

CERTIFICATE OF FINDINGS**Section 94, Coroners Act 2006**

IN THE MATTER of **Grant Charles CORNELIUS**

The Secretary, Ministry of Justice, Wellington

As the Coroner conducting the inquiry into the death of the deceased, after considering all the evidence admitted to date for its purposes, and in the light of the purposes stated in section 57 of the Coroners Act 2006, I make the following findings:

Full Name of deceased: Grant Charles CORNELIUS
Late of: 160 Green Road
RD 2
Albany
Auckland
Occupation: Farmer
Sex: Male
Date of Birth: 25 August 1958
Place of Death: 160 Green Road
Albany
Auckland
New Zealand
Date of Death: 05 September 2011
Cause(s) of Death
(a). Direct cause: Positional/Traumatic Asphyxia
(b). Antecedent cause (if known):
(c). Underlying condition (if known):
(d). Other significant conditions contributing to death, but not related to disease or condition causing it (if known):

Circumstances of death (if known):

*Those findings, and my reasons for making them, are also set out in my written findings dated: 23 October 2013.

Signed at Whangarei on 29th day of October 2013.


Coroner H Brandt Shortland

**IN THE CORONERS COURT
AT AUCKLAND**

CSU-2011-AUK-001161

UNDER

THE CORONERS ACT 2006

AND

IN THE MATTER OF

**An inquiry into the death of
GRANT CHARLES CORNELIUS**

Date of Hearing:

9 April 2013

Appearances:

**Sgt. Paul Herman - NZ Police
Mrs. S Cornelius – Wife
Mr. Gary Lumsden – Ministry of
Business, Innovation and Employment**

Date of Findings:

23 October 2013

FINDINGS OF CORONER H B SHORTLAND

Introduction

[1] On September 2011, the police attended the property of Mr Grant Cornelius, a farm located at 160 Green Road, Dairy Flat, Auckland. Grant Cornelius was found pinned under his 4X4 quad bike on a part of his property where he had been spraying.

[2] When he did not return for his lunchtime meal, Irene Flynn, farm employee went to search for him where he was spraying for the day.

[3] The bike was seen on its side up against a tree with Mr Cornelius pinned under it.

[4] The alarm was raised immediately including seeking the assistance of nearby neighbours. Despite the attendance of emergency services including the police, Mr Cornelius had been crushed by the quad bike.

[5] At inquest the Court heard evidence from Sergeant Blair Atkinson, the officer in charge of the Waitemata District Serious Crash Unit; from Irene Flynn, friend and farm employee; Mr Lumsden the Health and Safety Inspector at the time with the Department of Labour, now with Ministry of Business Innovation and Employment. There were a number of other statements handed up including those who attended the scene consisting of (David Cornelius and Michael Nicklin.)

[6] There were other statements made by attending police, medical evidence including post mortem and toxicology reports. Both the police, Serious Crash Unit (SCU) and the Department of Labour (DoL), as it was known then, carried out thorough professional and credible investigations.

The Law

[7] Section 57 of the Coroners Act 2006 sets out the purpose of an inquiry and the legal frame work for an inquest.

57 Purposes of inquiries

- (1) A coroner opens and conducts an inquiry (including any related inquest) for the 3 purposes stated in this section, and not to determine civil, criminal, or disciplinary liability.
- (2) The first purpose is to establish, so far as possible,—
 - (a) that a person has died; and
 - (b) the person's identity; and
 - (c) when and where the person died; and
 - (d) the causes of the death; and
 - (e) the circumstances of the death.
- (3) The second purpose is to make specified recommendations or comments (as defined in section 9) that, in the coroner's opinion, may, if drawn to public attention, reduce the chances of the

occurrence of other deaths in circumstances similar to those in which the death occurred.

- (4) The third purpose is to determine whether the public interest would be served by the death being investigated by other investigating authorities in the performance or exercise of their functions, powers, or duties, and to refer the death to them if satisfied that the public interest would be served by their investigating it in the performance or exercise of their functions, powers, or duties.

[8] The main focus of this inquest is the circumstances of the death. Further recommendations arising from this inquiry will hopefully prove to be another positive step toward making the use of quad bikes safer.

The Facts

[9] Grant Cornelius born 25 August 1958, (53 years of age at the time of his death) along with his wife Sarah Cornelius farmed a property at 160 Green Road, Dairy Flat, Auckland.

[10] The farm consisted of both gentle and steep sloping hillsides. On the morning of Monday 5 September 2011, Grant Cornelius was preparing to spray a paddock situated close to his driveway being approximately 100 metres west from the access way under one of two large trees.

[11] The paddock in question was described as uneven, soft under foot in part and heavily punctuated with ruts and animal foot holes after having stock in the paddock for some time. Mr. Cornelius began spraying this paddock. He returned to refill his tanks at about 11.00 am. He had been using his 400 cc Suzuki Eiger quad bike, with a mounted spray unit at the back of the quad bike.

[12] The 100 litre silvan selecta tank contained approximately 75 litres of a spray mix in the unbaffled spray tank. The spray pump would ensure an even spread of spray coming from the back of the quad bike when Mr. Cornelius made his runs up and down the paddock.

[13] It was estimated the 75 litres of fluid and pump was in excess of 75 kilos.

[14] After refilling his tanks he headed back out to complete the spraying a short time after 11.00 am and was expected back around lunchtime.

