



IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2017 1539

FINDING INTO DEATH WITHOUT INQUEST

Form 38 Rule 60(2)

Section 67 of the Coroners Act 2008

Amended pursuant to *Section 76 of the Coroners Act 2008* on 28 February 2019¹

I, AUDREY JAMIESON, Coroner having investigated the death of DAVID KEITH MOLLOY

without holding an inquest:

find that the identity of the deceased was DAVID KEITH MOLLOY

born 26 April 1952

and the death occurred on 4 April 2017

at Thirteenth Beach Road, Barwon Heads, Victoria 3227

from:

1 (a) HEAD AND NECK INJURIES SUSTAINED IN A BICYCLE INCIDENT

¹ This document is an amended version of the finding into David Keith Molloy's death dated 4 February 2019. A correction to Recommendation 1 has been made pursuant to Section 76 of the *Coroners Act 2008* (Vic).

Pursuant to section 67(1) of the **Coroners Act 2008**, I make findings with respect to **the following circumstances**:

1. David Keith Molloy was 64 years of age and resided in Ocean Grove, Victoria, at the time of his death with his wife Helen. He had three children Claire, Andrew and Campbell. Mr Molloy was an experienced cyclist.
2. On 4 April 2017 at approximately 8.10am, Mr Molloy was riding with his regular cycling group. They were travelling west on Thirteenth Beach Road, Barwon Heads. The group was approximately ten minutes into their ride. Mr Molloy was leading the group with his friend Ivor Guest. They were travelling at approximately 26 to 28 kilometres per hour when the front forks of Mr Molloy's bicycle suffered a sudden and catastrophic failure and snapped. Mr Molloy fell forward over the front of his handlebars and the front of his face struck the road surface.
3. Mr Molloy's friends immediately stopped to render first aid and called Emergency Services. Kerry Wethenhall, a registered nurse who was riding with the group, commenced cardiopulmonary resuscitation (CPR). Shortly after, Emergency Services arrived. Paramedics observed that Molloy had significant lower facial trauma, multiple abrasions to his arms and deformity to his left clavicle / shoulder. They continued CPR and applied defibrillation pads. Officer Mackie-Coop inserted a laryngeal mask airway. Mobile Intensive Care Ambulance (MICA) paramedics then arrived and continued treatment of Mr Molloy who was in cardiac arrest. At approximately 9.14am, resuscitation was ceased, and Mr Molloy was declared deceased.

INVESTIGATIONS

Forensic pathology investigation

4. Dr Sarah Parsons, Forensic Pathologist at the Victorian Institute of Forensic Medicine (VIFM), performed an examination upon the body of David Keith Molloy, reviewed a post mortem computed tomography (CT) scan and referred to the Victoria Police Report of Death, Form 83.
5. Radiologist review of the admission post mortem CT scan revealed multiple facial fractures, coronary artery calcification, C3/4 spinous fractures and basal subarachnoid haemorrhage.

6. Toxicological analysis of Mr Molloy's post mortem blood was negative for alcohol and common drugs and poisons.
7. Dr Parsons formulated the cause of Mr Molloy's death as head and neck injuries sustained in a bicycle incident.

Police investigation

8. Upon attending the site of the incident after Mr Molloy's death, police observed that the section of road where Mr Molloy fell off his bicycle was an 80 kilometres per hour (kp/h) zone. Police reported that conditions that day were very good, the weather was fine, the road was dry and visibility was unimpeded. Police examined the road surface and found it to be in very good condition, with painted signs on the road indicating it was a bicycle route with well-defined line markings. There was no evidence of current or recently repaired potholes in the area and the road edges were also in good condition. Police reported that the length of road was sometimes prone to sand drift, whereby sand from the dunes can encroach onto the road surface, however this was not evident on the date of the incident.
9. Leading Senior Constable (LSC) Gavin Duncan was the nominated Coroner's investigator.² At my direction, LSC Duncan investigated the circumstances surrounding Mr Molloy's death, including the preparation of the coronial brief. The coronial brief contained, *inter alia*, statements made by members of Mr Molloy's cycling group, attending paramedics and Mr Molloy's wife.
10. In the course of the investigation, police learned that Mr Molloy enjoyed a very active retirement, was a keen outdoorsman and avid cyclist. He was a member of an informal regular cycling group which met on Tuesdays and Thursdays for a "leisurely" paced ride. The rides would generally go from Barwon Heads to Torquay, departing from a carpark adjacent to the Barwon Heads Hotel. Police learnt that on the date of the collision, Mr Molloy was leading a group of approximately 12-14 riders when his bicycle's front forks suddenly and catastrophically failed causing him to fall over the front handlebars of his bicycle and impact the road surface face first.

