A choice between Life and Death

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ABSTRACT

On 16 April, 2009, a tragic single vehicle collision occurred on the Princess Highway, Heathmere, Australia. On the fateful evening, the driver safely negotiated the 53 seat coach and eleven unassuming passengers around a right curve before continuing into a straight section of road where the vehicle speared onto the incorrect side of the road and into the path of an oncoming vehicle. The driver of the coach input a severe left manoeuvre to avoid colliding with the oncoming vehicle resulting in a loss of control and subsequent rollover of the coach. Five passengers were ejected and three, including a 2 year old child, sustained fatal injuries.

The author, a collision reconstruction expert with Victoria police, attended the collision and identified a number of choices which had been made that ultimately led to the death of three people.

This paper will look at the circumstances which contributed to the collision and the untimely deaths. The road surface was identified as a significant contributing factor due to skid resistance levels falling well below recommended levels. The road had been identified as being in need of repair in 2004 when another fatal collision occurred at the same location. A funding bid was launched to perform repairs. Due to funding failings, only a partial repair was made. Contractors who performed minor maintenance at the location in February 2009 failed to alert the governing body of the poor road condition. Two months later the tragic collision occurred. The three passengers who died were not wearing seat belts. Seat belts were fitted to all seats on the coach.

1 WHY DOES ROAD FRICTION MATTER

Around the world, collision investigators and reconstruction experts are able to accurately identify the cause of serious injury and fatal collisions in most circumstances. Driver error is determined to be the sole or significant contributing factor in most collisions. When collision reconstruction experts attended at the scene of the triple fatal collision on the Princess Highway, Heathmere, on 16 April, 2009, the cause of the collision was not immediately clear.

Initial investigation approaches concentrated on vehicle speed, driver fatigue and driver error, all of which were all eliminated. More than 12 hours after the collision, skid resistance tests were performed at the collision scene. The tests produced significant variations in results within a small area of road. The results fell well below recommended investigatory levels. If contributing environmental factors, including road surface friction levels are not identified and rectified then there is substantial risk that the collision will occur again in addition to the risk that innocent drivers being incorrectly prosecuted.

In 2004, investigations into a single fatal collision at the same location did not examine the skid resistance levels at the site. Since that time, inadequacies in road surface condition at the site were identified and partial repairs were made in the area. The serious risks involved with poor road surface skid resistance, variation in skid resistance levels in a small area and the extreme weather conditions were each underestimated and ultimately contributed to a tragic collision in 2009, when 3 innocent lives were lost.

2 A CHOICE BETWEEN LIFE AND DEATH

On 16 April, 2009, a triple fatal collision occurred on the Princess Highway, Heathmere, Australia. On the fateful evening, the experienced driver safely negotiated the 53 seat coach and eleven unassuming passengers around a right curve before continuing into a straight section of road where the driver unexpectedly lost control of the vehicle. The coach speared onto the incorrect side of the road and into the path of an oncoming vehicle. The driver of the coach input a severe left manoeuvre in an attempt to avoid colliding with the oncoming vehicle. The steering input by the driver led to a subsequent roll over of the coach. During the rollover, 5 passengers were ejected. 3 of the ejected passengers, including a 2 year old child and her heavily pregnant mother, sustained fatal injuries. The deceased mother was 7 months pregnant.

The author, a collision reconstruction expert with Victoria police attended the collision and identified a number of choices which had been made that ultimately led to the death of three people.

The road surface was identified as a significant contributing factor in the collision due to skid resistance levels that fell well below investigatory levels. In 2004, a single fatal collision occurred at the same location. The cause of that collision was not determined at the time. The decision was made to provide a partial repair of the road after the 2004 collision as a result of council assessments which determined lower than expected skid resistance levels. A full repair was recommended but reduced due to very high costs

associated with the maintenance. The partial repair resulted in the road having a number of different skid resistance levels in a small area. The risks of having areas with multiple skid resistance levels are underestimated. The summer months of 2009 in Australia, which preceded the collision were extreme leading to further degradation of the road surface and resulting in significant polishing and bleeding on the high traffic volume road. The extensive wear damage combined with the areas of multiple skid resistance levels and light rain provided conditions that were unforgiving on 16 April 2009. The three passengers who died were not wearing seat belts. Seat belts were fitted to all seats on the coach.