[15] At about 11.50 am, Ms Flynn in discussion with Mrs. Cornelius realised they had not heard the quad bike as it was nearing lunchtime.

[16] Mr. Cornelius was a man who was always on time for lunch.

[17] As Mrs. Cornelius was preparing lunch Irene Flynn grabbed her jacket and decided to look for Mr. Cornelius as it was unusual he would miss lunch.

[18] She made her way down the paddock and started to follow the tracks of where the quad bike had been running.

[19] As she entered the paddock and walked over the dip she saw the quad bike upside down. It was leaning on two wheels, on its side and supported by the tree. She noticed Mr. Cornelius had been pinned by the quad bike around the area of his buttocks. She described him as purple and in very bad shape.

[20] Though the quad bike was not running she turned off the ignition and switched off the spray pump. She checked for a pulse and could not find one and also checked his neck without success.

[21] She then ran back to the house and raised the alarm with Mrs Cornelius who rang the ambulance describing the situation.

[22] Irene Flynn then returned to the scene and again checked for a pulse without success. The bike was too heavy for her to move on her own so she returned to the house for help. At that point Michael Nicklin, a neighbour, with the Cornelius', was making his way to the property to speak with Mr Cornelius about a scheduled neighbourhood meeting that night.

[23] As Mr. Nicklin engaged with Mrs Cornelius, he was advised there had been an accident and Mr Cornelius was pinned under his quad bike as it rolled on him. He immediately made his way down to the paddock and assisted those in attendance to remove the quad bike off Mr Cornelius. He described the quad bike as on its left two wheels and resting against the tree with Mr Cornelius facing down the hill and face down.

[24] CPR was started immediately until the arrival of the ambulance and fire service. Despite every effort by those in attendance and emergency services, Mr Cornelius had passed away.

Post Mortem and Toxicology Reports

[25] A post mortem examination was carried out by Dr Paul Morrow on 6 September 2011. He determined in his findings that the direct cause of death was a result of traumatic/positional asphyxia as a direct result of Mr Cornelius being trapped underneath the quad bike.¹

[26] Incidental findings from the post mortem confirmed Mr Cornelius had Scoliosis of the spine and evidence of past surgeries, osteoarthritic change to the vertebral column.

[27] The post mortem report (PM) refers to the ESR Toxicology findings of Amitriptyline and tetrahydrocannabinol in the blood stream.

[28] Amitriptyline is an anti-depressant medication and the testing confirmed that the levels were consistent with therapeutic use of the medication.

[29] In contrast, tetrahydrocannabinol (THC) is the drug found in cannabis. The blood THC level was five micrograms per litre and that being consistent with smoking the equivalent of a single cannabis cigarette within about three hours prior to death.

[30] Cannabis can have a psychological and behavioural affect on an individual who may experience euphoria, relaxation or impairment of perception and cognition with potentially the loss of motor co-ordination. The subjective symptoms of cannabis intoxication usually peak 10 to 15 minutes after smoking cannabis and lasts about 1.5 to four hours.

[31] The PM report acknowledges that the smoking of cannabis and the affects that follow can vary between individuals and there are a number of factors that may affect the behaviour of an individual. Those factors included the frequency of use; the smoking technique experience; the size and potency of the cannabis cigarette.

¹ Exhibit 3 – Post Mortem Report with reference to the ESR Toxicology Report – Dr Paul Morrow

[32] The PM report concluded;

“Blood THC levels are generally a poor indicator of cannabis intoxication. It is not usually possible to determine whether a subject was intoxicated based on blood levels alone. However, the level of THC in Mr Cornelius’ blood is such that it is likely that he was affected by the drug at the time of his death.

The combined affects of cannabis, Amitriptyline and morphine are not known.”

[33] Mrs. Cornelius had indicated her husband had suffered from a serious back injury in 2004 whilst handling a heavy wool bale. He had undergone a number of medical interventions in an attempt to improve his health. In effect he never really recovered and constantly experienced pain. He would use cannabis as a means of pain relief.

[34] A report provided Dr Paul Milton confirmed the above facts.²

[35] Dr Milton had been Mr. Cornelius and his family’s GP since 1982. He confirmed Mr. Cornelius had a significant back injury stemming back to 23 November 2004 when he was handling a heavy fadge wool bale. As a result of the injury he underwent a spinal discectomy in March 2005 and then a further spinal fusion in September 2005.

[36] He had further surgery from a different back specialist and then an infection in his back resulting in his admission in the North Shore Hospital.

[37] As a result of these ongoing difficulties, Mr. Cornelius continued to have back pain and would attend the pain clinics throughout his long ordeal. The first being in Auckland city hospital on 7 March 2006 and the last being the North Shore Hospital on 13 May 2011.

[38] Dr Milton received the report from the pain clinic which confirmed that Mr. Cornelius was using marijuana on a regular basis as a means to relieve his pain. The last report being 13 May 2011.

² Exhibit 8 : Report By Dr Paul Milton – GP to Mr Cornelius and Family dated 20 January 2012

[39] In conclusion, Dr Milton confirmed that Mr. Cornelius had been prescribed analgesics and listed a number of medications in his report. He also trialed several non-drug strategies including TENS and activity based programmes including physiotherapy.

[40] The evidence shows that Mr. Cornelius continued to farm despite his physical difficulties and found the use of marijuana as a means of regulating his pain.