² A Coroner's Investigator is a police officer nominated by the Chief Commissioner of Police or any other person nominated by the Coroner to assist the coroner with his/her investigation into a reportable death. The Coroner's Investigator receives directions from a Coroner and carries out the role subject to those directions.

11. At the time of the collision it was found that Mr Molloy was wearing a bicycle helmet which came off during impact. The helmet was found to have grazes on the front and cracks throughout the foam on the inside of the helmet.
12. Mr Molloy had purchased his road bike second hand approximately ten years prior to his death. He had the bike serviced regularly and would clean it and put oil on it when required. Shane DeGrandi of De Grandi Cycle & Sport (**De Grandi**) confirmed that De Grandi serviced Mr Molloy's bike on two occasions. On 8 April 2014 De Grandi replaced worn out components like the chain, a chain ring and brake pads. On 17 January 2015 De Grandi installed new headset bearings and adjusted the wheel bearings. Mr Degrandi stated that no other items were identified as requiring replacement or repair at the time of servicing.
13. It was ascertained that approximately twelve months prior to Mr Molloy's death, he had sustained damage to the front wheel of his bike when riding over a large pot hole near the new Warralily Estate. Mr Molloy had both wheels replaced following this incident.
14. LSC Darren Mighall conducted a SASEG search of the Traffic Incident System for all regions in Victoria. He found that there were 18 fatal collisions involving bicycles between 1 January 2016 and 30 September 2017. Mr Molloy's death was the only collision that involved mechanical failure of the bicycle.

Bicycle investigation

15. The coronial investigator commissioned Raoul Luescher, Director of Luescher Teknik Specialist Sports Technology to inspect Mr Molloy's bicycle. Mr Luescher observed that the bicycle was a Klein Quantum model which was an older model aluminium frame dating back to approximately 1995. He noted that a number of parts had been replaced including the original fork which had been replaced with a Kestrel EMS carbon fibre model. He noted the fork was high quality and matched the approximate age of the frame. He noted the aluminium frame had several areas of corrosion and paint wear and tear but appeared to be relatively well looked after and maintained. He noted the wheels appeared to have been fitted relatively recently and were a newer model than the bicycle frame. He considered the bicycle frame and fork would have had a service life of more than 20 years depending on use.

16. Mr Luescher observed both front fork legs had failed and separated at a distance of 230mm to 250mm from the wheel axle dropout. There was damage to a spoke at a distance of 250mm from the wheel axle. The spoke was bent in the direction of travel with surface damage to the rim face aft of the damaged spoke. Mr Luescher conducted an Ultrasonic A scan on the fork. He did not find any significant manufacturing flaws in the adjacent area or other areas in the fork.
17. Mr Luescher noted that carbon composite has relatively low ductility or toughness and that a high velocity impact at a localised region can lead to fibre failure in the region and consequently loss of the mechanical properties. He noted this can result in a complete rupture of the part due to insufficient sound material to meet the load requirements. He concluded that a foreign object lodged into the wheel whilst at speed and impacted the fork leg(s) resulting in a brittle failure of the carbon composite. He considered that it was plausible that debris on the road, such as a piece of metal or wood of sufficient strength and profile, impacted the rear face of the fork leg(s), leading to rupture of the fork legs.
18. Mr Luescher also noted that it was plausible that the epoxy matrix's structural properties had degraded over time due to age and environmental exposure and could have resulted in an overall reduction of the structural integrity of the fork. He was unable to validate this due to the variables in epoxy type and cure cycles.
19. Mr Luescher noted that it is common to extend the service life of older bicycles by fitting new components and repainting the frame to appear new again. However, this may compromise the original intended life of the structural properties of the bicycle. Handling damage from localised overloads or impacts can lead to a significant reduction of structural integrity. Critical components can fail catastrophically after a period of time due to metal fatigue, in-service damage, composite matrix degradation and growth of internal production flaws. Bonded joints may also fail due to adhesive degradation, environmental exposure, thermal mismatch and corrosion.
20. Mr Luescher recommended that bicycle riders consider the service life of older bicycles and undertake regular inspection of critical areas to reduce the likelihood of failure.

COMMENTS

Pursuant to section 67(3) of the **Coroners Act 2008**, I make the following comments connected with the death:

1. Currently bicycle manufacturers are required to include a warning in the owner's manual pursuant to ISO 4210-2:2015 section 5(y):

'A bicycle is subject to wear and high stress. Different materials and parts may react to wear or stress fatigue in different ways. If the design life of a part has been exceeded, it may suddenly fail, possibly causing injuries to the rider.'