3 VICTIMS

All 12 occupants of the bus including the driver and 11 passengers sustained injuries of a varying degree. 3 passengers sustained fatal injuries and died at the collision scene. 1 male passenger sustained serious injuries, which required ongoing treatment and care. The remaining 8 passengers, including the driver, were conveyed to hospital for treatment for a range of minor injuries. Aside those physical injured in this collision there are so many other victims. Mothers lost daughters and granddaughters, Fathers lost sons, husbands lost wives. There are so many victims when it comes to road trauma. Most victims were not physically injured.

3.1 SABRINA BRADY

At the time of the collision, Sabrina Brady was 19 years of age. Sabrina had been to Melbourne for the day to visit her mother. Sabrina was 7 months pregnant and was also travelling with her 2 year old daughter, Maddision. Sabrina was returning home to her partner with whom she resided. Sabrina was seated at the rear of the bus with Maddison asleep with her head on her mums lap. Sabrina sustained chest injuries in the collision and died at the scene after been thrown from the vehicle during the rollover. She was not wearing a seatbelt. Sabrina's unborn child was also killed as a result of the collision.

3.2 MADDISON DOBIE

Maddison Dobie was just 2 years of age and the time of her death. Maddison had travelled to Melbourne with her mum, Sabrina, to visit her grandmother. They were returning home when the collision occurred. It is likely that Maddison was asleep on the rear bench seat of the bus with her head resting on her mother's lap with the collision occurred. Maddison was thrown from the bus during the rollover and died at the collision scene from head injuries. Maddison was not wearing a seatbelt at the time of the collision.

3.3 JUSTIN POMERY

Justin Pomery was a 20 year old student from Heywood when he was tragically killed. Justin had been studying in Bendigo and was returning to his home in Heywood. He boarded the bus in Warrnambool. Justin selected a seat towards the middle of the bus on the driver side. Justin was partially ejected from the bus during the rollover and died

from head injuries. He died at the collision scene. Justin was not wearing a seatbelt when the collision occurred.

3.4 LEIGH HOGGAN

Leigh Hoggan was a 25 year old man who boarded the coach in Warrnambool to return to his home in Heywood. Hoggan had been to Warrnambool for the day to visit his children. Hoggan had been seated on the driver side of the bus until they stopped in Port Fairy at which time he changed seats to the passenger side of the bus. Hoggan was wearing a seatbelt when the collision occurred. Hoggan suffered a fractured vertebra in his neck and was conveyed to the Alfred Hospital Trauma Unit for treatment. In the most part, Hoggan has now recovered from his physical injuries. Emotional injuries are much harder to overcome.

4 THE DRIVER

Mr Maxwell Shayler was aged 57 years on the evening that he was driving the Iveco Coach from Warrnambool to Mount Gambier. An experienced coach driver, Mr Shayler held a full and unrestricted Bus Drivers Licence and had been working for the same in the two years preceding the collision without incident. A local resident, he was familiar with the road and the conditions and drove accordingly. Mr Shayler was deemed to be fit for his work as a driver of heavy vehicles and suffered from no medical condition which may have reduced his ability to drive at a high standard. Despite his own injuries sustained in the collision, Mr Shayler assisted both injured and uninjured passengers from the bus after the collision. Medical examinations conducted after the collision determined that Mr Shayler was not affected by drugs, alcohol or fatigue and was not affected by any medical condition which may have caused or contributed to the collision.

5 THE VEHICLE

The Euro-3 bus chassis was purchased from Iveco by Warrnambool Bus Lines (WBL) in 2006. The body of the bus had been constructed by ‘Coach Design’ and it entered service in November, 2006. The bus was licensed to carry 53 passengers. It was intended for distance passenger travel on the V’Line run between Warrnambool and Mount Gambier and was known within the fleet as bus 38.

