



Office of Transport Safety Investigations



TECHNICAL INSPECTION FINDINGS

Fire Involving *Come' On Tours* Coach

Kosciuszko Road, Jindabyne

7 August 2010

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KOSCIUSZKO ROAD, JINDABYNE

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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, coach 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.

It is not within OTSI's jurisdiction, nor an object of its investigations, to apportion blame or determine liability. At all times, OTSI strives to reflect a "Just Culture" approach to the investigative process by balancing the presentation of potentially judgemental material in a manner that properly explains what happened, and why, in a fair and unbiased manner.

The Incident

On Saturday 7 August 2010, 38 high school students and five teachers were travelling by tour coach from the Smiggins ski resort in the Snowy Mountains of New South Wales to their accommodation at Berridale, approximately 50km away.

As the coach passed through the town of Jindabyne, just over half way through the journey, the driver felt that the coach was losing power as he was having to change down gears just to keep it moving. As he looked in his passenger's side rear mirror in preparation to pull to the side of the road, he saw smoke coming from the passenger's side rear wheels.

He stopped the coach and went to check on the problem, immediately realising there was a fire within the rear wheel arch of the coach. The coach was evacuated and the driver attempted unsuccessfully to extinguish the fire while emergency services were contacted. The fire spread from the wheel arch to the interior of the coach and could not be controlled.

OTSI was notified of the incident by the proprietor of *Come' On Tours* through the 24 hour on-call incident reporting system. Police attended, and having established that there were no suspicious circumstances, confined their actions to making a record of the matter.

Result

The coach was destroyed and many of the personal belongings and rented ski equipment stowed on board were lost. None of the passengers was injured but the driver was conveyed to hospital suffering from exhaustion and smoke inhalation.

Under instructions from the operator's insurer, the coach was recovered from the site of the fire on Thursday 12 August and transported to Queanbeyan.

The Coach

The vehicle was a 1987 model Mercedes 0303 series coach, fitted with a normally aspirated V8 diesel engine and a manual transmission. The coach had travelled approximately 1.6 million kilometres since new but had undergone a number of mechanical re-conditioning processes during its service.

The coach was the only vehicle owned and operated by *Come' On Tours*, based in Sydney.

Damage

Photographs 1, 2 and 3 depict the extent of fire damage to the coach.



Photograph 1: View of passenger's side showing origin of fire



Photograph 2: Seating and flooring looking forward



Photograph 3: Rear drive axle and fire damaged tyre

Examination

The coach was initially examined by OTSI on Friday 13 August at a repairer's holding yard in Queanbeyan.

Corroborating the driver's version of smoke initially coming from the passenger's side rear wheels was a distinct burn pattern emanating from the rear drive wheel (forward rear axle), indicating the fire's origin.

Both rear tyres on that axle had been extensively damaged by fire but it appeared unlikely that the fire had actually started in the tyres since there was no evidence of the tyres having run deflated. However, there was evidence present around the backing plate, brake drum, rims and hub to show that there was a concentration of excessive heat at the passenger's side rear brakes.

Because it was not possible to access the underside of the coach, a full and thorough inspection of the braking system was not possible on this occasion, but the following was noted:

- the braking system comprised of full air brakes with an antilock braking system (ABS) and automatic slack adjusters;

- the passenger's side brake chamber push rod was extended noticeably further than the driver's side push rod;
- there was approximately 4mm of friction material on the passenger's side rear brakes; and
- the brakes were in the applied position.

A second inspection of the coach was carried out on 12 October 2010, where arrangements had been made to access the services of a heavy vehicle mechanic to assist with tooling for the dismantling of the rear brakes.