2. On 2 November 2016, Coroner Lisbeth Campbell delivered the Finding pursuant to Inquest into the death of Roger John Stanton. Mr Stanton died on 31 January 2015 in the Australian Capital Territory as a direct consequence of falling from his bicycle when the front alloy steering tube carbon fork of Mr Stanton's racing bicycle unexpectedly and catastrophically failed as he was riding along a road.
3. Coroner Campbell recommended *inter alia* that the manufacturer of Mr Stanton's bicycle, Trek Bicycle Corporation (**Trek**) update its owner's manuals and consumer information to expand upon a warning that bicycles are not indestructible and every part of a bicycle has a limited useful life, and undertake public education activities within Australia, and particularly within the Australian Capital Territory to bring the issue of bicycle component life to the attention of existing Trek bicycle owners. Trek indicated it was prepared to undertake outreach to bicycle advocacy groups to educate the cycling community on the issues of metal fatigue and bicycle component life including local cycling advocacy group ACT Pedal Power and national advocacy group Cycling Promotion Fund.
4. Coroner Campbell noted that the Australian Standard (AS/NZS 1927:1998 – Pedal Bicycles – Safety Requirements) and the International Standard ISO 4210 which specify the safety and performance requirements for the design, assembly and testing of bicycles and certain sub-assemblies, do not address the issue of safe life. Coroner Campbell also noted the Australian Standard did not have any reference to metal fatigue. Trek advised Coroner Campbell that previous attempts to introduce this type of standardisation internationally had failed due to industry views that individual bicycle usage is subject

to such wide variability that assigning a safe life would not be meaningful or of assistance to a consumer. Trek undertook to request international standardisation bodies to reconsider their prior rejections of safe life limits. It also approached Standards Australia to request that it reconsider referring to safe life and metal fatigue in the Australian Standard.

5. On 16 October 2017, Sherene Daniel, Corporate Services Manager at Standards Australia provided a response to Coroner Campbell's recommendations. Standards Australia advised Coroner Campbell they had sought the views of CS110 *Bicycles and Bicycle Accessories*, the committee responsible for AS/NZS 1927:2014 *Pedal Bicycles – Safety Requirements* on what steps should be taken in light of her findings. The Committee confirmed that AS/NZS 1927:2010 and AS/NZS 1927: 2010/Amdt 1:2014 did not refer to the safe life of a bicycle. The Committee also discussed the different variables involved with determining the safe limit of a bicycles including knowing and monitoring the use of a bicycle, distance travelled, type of rider, surface travelled on, type of materials that the bike is comprised of, transport storage history and crash history. Due to these many variables the Committee determined that there were currently no acceptable methods to determine a safe life limit of a bicycle. The Committee also considered the work undertaken at the ISO with regards to determining such safe life requirements. The Committee noted that ISO 420 *Safety requirements of bicycles* does not include a safe life limit because of the complexity involved with determining such a limit and that it would be of limited benefit to the Australian community.
6. Standards Australia confirmed they were ready to engage with relevant stakeholders and work with them on revising the AS/NZS 1927:2010 and AS/NZS 192:2010/Amdt 1:2014 or to adopt an existing or develop a new international standard to include safe life limit of bicycles should they receive a project proposal from stakeholders.
7. On 26 October 2017 Trek Bicycle Corporation responded to Coroner Campbell's recommendations. Trek confirmed they had updated the language in its bicycle owner's manual to expand upon the original warning that bicycles are not indestructible and that all components have a limited useful life.
8. Trek created a banner on the homepage of its Australian website directing consumers to the updated manual for a period of twelve months from 28 April 2017. It also

communicated directly via email with its existing customers in Australia who registered their bicycles after purchase. The email notification reminded customers about the dangers of fatigue, encouraged them to get their bicycles inspected by a local retailer and directed customers to the updated owner's manual.