Post collision, a mechanical inspection was performed on the bus by a fully qualified forensic mechanic. It was concluded that prior to and at the time of impact, the vehicle as inspected would have been classed as being in a roadworthy condition. In particular all suspension components were in good serviceable condition. The vehicle had been mechanically well maintained.

The bus sustained extensive damage during the rollover collision including shattering of all the windows on the right side of the vehicle (driver side).

6 THE ROAD

The Princes Highway, Heathmere is a two lane, two way country road which runs between Warrnambool and Mt Gambier in rural Victoria, Australia. The area is surrounded by large farming properties. The opposing lanes of the highway are divided by a painted double white line, which prevents legal over taking in both directions. The road runs in a general north to south direction however there are numerous bends along its length. The road has a speed limit of 100 kph (62 mph) for all vehicles travelling in both directions. Predominantly the road is used for long distance travellers and large transport vehicles. The collision occurred about 100 km (62.1 miles) from Warrnambool in a small country area of Heathmere. Heathmere is prone to extreme hot temperatures in summer (40°C +) and extreme cold temperatures in winter (-0°C). The extreme weather conditions combined with high prevalence of high speed and heavy vehicles left the road suffering from extensive bleeding and polishing. Some areas of the road had undergone repair resulting in multiple areas with significant variation in skid resistance levels.

7 COLLISION

At about 6:40 p.m. on Thursday 16 April, 2009, the Austral passenger coach was being driven between Warrnambool and Mt Gambier. It had been raining but the rain was easing. The roads were wet and it was dark.

The bus was travelling at about 100 kph before the driver reduced his speed to around 90 kph whilst negotiating a right curve leading to a straight section of road with a mild decent. The bus was negotiated safely around the curve and commenced the straight section of road when the rear of the bus suddenly 'skipped out'. The bus slid across the centre dividing line of the road and into the oncoming lane without any steering input by the driver. The bus was almost wholly on the incorrect side of the road and approaching a vehicle travelling in the opposite direction. The driver of the coach then input a left steering manourvre in an attempt to avoid a head on collision with the oncoming vehicle and also returns the vehicle to the correct side of the road. As a result of the steering manouvre, the bus commenced to yaw. It rotated in an anticlockwise direction whilst crossing back into the north bound lane. The front of the bus continued onto the bitumen shoulder and the bus was almost 90° to the travelling direction when it tripped and commenced to roll onto the driver side of the vehicle. The bus rolled onto the right side causing all unrestrained passengers to be thrown across or out of the vehicle on the driver side. The bus continued to slide onto the driver side whilst rotating in an anticlockwise direction before coming to rest on the grass reservation on the west side of the road facing south. The bus remained on the driver side.

When the bus first commenced to yaw it was travelling at a maximum of 73 kph. An onboard visual recording of the driver identified the sudden loss of control of the bus without any input of the driver. From the recording it was evident that the driver was awake and alert.

8 COLLISION CHRONOLOGY

There was an extensive crash history at the site between 2004 and 2009. Sadly this was not the first fatal collision to occur at this location. In June, 2004, a semi trailer and prime mover combination rolled on the same curve resulting in the death of the single occupant/driver. The cause of that collision was never identified.

In August, 2004, Vic Roads conducted an inspection of the site due to the fatality in June. 'Slippery when wet' signs were installed and sideways force co-efficient routine investigations machine (SCRIM) testing requested. The SCRIM testing was performed in September, 2004 and revealed skid resistance values below the Vic Roads investigatory level. This led to a futher full site inspection in October, 2004 which identified significant texture loss. A bid for funding to reseal the road was launched in December, 2004. The bid was successful and the works were scheduled for March, 2006.

In March, 2006, the reseal was performed however an error in the bidding process meant that the reseal was 130 metres short of what was previously identified as required for the site. A further bid was made to complete the 130 metres in spring, 2006 but unfortunately the short section of reseal failed to attract funding. A subsequent pavement study in July, 2007 indicated the the road 'roughness' and wheel rutting was moderate. In spring of the same year the 130 metres of road which had not undergone reseal was identified as being in poor condition and in need of water blasting treatment. In February, 2009, the 130 metre reseal was completed. This area of reseal was immediately north of the subject crash location. The road immediately south of the coach at rest had undergone repair in this reseal.