Serious Crash Unit Report and Department of Labour Investigations

[41] Sergeant Blair Atkinson attended the inquest and outlined the salient evidential points arising from his crash analysis report. Mr. Lumsden, Health and Safety Inspector with the then Department of Labour (Ministry of Business Innovation and Employment) summarized his investigation. The essential focus to both reports centred on the circumstances leading to the fatal crash.

[42] As described earlier in this finding the paddock in question (terrain) was considered to be steep and uneven with a 30 degree downward slope. There was clear evidence that stock had been in the paddock for a period of time as there were many animal foot ruts (holes) and the ground was considered soft in some area particularly under the trees.³

[43] Tyre tracks were found leading to an animal rut hole indicating that Mr. Cornelius was traveling across the slope of the paddock in a southerly direction at the time of the incident.

[44] The animal rut hole was located at a soft area of the earth near the front of the quad bike with a diameter of approximately 400 millimetres and a depth of 120 millimeters. An examination of the hole found a curved tyre tread mark indicating the wheel started churning anticlockwise when it hit the rut.⁴

[45] The 400 cc Suzuki Eiger was independently inspected by Automotive Consultancy Services Limited, compliance officer Mr. Neil Cuthbert. He identified the damage to the quad bike and sought to determine whether there had been a

³ Exhibit 23 – “DOLI 6 Summary of Evidence” Department of Labour Report”

⁴ Exhibit 4 “Crash Analysis Report – Fatal Vehicle Collision, 5 September 2011 – prepared by Sergeant Blair Atkinson Serious Crash Unit Waitemata District 110907/8543, (“SCU Report”)

failure in any of the components or mechanical apparatus on the bike that may have led to this tragedy.⁵

[46] In terms of whether there was a malfunction in the componentry of the machine, he found there were no pre-existing faults having tested the brakes, steering, suspension and the throttle operation. It was his view the vehicle appeared to have been operating in a normal manner prior to the crash.

[47] It was noted in the Serious Crash Report that the tyres on the quad bike had different tread depths and pressure within the tyres. The front left tyre had a tread depth of 11 millimetres and pressure of 6 PSI. The right front tyre had a tread depth of 12 millimetres and 6 PSI. Both the back rear tyres had the same tread depth of 14 millimetres and the same pressure of 5 PSI.

[48] The spray tank that was located on the back of the quad bike had the capacity of carrying 100 litres of fluid. When it was examined it had approximately 70 litres remaining in the tank which is equivalent to approximately 70 kilograms of extra weight. The spray tank was not baffled, therefore, the fluid within the tank would move as the bike changed directions. This has the affect of immediately destabilising the bike with potentially serious consequences.

[49] Of particular importance are the warning signs that are placed on the guards of the bike. The brightly coloured yellow warning sticker made particular reference to ensuring that the operator read the instruction manual before attaching the spray unit to the quad bike. There was specific reference to the instability of the bike and an attachment was made.

“Failure to do any of the above may result in serious injury or death.”

[50] The second sticker which was found on the mud guard had a warning sign with particular reference to ensuring that the combined weight in operation did not exceed 172 kilos. It also made reference to ensuring there was proper tyre pressure with a reference to improper tyre pressure or overloading can lead to loss of control.

⁵ Exhibit 14 “Independent report by Mr Cuthbert – SCU Report” motor vehicle inspector for Automotive Consultancy Services Limited dated 8 September 2011.

[51] The police analysis believed that the maximum load capacity of 172 kilos was either on the limit or near it.

[52] In their calculation the combined weight of the spray unit, the remaining spray fluid of 70 kilos and the weight of Mr. Cornelius has been estimated at 96 kilos at a final total of around 166 kilos. In addition there was further weight added from a tool box and tools that were fitted to the front of the quad bike, which in effect, may have exceeded the maximum weight.

[53] Their continued analysis showed with the bike descending down the hill over uneven ground with many animal foot ruts and the potential instability of the bike with the combined weight possibly exceeding the maximum load, has led to Mr. Cornelius losing control of his bike when his tyre hit the foot hole or rut causing it to roll over and crushing him in the process.

[54] At the time Mr. Cornelius was not wearing a helmet, although it was conceded by the police that it was highly unlikely that the wearing of a helmet would have made a difference.

[55] The SCU Report made reference to a statement made by 21 yr old, David Cornelius, a son to Mr. Cornelius.

[56] David Cornelius indicated his father always maintained his bikes and machinery in good working condition. He confirmed this particular quad bike was the third that he had owned and it had just been returned from servicing.

[57] He conceded there was no formal training on the farm and there was discussion that formal training should be considered. David Cornelius had made inquiries about attending a course and the cost associated.⁶

[58] He said his father was conscientious about his safety;

“Dad was heavy on the safety aspect, especially on the quad bike, even telling me off when I sped up the driveway. This also followed on when riding with the spray tank on the quad bike, towing a trailer, this even applied to using the tractor, chainsaws, weed eater, sprayers.

⁶ Exhibit 19 “Statement of David Cornelius – 15 November 2011”

I wasn't even allowed to use the ride on mower until I had watched the manufacturer's /operational DVD.

We were never told to wear helmet, it was probably slack about wearing helmets. We don't even have a helmet for it."

[59] The quad bike was in its original condition. The only modification added was the tool box fitted to the front.