9. Trek launched a safety campaign in Australia 'The ABCs of Awareness' to highlight aspects of safe riding including visibility and pre-ride bike inspections. The campaign was featured on its Australian website, included a link to the updated owner's manual and focused specifically on bicycle and component fatigue. Trek also posted material on social media, including Facebook and Twitter, about the importance of rider safety. In each post, Trek included a link to the campaign, so riders could learn more about bicycle and component fatigue and connect to the updated owner's manual.
10. Trek encouraged its retailers to educate consumers about bicycle and component fatigue by sending an email notification to every authorised Trek retailer in Australia, reminding them about the importance of rider safety and linking them to the updated owner's manual and posting an article on Dexter, Trek's primary global communication tool for retailers. The article encouraged retailers to educate consumers who pass through their shop with an older bicycle or a bicycle that has been involved in an accident or ridden hard about metal fatigue and bicycle component life and to suggest, where appropriate, replacing the bicycle or component with a new model.
11. Trek also asked Bicycle Industries Australia (BIA), an independent non-profit organisation representing bicycle industry importers, manufacturers, retailers and suppliers throughout Australia to help promote awareness among cyclists that bicycles have a finite life span and provide advice that frequent inspections for signs of fatigue is the only viable method to avoid an accident caused by a safety-critical part that has reached the end of its safe life. Trek provided BIA with an "M-Check" Bicycle Safety Check created by Trek Certified Service and provided in its retailer training classes and encouraged BIA to act as an additional channel to educate cyclists in Australia.
12. Trek sent a letter to the Secretariat of ISO TC149 SC1 WG13 Technical Committee on Bicycles and Major Subassemblies and requested the Committee to consider the promulgation of a standard that advises a consumer how to better evaluate when the replacement of a bicycle frame, fork or other safety-critical component is necessary or

advisable through a safe life limit. Trek presented this topic at ISO's annual meeting on 22 June 2017. The committee decided not to move forward with establishing a safe life at that time. Trek also sent a letter to the Chairperson of ASTM's Subcommittee F08.10 on Bicycles and requested the same consideration. Trek presented this topic at the Subcommittee's meeting on 10 May 2017. However, there was consensus among the members that there were too many variables to accurately define "life span" and therefore declined to move forward.

13. Trek notified Coroner Campbell that it had declined Standards Australia's offer to submit a proposal on revising AS/NZS 1927:2014 or the development of a new standard to address bicycle safe life. Trek stated this decision had been made after careful consideration on the basis that it believed the updated language in its owner's manual was adequate to warn consumers of the issue. Trek also considered it should have regard to the global standard bodies' determination that there are currently no acceptable methods to determine a safe life limit of bicycles.
14. Mr Molloy's death highlights the risks of component life and metal fatigue in bicycle components. I commend Trek for their efforts in educating the bicycle riding community about the limited life spans of bicycles and bicycle components and the need to conduct regular inspection of safety-critical parts.

RECOMMENDATIONS

Pursuant to section 72(2) of the **Coroners Act 2008**, I make the following recommendations:

1. With a view to promoting public health and safety and preventing like deaths, I **recommend** that Bicycle Network³ promote awareness among cyclists about the limited life spans of bicycles and bicycle components and the need to conduct regular inspection of safety-critical parts (including frame and fork) to discover any signs of fatigue.
2. With a view to promoting public health and safety and preventing like deaths, I **recommend** that Bicycle Industries Australia encourage its members to promote awareness among cyclists that bicycles have a finite life span and provide advice that

³ The finding dated 4 February 2019 incorrectly referred to Bicycles Network Australia. The correct entity is Bicycle Network.

frequent inspections for signs of fatigue is the only viable method to avoid an accident caused by a safety-critical part that has reached the end of its safe life.

FINDINGS

The investigation identified that David Keith Molloy was riding his bicycle along Thirteenth Beach Road in Barwon Heads when his bicycle's front forks suddenly and catastrophically failed causing him to fall over the front handlebars and collide with the road surface, resulting in his untimely death.

I accept and adopt the medical cause of death as identified by Dr Sarah Parsons, and I find that David Keith Molloy died from head and neck injuries sustained in a bicycle incident.

Pursuant to section 73(1A) of the **Coroners Act 2008**, I order that this finding be published on the internet.

I direct that a copy of this finding be provided to the following:

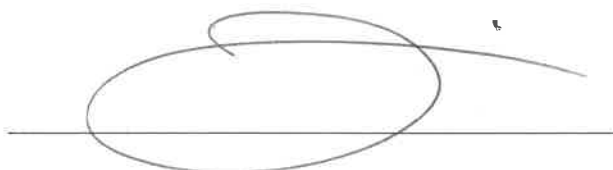
Mrs Helen Molloy, Senior Next of Kin;

Bicycle Network⁴;

Bicycle Industries Australia;

Leading Senior Constable Gavin Duncan, Coronial Investigator

Signature:

A handwritten signature in black ink, consisting of a large, stylized loop followed by a horizontal line extending to the right.

AUDREY JAMIESON

CORONER

Date: **28 February 2019**



⁴ Ibid.