In April, 2009, the triple fatal collision involving the Austral coach occurred. The next day the speed limit in the area was reduced to 80 kph. On 17 May, 2009, one month after the bus rollover a paper delivery truck lost control upon entering the same right bend. The reason for the loss of control was unclear but speed was not believed to be a contributing factor.

On 26 May, 2009 a SCRIM testing vehicle from NSW was transported to Victoria to test the collision site. The test revealed various surface friction results at the site. Post testing the entire site was water blasted. Subsequent SCRIM tests the day after water blasting revealed significantly increased surface friction values.

9 SKID RESISTANCE TESTS

Vic Roads are responsible for the regulation of road conditions and standards in the State of Victoria. Vic Roads provide recommended skid resistance levels based on various site categories. Henty Highway, Heathmere at the collision location is categorized as a category 2 site. Site category 2 includes curves with a radius equal to or less than 250 metres, gradients of 5% or steeper and 50 metres or longer freeway on/off ramps. It is recommended that site category 2 have a recommended investigatory skid resistance level of 0.50 with allowable risk rating adjustment zones of 0.45 to 0.60.

At about 8:00 a.m. on Friday the 17th April, 2009 a series of skid resistance tests were conducted at the collision location. All tests were performed whilst travelling north in both the north and south bound lanes in addition to a combination of both. At the time of

testing the road was wet as a result of persistent rainfall since the collision. Based on information received it was likely that the condition of the road was very similar to what it was at the time of the collision when skid resistance tests were done. Two series of tests were performed. Initially tests were conducted in a VE Holden Omega, a large family sedan. The test series was then repeated at 9:10 a.m. in a 1989 Austral passenger bus.

9.1 VERICOM BRAKE TEST COMPUTER

Skid resistance levels were measured using a VC4000 Brake Test Computer fitted into the vehicles. The same device was used for both test series. A brake test computer is essentially an accelerometer, crystal clock and microcontroller. The accelerometer measures the acceleration whilst the test vehicle is under braking. The crystal clock measures the length of time that the vehicle is under braking. The microcontroller calculates the vehicle velocity 100 times were second. With velocity and time known the microcontroller calculates distance 100 times per second. With acceleration, time and distance known the skid resistance of the test surface can be determined.

9.1.1 Accelerometer

Three plates, A, B and C are suspended. Plate B is a mass suspended by springs between plate A and plate C. At zero G's, plate B is equidistant from plate A and plate C. When the brakes of the vehicle are applied by the driver the vehicle will pull negatives G's and plate B will move closer to plate C and further away from plate A. As plate B moves closer to plate C the voltage from plate B to C increases at a rate of one volt per G. When a vehicle is being accelerated positively, plate B will move closer to plate A and further from plate C.

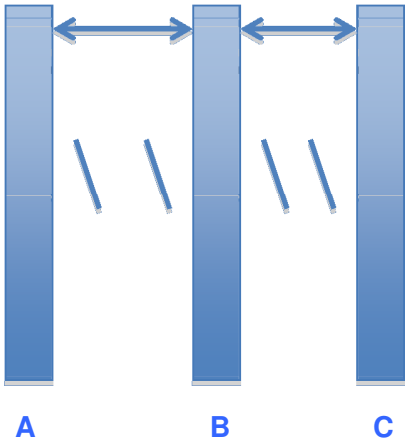

Fig. 2.1 Accelerometer

9.2 SKID RESISTANCE TESTS – HOLDEN OMEGA SEDAN

Table. 1 Skid resistance tests in north bound lane north of collision scene on newly resurfaced road section

Test	Time (s)	Speed (kph)	Average G
1	1.41	38.7	-0.770
2	1.49	40.0	-0.761

Table. 2 Skid resistance tests in north bound lane at initial loss of control of the bus