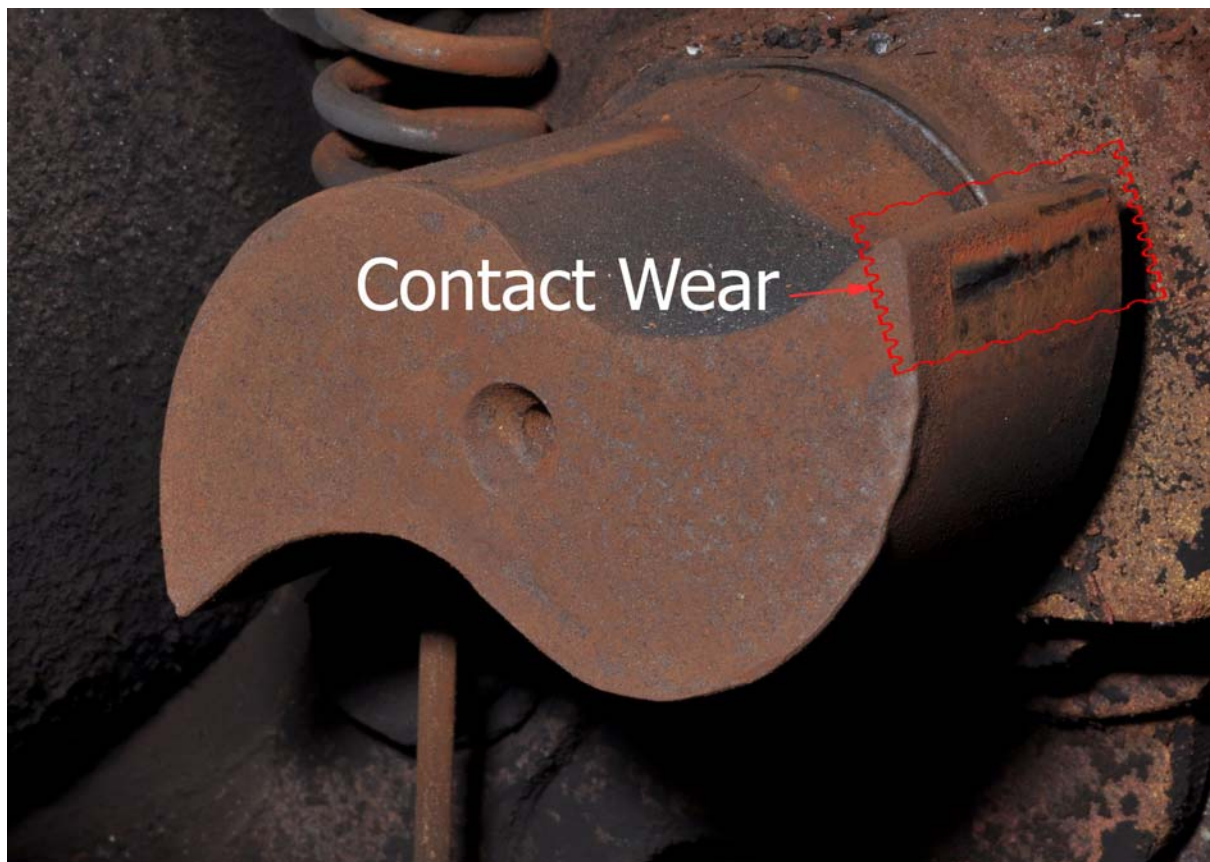
The remnants of both passenger's side rear drive axle tyres and the brake backing plate were removed. The 'S' cam, which transfers rotary motion from the 'S' cam shaft into the linear motion of the brake shoes for brake applications, could be seen in contact with both brake shoe rollers at the limit of its effective travel (see *Photograph 4*). The hub and drum assembly could not be rotated by hand, confirming that the brakes were locked in the applied position.



Photograph 4: 'S' cam in contact with brake roller at limit of travel

The brake chambers have a spring-applied emergency / parking brake feature which applies automatically when there is a loss of braking system air pressure. Due to the incineration of the brake air supply lines, the brakes would be applied through spring pressure from the brake chambers due to the consequent loss of air pressure. That being the case, releasing the spring brake through backing off the manual brake release located at the rear of the chamber should have released the brakes. However, despite manually releasing the brakes, the 'S' cam shaft did not move and the brakes remained in the applied position.