"It normally did not have the spray tank fitted to the rear, except whenever we need to around the farm. As far as I am concerned it is an unfortunate accident that occurred."

[60] In conclusion of the SCU report the police found at the time the weather was fine, sunny and visibility was excellent. The crash area of the paddock is a steep uneven section with a 30 degree downward slope with clear evidence that stock had worked the ground over to the point it was uneven creating ruts in the soft earth.

[61] The quad bike was in good mechanical condition and it had recently returned from a service. That failure of the mechanical components of the bike had not contributed in any way.⁷

[62] It is more than likely the combined weight of the quad bike, the weight of Mr Cornelius; the unbaffled spray unit with 70 kilograms of fluid on board and the tool box on the front has exceeded the maximum load capacity which has seriously compromised the stability of the bike overall.

[63] It must be considered the instability of the bike was also contributed to by the inconsistency of the PSI in the tyres which may have been a factor when the bike had hit the foot hole or rut on the downward slope.

[64] Lastly, it cannot be underestimated that Mr Cornelius was under the influence of THC and whether this was a factor contributing to the overall circumstances leading to his death. All these factors are circumstances leading to his death.

[65] With respect to the Department of Labour report provided by Mr Lumsden⁸. It was his role to inspect the circumstances and the cause of death from a health

⁷ Exhibit 15 "Bikesport Limited – Last repair carried out 22 August 2011" Tax Invoice.

and safety employment perspective. Mr. Cornelius was self employed as a farmer and was legally required to ensure that he operated his business; machinery and other attachments in a manner that was consistent with the Health and Safety Employment legislation.⁹

[66] He also concludes in his report the same facts as outlined in the SCU Report with reference to the terrain, the state of the uneven ground with stock ruts and holes.

[67] Mr. Lumsden identified what he considered the hazards under his legislation with respect to the maximum vehicle load capacity of 172 kilos. This was reference to the unbaffled 100 litre liquid spray tank on the rear of the bike (filled with 75 litres); the 30 degree slope and the high centre of gravity that the spray tank had been located in.

[68] There was reference to the wearing of a helmet which had been promoted for some period of time by his department and endorsed by ACC¹⁰. He also conceded in this situation the wearing of a helmet would not have changed the unfortunate outcome.

[69] In conclusion, it was his view that Mr Cornelius' death was avoidable and that he made a fatal error in judgement in choosing the path that he rode across the face of the slope with the bike in an unstable position given the potential excess overload of maximum weight and the shifting of the 70 litres of fluid in an unbaffled tank.

[70] Of significance was his footnote in his report which he made mention of Mrs Sarah Cornelius who despite having to deal with the loss of her husband in a quad bike death she had stopped to talk to quad bike riders in a situation that she observed to be risky. She was able to share her tragic story with them which led to a change in their immediate behaviour.

⁸ Ibid 3 – See Exhibit 23

⁹ Health and Safety Employment Act 1992

Comments

[71] In summary, the circumstances leading to Mr Cornelius' death was a combination of factors as already outlined in this finding. It simply boils down to making good decisions. Good decisions can be arrived at by firstly understanding and respecting the capabilities of the quad bike and additional attachments. It is respecting those capabilities and ensuring that stability and risk to life is not compromised by the pressures of having to meet the demands of farming.

[72] This is easily said than done when many hard working farmers often push their machines and farming schedules ahead of personal safety due to market and financial demands.

[73] This death was totally avoidable and I accept the findings of both the Serious Crash Unit and that of Mr Lumsden's report.

[74] It cannot ignore the influence that THC may have played. Although there is no direct evidence in relation to the affect THC may have had on Mr Cornelius and the events that followed it is a factor of some significance. There are many other examples in various legal jurisdictions that show the correlation between death, serious injury and the effect of THC.

Formal Finding

[75] I am satisfied on the balance of probabilities that Grant Charles Cornelius, 53 years of age has died as a result of positional/traumatic asphyxia when his 400 cc Suzuki Eiger quad bike has rolled over on top of him whilst he was spraying a paddock in his farm on 5 September 2011. He was trapped he has died directly as a result.

[76] The circumstances of his death have been outlined in this finding.

Quad Bike Issues - Final Comments

[77] I acknowledge the gathering of the expertise over 10 and 11 April 2013. This was a coming together of like-minded experts.

¹⁰ Exhibit 22 "ACC Quad Bike Safety"

[78] I am grateful for the information and evidence provided by the cross section of expertise from the manufacturers and distribution representatives of the Motor Industry Association through to the farmers and agricultural industry leaders in health and safety. There were many other professionals and experienced leaders including educators and trainers with many years experience; academics and engineers who have provided their own source of independent research and information.

Lastly, I acknowledge the contribution of the Ministry of Business, Innovation & Employment ("MBIE" and formerly known as the Department of Labour) and the Accident Compensation Corporation ("ACC").

[79] At the end of the two day hearing I called for further submissions and received many from other knowledgeable individuals who were unable to attend ranging from farmers, to health and safety consultants with expertise on farm machinery specifically the quad bike.

[80] I further acknowledge the overwhelming amount of information that has literally poured in relation to quad bike issues. That information forms the basis of these final comments.

[81] All these experts in my view had a common goal. Although they may have been from different sections of the spectrum of quad bike interest they unitedly wanted to advance the safer use of quad bikes in New Zealand ("NZ").