Test	Time (s)	Speed (kph)	Average G
3	3.03	43.3	-0.403
4	2.70	41.5	-0.434

Table. 3 Skid resistance tests straddling centre dividing line of north and south bound lanes whilst travelling north

Test	Time (s)	Speed (kph)	Average G
5	1.97	36.8	-0.529
6	1.92	37.2	-0.547

Table. 4 Skid resistance tests in south bound lane whilst travelling north parallel to tests 3 - 6

Test	Time (s)	Speed (kph)	Average G
7	2.25	39.1	-0.490
8	2.28	43.7	-0.543

The tests in the Holden Omega sedan on the wet road fell at or below the lower end of the allowable risk rating adjustment zones set by Vic Roads and often below the

recommended investigatory levels. The tests conducted on the newly surfaced area north of the collision location provided good results for this type of road used for high volume, high speed traffic including heavy vehicles. When the tests were performed in the south bound lane the test vehicle rotated significantly in an anticlockwise direction coming to a stop facing 180° from the commencement of braking. The rotating was severe and as a result these tests were not repeated in the test coach for safety reasons.

9.2.1 Skid Resistance Tests – 1989 44 Seat Austral Passenger Coach

Table. 5 Skid resistance tests in north bound lane north of collision scene on newly resurfaced road section

Test	Time (s)	Speed (kph)	Average G
1	1.14	20.3	-0.503
2	1.2	21.9	-0.518

Table. 6 Skid resistance tests in north bound lane at initial loss of control of the bus

Test	Time (s)	Speed (kph)	Average G
3	1.33	15.5	-0.329
4	1.68	19.0	-0.318
5	2.12	24.0	-0.319

Table. 7 Skid resistance tests straddling centre dividing line of north and south bound lanes whilst travelling north