The brakes could only be released after repetitive tapping of the shaft and loosening of the slack adjuster. Once released, the drum was removed for inspection and it was found that both the drum and friction material were worn which explains the excessive travel of the 'S' cam. Witness marks on the 'S' cam surface showed wear points at the limit of its travel (see *Photograph 5*). Rotating any further would have allowed the 'S' cam to travel over-centre, resulting in the brakes not functioning at all on that side.



Photograph 5: Wear pattern on 'S' cam visible after disassembly

The friction material riveted to the brake shoes was worn unevenly (see *Photograph 6*), with a maximum thickness of 6.5 mm at the edges (see *Photograph 7*). The lining material may be up to 19 mm thick when new, and has an allowable maximum wear thickness down to 5 mm. This, combined with approximately 2.5 mm wear to the drum (see *Photograph 8*) would have been sufficient to allow for the excessive travel of the 'S' cam.



Photograph 6: Uneven wear across surface of the brake lining



Photograph 7: Brake lining thickness at maximum point



Photograph 8: Brake drum wear evident by 2.5 mm lip on drum

The brake drum displayed clear evidence of undergoing excessive heat loading, with bluing and surface cracking throughout the friction surface of the drum (see *Photograph 9*). Further evidence of overheating was that the friction material had decomposed and cracked away from the shoes, and the shoe return springs had lost their tension. The heat damage to the braking components greatly exceeded normal operating temperatures. This is most probably the origin of the fire, with the fuel for the fire being the rubber of the inner rear tyre.



Photograph 9: Heat damage to brake drum and remnants of friction material

Observations

The fire appeared to have spread from the wheel arch to the interior of the coach through the flooring in the adjacent luggage compartment. Once the fire had spread to the interior, the burn pattern appeared to indicate that the fuel load for the fire was concentrated in the materials used in the seating upholstery. *Photograph 10* shows the burn pattern around the rear bulkhead, consistent with intense heat coming from the combustion of the seating upholstery fabrics.

The apparent very high flammability of the interior upholstery fabrics is reason for concern. The only relevant coverage of fabric flammability in Australian Design

Rules (ADR) is in ADR 58.17 *Requirements for Omnibuses Designed for Hire and Reward 2006 – Interior Fittings/Materials* which states: “Interior roof lining and other interior trimming shall be of a material not readily flammable ...”. However, the Australian Motor Vehicle Certification Board has listed but not yet prioritised a need for an ADR concerning: “Burning behaviour of materials used in the interior construction of certain categories of motor vehicles”. It has identified a United Nations Economic Commission for Europe (UNECE) regulation, ECE R 118, as potentially suitable for adoption by Australia.



Photograph 10: Burn pattern on rear aluminium bulkhead

The coach displayed a burn pattern characteristic of a compartment fire with the sides, windows and roof of the coach replicating a compartment. Compartment fires grow rapidly due to reflected heat increasing internal temperatures exponentially as the fire grows. Flashover occurs when materials away from the initial point of the fire are subjected to gas temperatures above their auto ignition temperatures, effectively meaning that all surfaces burst into flames at approximately the same time. It was apparent from floor to ceiling charring, burning of the floor and destruction of all windows, that the fire was able to reach flashover within the coach. This also

accounts for witness observations that the fire totally consumed the coach within minutes.

Conclusion

The fire originated at the passenger's side rear drive hub with the cause of the fire being overheating of the brake drum through dragging brakes. This generated enough heat to ignite the inner rear tyre, with the evolving fire spreading into the luggage compartment adjacent to the rear wheel well and then through the floor of the coach and into the interior furnishings.

Portable extinguishers used to combat the fire in the early stages proved ineffective as the heat energy within the brake drum and wheel would have been far too high to have been countered effectively by the extinguishers. The subsequent spread of the fire to the inside of the bus was therefore unavoidable.

On the basis of these findings OTSI has determined that the incident does not require further investigation under the provisions of *Section 46BA (1)* of the *Passenger Transport Act 1990 (NSW)*.

A copy of these Findings has been provided to *Come' On Tours* and Transport NSW, and to the Australian Motor Vehicle Certification Board for consideration in relation to prioritising the development or adoption of an appropriate ADR.