[82] There is a plethora of issues surrounding quad bikes. These issues are complex in nature and despite discussion and robust debate the issues remain complex without resolution in some respects.

[83] In the NZ context, the quad bike has been in use for over 40 years. The quad bike has been the modern horse for the New Zealand farmer. The tractor and the quad bike have carried the load for farmers for many years.

[84] The early predecessor of the quad bike was a three-wheeler bike which in very early terms proved to be a dangerous machine.

[85] Evident during the hearings were the reasons why quad bikes are so popular amongst farmers. They are versatile and provide many options for the modern-day farmer. They perform a multiple range of functions in relatively quick time and are perceived by farmers to be a cost-effective piece of machinery. They are responsive and considered efficient in terms of time management. They continue to bare heavy loads through towing trailers; carting spray units; and they have the distinct ability to go places where other machinery are perceived not to go.

[86] The quad bike maybe considered to be a farmer's best friend and their worst enemy.

[87] They have definite advantages over other machinery (tractors) and they equally have clear limitations. Various commentators state the humble quad bike is often pushed beyond its design capabilities. At inquest this comment was reiterated a number of times.

[88] I have observed from this inquest and the other hearings a farmer's safety is seriously compromised when the strict safety guidelines of a quad bike are compromised when used beyond their capability.

[89] Mr. John James, a professional trainer and educator of quad bikes and other machinery best described the quad bike as "Error intolerant". This is an apt description.

[90] These bikes are prone to rolling and tipping in a range of circumstances from riding at speed to going very slowly; over hilly slopes to undulated ground where the quad bike has been compromised in terms of its stability by the decision making process of the rider. This also gives rise to issues about design.

Manufacturers Views

[91] Manufacturers have been very clear about the strict parameters in terms of the maximum weight limits and the use of after-market attachments including purpose-built trailers and spray machines.

[92] However, the most debated issue is that of crush protection devices (CPDs) or roll over protection devices (ROPs).

[93] Quad bikes are known to have a high centre of gravity; a short and narrow wheelbase and have tyres on the bike that require accurate pressure levels. They also require a high level of maintenance to maintain efficiency.

[94] Mr Clive Hellyar and Mr David Crawford, the former CEO and current CEO respectively of the Motor Industry Association, confirmed in their collective evidence quad bikes are designed to be ridden actively. They require "active riding". Quad bikes are essentially a four-wheel motorbike which requires good maintenance and especially accurate tyre pressure at the correct psi levels. They endorsed the importance of wearing a helmet. The issue of helmets will be further discussed in this section.

[95] Mr. Crawford confirmed the fact quad bikes had limited scope in their abilities. This was reiterated further by Mr. Paul Stewart who over 40 years has been a quad bike mechanic; a quad bike training manager; and has represented the New Zealand distributors of quad bikes.

[96] In his view the distributors of quad bikes have always taken the proactive approach to safe use and rider training of quad bikes as a priority. In his view active riding and rider training was an essential part of ensuring the safe operation of a quad bike. It also formed part of the after sale service.

[97] The quad bike is unique. There is no other bike like it with features like the throttle found on the right-hand control; a single seat; a hand-operated front brake lever and a hand-operated rear brake lever with a right-hand foot brake lever. The quad bike allows a rider to stand up in certain circumstances which lowers the centre of gravity.

[98] The design and shape allows a rider to be active in moving their body weight around the bike where it is required.

[99] Mr Stewart confirmed that quad bikes primarily were designed for the recreational market. Every quad bike user needed to understand the manufacturer's guidelines.

[100] I was satisfied during the gathering of information that New Zealand distributors are very thorough in their after sales service to clients.

[101] The primary sale from a distributor to the first user included active riding training; a thorough instruction of the operation manual; an understanding of the quad bike's capabilities; and the importance of wearing a helmet. After sale, the distributors would ensure that their purchaser (often a farmer) had a follow-up visit in terms of a review of the above

[102] Unfortunately, these inquests highlighted the need for similar training for users of quad bikes when they maybe the second, third or ninth owner of the same bike. When they are on-sold, unless it is through a dealer or distributor, the likelihood of the same instruction and training is extremely remote and probably zero. There was no evidence the five fatalities in these hearings had any level of similar training.

[103] The best example in NZ would be a weekend warrior purchasing a quad bike from the online "Trade Me Auction site" for the purpose of riding round their property or taking it to a beach with an expectation that all they had to do was turn the key and play with it until they could ride it properly. That is a most common scenario and a recipe for potential disaster.

[104] I reiterate Mr Stewart's final submission where he summed up what he thought was most important regarding quad bike use and that a quad bike requires a rider to make good decisions, to apply common sense and to realise that a quad bike has limitations. It is important to have good training to understand the reasons why the bike must be ridden actively and to adhere to the manufacturer's guidelines with the use of wearing a helmet would make for safer use overall.

Ministry of Business, Innovation & Employment

[105] Quad bike safety is part of the overall health and safety message in the agricultural sector.

[106] The sector is made up of a number of stakeholders all with a serious interest from health and safety; to efficient operation of the farming unit; and to policy making and oversight. The Ministry of Business, Innovation, and Employment (MBIE) drive the policy required to reduce injuries and fatalities around quad bike use.

