May 2014 following detailed consideration by the Steering Committee. Both TfNSW and RMS are represented on the Steering Committee

Conclusions

The conclusions drawn in the 2005 - 2012 Report are just as relevant to 2013 as they were for the seven years it examined:

> Available data indicates some overall consistency over time in relation to the causes of fires. The majority of fires originate in the engine compartment due mainly to flammable liquids and gases coming into contact with very hot engine components because of loose fittings and/or damaged hoses/lines. Electrical fires account for around 20-25% of fires. Up to about 25% of fires originate in the wheel wells mainly due to brake problems. Comparatively few

> originate in the passenger compartment and those that do are often electrical fires behind the dashboard.[6]

The reduction in the proportion of fluid related fire is notable as is the significant increase in the number of occasions the driver has been the first person to detect a fire situation.

[6] ibid., p.36

Appendix A

BUS FIRES RECORDED IN 2013

MONTH	VEHICLE TYPE	YEAR	LIKELY FIRE SOURCE LOCATION	LEVEL of DAMAGE	ONBOARD FIRE EQUIPMENT USED
Jan	Coach	2008	Fuel or oil leak	Destroyed	Not used
Jan	Bus	2000	Coolant leak	Minor	Not used
Feb	Bus	2000	Split coolant hose	Minor	Portable extinguisher
Feb	Bus	2000	Split coolant hose	Minor	Portable extinguisher
Feb	Bus	2006	Short circuit in cruise control unit	Minor	Not used
Mar	Bus	1997	Short circuit in fuse box wiring loom	Minor	Portable extinguisher
Apr	Bus	2008	Arson	Major	Not applicable
May	Bus	1993	Short circuit in wiring loom near gearbox	Minor	Portable extinguisher
Jun	Bus	1987	Short circuit in wiring harness near gearbox	Moderate	Not used
Jun	Coach	2007	Electrical fault in wiring looms	Destroyed	Portable extinguisher
Jul	Bus	2009	Overheated brakes	Nil	Not used
Aug	Bus	1999	Split coolant hose	Minor	Portable extinguisher
Sep	Bus	2008	Sticking brakes	Nil	Not used
Sep	Bus	2007	Overheated brakes	Very minor	Not used
Sep	Coach	1995	Alternator	Moderate	Portable extinguisher
Sep	Bus	1995	? Defective regulator	Moderate	Portable extinguisher
Sep	Coach	2004	Overheated brakes	Very minor	Portable extinguisher
Sep	Coach	2006	Overheated brakes	Very minor	Portable extinguisher
Sep	Bus	2000	Split coolant hose	Very minor	Portable extinguisher
Oct	Bus	1998	Injector line mechanical damage	Minor	Portable extinguisher
Oct	Bus	2010	Brake maladjustment	Very minor	Portable extinguisher
Oct	Bus	2003	Intercooler fan bearing seized	Minor	Portable extinguisher
Oct	Bus	1997	Fuel leak - loose injector fitting	Minor	Portable extinguisher

Nov	Minibus	2002	Engine area *	Destroyed	Not used
Nov	Coach	2004	Fuel leak	Major	Not used
Nov	Coach	1995	Electrical short circuit at rear	Destroyed	Not used
Nov	Bus	2010	Split coolant hose	Minor	Fire suppression and Portable extinguisher
Dec	Coach	2005	Loose fuel line	Destroyed	Portable extinguisher

*****Cause not yet definitively established