Test	Time (s)	Speed (kph)	Average G
6	2.00	23.6	-0.333
7	1.59	22.3	-0.397

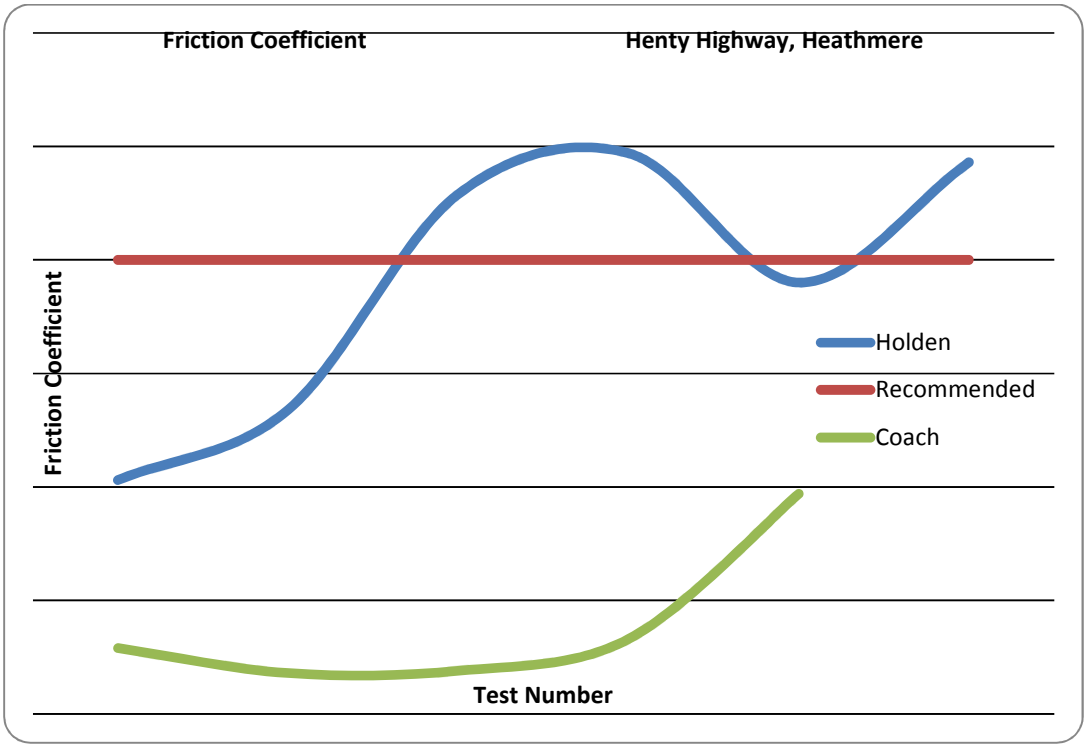

Fig. 2 Friction Coefficient of large sedan and coach on Henty Highway, Heathmere

It is clearly evident from Fig. 2 that the friction coefficient determined from the skid resistance test in the Austral Coach that all results fell well below the Vic Roads recommended levels. It must be noted however that the recommended levels are set in relation to passenger vehicles. When comparing the results of the Holden Omega sedan with the recommended levels it is apparent that the results obtained generally fall near to or below the Vic Roads recommended levels. Major Highways in Australia carry large volumes of heavy vehicles including trucks and coaches. Consideration must be given to the reduced friction coefficient that these vehicles have in comparison to passenger vehicles.

10. OUTCOME

A full inquest into the death of Sabrina Brady, Maddison Dobie and Justin Pomery was conducted in August, October and December, 2010. As a result of the inquest, Coroner Heather Spooner made a number of findings and recommendations. Coroner Spooner found that whilst the reason for the initial loss of control of the coach could not be determined the poor road surface and low friction values were responsible for this incident. She further stated that the VicRoads system for management of risk, hazard identification, road maintenance and funding and repair were inadequate at that time. A number of recommendations were made in relation to road management. No fault lay with the coach driver, Mr Shayler. Coroner Spooner found that the deaths of Sabrina Brady, Maddison Dobie and Justin Pomery may have been spared during the rollover had they been properly restrained.

A number of recommendations were made by Coroner Spooner in relation to the road management and seat belt implementation. It was recommended that Vic Roads review their road maintenance system and implement a 'best practice' system for inspecting, monitoring, auditing, funding and repairing road surfaces to minimize the risk of crashes. This system should also incorporate specific considerations relating to the incidence of extreme climate events and road surface management. Coroner Spooner further recommended that the Victorian Government need to ensure that Vic Roads is adequately resourced to ensure the implementation and sustainability of the recommendations relating to road maintenance and risk. Recommendations were made that child restraints be available on all buses operating in Victoria and audible messages be played regularly during travel in an effort to increase passenger compliance. It was recommended that Transport Safety Victoria in conjunction with relevant safety agencies including Victoria Police and Vic Roads ensure that a comprehensive strategy is developed to improve seat belt compliance and passenger awareness of their importance.

As a result of the recommendations, Vic Roads has reviewed a number of existing policies in relation to their management of roads with poor surface and low surface friction. Significant changes have also been made in relation to the mandatory reporting of skid resistance issues identified by contractors during road inspections. There was previously no requirement for contractors to report to Vic Roads.

The lives of Sabrina Brady, Maddison Dobie and Justin Pomery cannot be returned. It is hoped that a better understanding of road surface friction and combined efforts from Vic Roads, Victoria Government and Victoria Police to meet the recommendations by the Coroner of Victoria will significantly reduce the risk of needless loss of life due to poor road surface friction in the future.

Biography

Jenelle Hartman has been a member of Victoria Police, Australia for 18 years and has worked as a collision reconstructionist exclusively since 2004. Jenelle has attended more than 400 fatal and serious injury collisions and reconstructed in excess of 1000 collisions. Jenelle holds a Bachelor Degree in Science (Applied), Masters in Engineering (Mechanical) and is in her final year of her Doctor of Philosophy (Mechanical Engineering). Jenelle's PhD study has involved primary research into the effects of temperature, velocity and rainfall on the friction coefficient of car tyres and road surfaces. Jenelle is excited to publish the results of her studies in the near future. Jenelle has published journal papers relating to the preliminary results of her study.