[107] MBIE as a regulator has the role of enforcement and to prosecute where appropriate. I sense their preference would be to work side by side with end users in the sector as opposed to total enforcement. That is not to say that in some cases enforcement and prosecution maybe the only viable option.

[108] Part of their philosophy is not to coerce safer quad bike use by way of enforcement only. They rather encourage individuals to empower themselves to take personal accountability for their actions and those who they are responsible for. Therefore, the emphasis is on greater personal accountability for quad bike users.

[109] MBIE have been proactive in developing programmes to reduce fatalities and injuries overall.

[110] Evidence from ACC also showed they have been active in this area as part of their core business.

[111] MBIE in 2011 introduced "The quad bike harm reduction project". The project was targeted to challenge unsafe quad bike use on farms in NZ.

[112] In my view it has been a successful project which has now become a building block for further development. New Zealanders know, the kiwi farmer is known to be stoic in their approach; self assured on their own opinions and stalwart on how their farms should be run. They often don't take change very well. These views and attitudes are often shaped by financial limitations or hardships; the affordability of resources; and uncontrolled variables like the weather and natural disasters. Despite the challenges MBIE have committed resources and policy to lift the bar on safe use of quad bikes on NZ farms.

[113] One of the successful outcomes of this project has been the increased use of helmets for quad bikes. There are a number of purpose-built quad bike helmets under NZ standards now available for users based on farmers' pragmatic needs. One of the problems why farmers do not wear helmets other than the fact it did not look good; was that they often could not perform some of their core functions like working the dog; being able to hear when moving stock; adaptable to weather demands; and realising whether there was any real benefit in using them.

[114] The project has shown there has been a marked increase in the use of helmets after a slow behavioural change. The use of helmets is one of the key messages.

[115] The original project was set for a two year period to end on 31 October 2013. The Court heard that given the perceived success and progress of the key indicators the programme has been extended. There are a number of factors contributing to the success. The dual approach of education followed by enforcement has been a clear indicator.

[116] The other has been the development of innovative ideas derived from the trans-Tasman relationships at government levels and with academic researchers involved in innovative research. These collective and ongoing developments have provided further positivity and support for the continuation of the programme.

[117] In the *Quad Bike Safety News*, June 2012 produced by MBIE, it was reported that the 2012 campaign saw more than 400 farmers across New Zealand visited by health and safety inspectors. That resulted in 67 repeat visits and at the time the Department of Labour (MBIE) had issued 189 written warnings and enforcement notices for issues like helmets; training; the carrying of passengers; towing; rider age and loading and fractions on the quad bikes.

[118] The same news reported that in the Taranaki region, there was an independent farming group that commenced regular meetings on health and safety issues including overwhelming support for the wearing of quad bike helmets.

[119] To summarise MBIE's position, they had four key messages which I endorse.

[120] There are four safety steps to consider; firstly, riders of quad bikes must be trained and experienced enough to do the job as required. To ensure the right vehicle is used for the right job. That makes reference to ensuring that the quad bike is not used beyond its capabilities. It may mean using other vehicles whether it is a side-by-side vehicle or a tractor. To always wear a helmet and to stop kids riding adult quad bikes.

[121] Whether quad bikes are used on farms or in a recreational setting it is important the quad bike safety message was transparent and clear.

[122] The second message MBIE promote is that farms are workplaces and therefore the Health and Safety in Employment Act 1992 furnishes legal responsibilities on farmers and their workers to comply with the Act and work safely. That includes the use of quad bikes and other machinery by employers and staff.

[123] I note the evidence of Jeanette Maxwell, National Board Member for Federated Farmers and spokesperson for health and safety highlighted there sometimes can be confusing messages on the interpretation of the Act. In her view it was understood by farmers that when they rode down to the letterbox to pick up their mail they did not need to use a helmet because they were not in a work phase. However, if they went from the letterbox to another part of the farm to check on stock that constituted work and therefore required to comply with the provisions of the Act. The point being clearer messages were needed.

[124] In my view pragmatism and common sense has been a feature of farming for many a long year there should be no issue on whether a helmet should be used or not.

[125] If engaging the quad bike in any activity there is always the possibility the bike could roll or flip given the well documented problems both in New Zealand and Australia whether it be at speed or low speed. On that basis the use of a helmet would be warranted in every situation.

[126] The third issue that MBIE seek endorsement is for the rural sector and communities associated with farming to stand up and take the leadership or ownership of the health and safety issues including quad bikes without the threat of enforcement of the regulators and prosecution.

[127] Human nature has shown that proactive leadership will always win the test of longevity in terms of success as opposed to coercion or compulsion. Self initiation has more long-term value in the end.

Roll Over Protection Devices

[128] The last issue and perhaps the most controversial of issues is the use of roll over protection devices (ROP's) or crush protection devices (CPD's). This inquest and the evidence provided by the experts confirmed that there is a diverse range of opinions. The debate is both robust and lengthy. There is a clash of scientific evidence followed by polarised views as to whether ROPs provide safety or undermine safety on a quad bike.

[129] There is a "Mexican standoff" between the competing factions and most recently the competing science.

[130] This debate has been raging for some years and over the last two or three years there has been a direct challenge to the science provided by manufacturers over the use of ROPs.

[131] The essential argument by manufacturers is that the fitment of ROPs or CPDs can undermine the stability of the quad bike which places the rider's safety at risk. The counter argument by the others (which include academics; independent engineers; farmers; and agricultural technology innovators) is that the unchanging design of the quad bike has led to a belief that a farmer or rider of a quad bike would be safer with an appropriate ROP. Countless injuries and fatalities support that view.

[132] The manufacturer's evidence which has been formulated from a testing regime based on computer driven simulation has now been directly challenged by Australian authorities such as John Lambert; Geoff McDonald and Professor Tony Lower in their respective areas of expertise.

[133] That information has been shared with NZ by way of the trans-Tasman relationships.

[134] MBIE form part of the trans-Tasman working group process in trying to provide clear resolutions around the issues of design improvements for quad bike safety with specific reference to ROPs. Unfortunately the trans-Tasman group struggle to reach consensus due to the polarised views of the members.

[135] Nevertheless, the process did succeed in gaining a general consensus about the methodological limitations of research commissioned by the quad bike manufacturers indicating that ROPs most likely would cause more injury than prevention. That has been the established position, unchanged, for many years by the quad bike manufacturers.

[136] MBIE confirmed in their submissions the watershed moment was achieved when the trans-Tasman specialist technical group called into question the validity of the manufacturer's findings. Specifically, the manufacturer's research had previously dominated the ROPs debate claiming to have the only empirical evidence on the effectiveness of ROPs.

[137] What MBIE say from their involvement in the trans-Tasman technical group is that the group now has an overall consensus that perhaps ROPs are not as bad as they have been made out to be.

[138] The current position by the NZ regulator taken from their submission is this;

“Various ROPs have been designed and fitted to quad bikes over the past two decades with the aim of protecting the rider from being crushed by the weight of the quad bike.

Quad bike manufacturers say that ROPs increase the chances of injury if a quad bike rolls and commissioned a computer simulation study to illustrate this effect. However, the validity of the study's findings has been challenged by others citing contradictory evidence and the debate continues.

The Department (MBIE) cannot promote or require the fitting of ROPs to manage the hazard of quad bike roll over until the protective properties of such devices have been firmly established.

Fitting ROPs to a quad bike therefore remains a matter of personal choice for the farmer. A recent survey indicates that some form of ROP is fitted to quad bikes on approximately 15 percent of New Zealand farms.”

[139] At inquest the issue was put to Mr Barton representing MBIE. He confirmed MBIE had no real choice other than to take the neutral position as the status quo notwithstanding future compelling evidence that would persuade the regulator

differently. There is developing evidence in Australia now challenging the manufacturer's science.

[140] NZ should be looking to the Australian landscape where ROPs have been fitted to quad bikes in the Federal government employment programmes and similarly in the NSW state government employment programmes. The quad bikes have been fitted with a proven commercial product deemed by the federal and state employers, endorsed by national health and safety entities, as an appropriate safety measure for their employees. I am aware a similar situation exists in Israel where ROP's have been fitted to government quad bikes for over 10 years.

[141] It is important to distinguish the fitment of ROPs on Government quad bikes was done in their capacity as employers as opposed to an initiative by regulators.

[142] The Australia example has shown there has been genuine work towards addressing the issues surrounding the fitment of ROPs. Federal Minister, Mr. Bill Shorten had led the charge on behalf of the Federal Government bringing together key stakeholders in terms of a review on the issue.

[143] It was my impression the Federal Government was potentially considering a legislative change in terms of the fitment of ROPs.

[144] In my view the Australian example which is being closely monitored by credible researchers like Professor Tony Lower and independent engineers including John Lambert and Geoff McDonald will provide the empirical evidence within the next 5 to 10 years showing that the fitment of appropriate ROPs will indeed reduce injury and fatalities.

[145] I believe this evidence in time will form the new bench mark science.

[146] In the NZ context there is a belief that at least 15 percent of quad bikes used on farms have a fitment of some sort. The perception is the farmer considers their choice of ROP as appropriate to their work demands.

[147] The inquests have shown there is a real variety of ROPs in NZ which may be best described "the good, the bad and the ugly".

[148] Dr David Moore who is considered in NZ and Australia as a credible academic and analyst of quad bike issues confirmed at inquest that not all ROPs were bad and in some situations an appropriate fitment would add safety.

[149] The clear message coming from the inquest is that there is a fine balance between an appropriate ROP and maintaining the stability of the quad bike given its limitations and error intolerance.

[150] Therefore the fitment of ROPs remains an independent and individual decision of a quad bike user. There are a range of ROPs available both on a commercial basis and individually developed designs by farmers who apply the "Number 8 wire" philosophy in a design that works for them.

[151] I take the view there is a strong argument that ROPs should be considered as a legitimate form of safety protection. Unless there is a fundamental shift in the design of quad bikes; that lowers the centre of gravity; that make the base of the bike wider; and maybe a new manufacture enters the market with a new and a safer design; then the "Mexican standoff" remains in terms of the polarised views.

[152] It is not for this finding to endorse commercial products and name them individually; nevertheless, there are at least two on the market that have independent endorsement and merit and have proven to be an added safety feature without compromising the safety of the bike through independent testing and not by simulation testing. They are not perfect but they are more likely to save the life of a rider when it is tipped than not. Again, it comes back to the individual's view on the spectrum of whether ROPs should be standardised as a fitment or not.

Training and Education

[153] Most importantly as an immediate and long-term factor in quad bike safety is the issue of education and training.

[154] I was impressed with the industry leaders in terms of their dedication and commitment whether they were manufacturers or industry educators on ensuring that those who use quad bikes understood the limitations and capabilities of the bike; the issues around good maintenance and functionality of the bike; the use of helmets; the importance of active riding and the reasons why it is done; that

inherently quad bikes are error intolerant; the importance of understanding the manufacturer's instructions and capacity weight tolerance when towing trailers or adding weight by way of spray machines and specifically understanding the importance of that safety aspect.

[155] There was a realistic acknowledgement, not directly, more from the understanding these types of bikes had unique design features and therefore they needed to be used as safely as possible. Training and education remains an integral part of the safety message.

[156] Over the years subsequent governments have funded or subsidised training and education programmes in quad bike use. The industry genuinely believed such programmes increased greater safety awareness adding real value to the agricultural industry and the Forestry industry.

[157] There were concerns by industry trainers the removal of Government subsidies would undermine the sector standards. The industry has tried to maintain a high standard of training and overall education established some years earlier. Their concern is the removal of the financial subsidy will undermine both the quality and effectiveness of the outcomes desired.

[158] I was impressed with the clarity of the message and whilst there may be a small element of self interest, overall, the message promoted to quad bike users was one of safety first above all else.

[159] With the complexities of design and associated arguments around it, the most pragmatic way of dealing with a quad bike on a day-to-day basis is through good education and training.

[160] Grant Hadfield, of FarmSafe NZ, reiterated the importance of skills-based training that included hazard identification and the management of that hazard. In applying the skill based principles to the use of quad bikes, it is making the rider of that bike personally responsible for their own safety. It is a lifelong responsibility when engaging quad bikes.

[161] With an estimate of between 80,000 and 100,000 quad bikes in use throughout NZ in various situations from commercial farming through to recreational

use, one can imagine the variance in riding skill levels; the variance in maintenance standards; and general attitude to safe use. The variance would span from exceptional to total neglect and worse.

[162] It would be easy to suggest there should be a minimum standard of bike maintenance or riding skill and therefore a regulatory licensing and registration regime should be set up for quad bike and riders, as with motorbikes, as with other machinery. In terms of a business plan with enforcement provisions that would be very difficult to establish requiring political motivation.

[163] I like the concept of the "FarmSafe Quad Bike licence" where a farmer; farmer's employee; self contractor or a quad bike user is trained and taught to be competent when using a quad bike. The training includes understanding the hazards of using quads; and the importance of good quad bike maintenance.

[164] FarmSafe stated 68 percent of quad bikes fail mechanical checks. It is a skills-based training course that to date had seen 350 quad bike licenses issued in NZ since 2011.

[165] The concept has real merit and regardless if the quad bike user stayed with the same employer or moved to somewhere else it would be a qualification/licence that would be recognised within the industry. There is discussion of expanding the concept industry wide to a "Rural Licence"

[166] Overall, I would endorse the continuation of training and education in this area. In my view it is the most pragmatic safety measure that would have the most use over the longest period of time.

Retention of Expertise

[167] At inquest, Dr. Moore, highlighted the need to accumulate and retain genuine and credible knowledge around quad bike use; safety and other appropriate evidence associated with it. He felt there was not enough expertise or overall knowledge being built up. There needed to be more collection and analysis of the contributing factors to both injury and death. There needed to be a building up of sector and technical knowledge.

[168] He felt the sector wasn't retaining the people with the sector and technical knowledge. There were too few people involved in key positions in the analytical and regulatory bodies and often they changed roles too frequently resulting in failure to retain the knowledge and the people who could make a difference.

[169] Dr Moore reiterated that New Zealand was not a separate case in that we were in a similar position to that of Australia, Sweden and other countries having the same debates and challenges. Other countries were struggling with improving health and safety standards in the issues around quad bike safety and the agriculture sector in general.

[170] In summary, he acknowledges that New Zealand was not a wealthy country overall and therefore would never be able to afford a health and safety system for agriculture modelled on the aviation or petrochemical sectors for an example which had large expert teams of regulators developing and updating rules; policies and procedures.

[171] He felt that we should adopt a different model in New Zealand to harness the energy and specialist knowledge of individuals in this industry but particularly around quad bike use. I support that sentiment.

ACC

[172] I acknowledge the work ACC have been doing in education and training. They have been at the forefront of funding research on helmet use and other factors. They have funded Standards New Zealand to develop specific helmets for quad bikes and have been working with companies both here in NZ and overseas (including Australia) to further the safety message around quad bike use. They remain active in the area of quad bike injury reduction and remain committed in providing media developed resources around keeping children safe around quad bike use.

[173] I endorse their continued involvement in the New Zealand community working with various groups including "Kidsafe" and others in providing the overall education and clear message about sensible use of quad bikes.

[174] Moving forward into the future ACC will play an important role in monitoring the scientific development of new evidence in its role of reducing injury; risk; and fatalities from quad bikes. ACC is also challenging the science around ROP's and continues to work and fund other researchers with similar views.

Testing of Aftermarket products

[175] There is a need for more information around the testing of after-market products that can be fitted or attached to a quad bike. Specifically, I talk about the use of spray units and the impact they have on the stability of a quad bike when in use. The same would apply to the attachments of trailers or purpose-built trailers.

[176] In all five inquests the common denominator was an after-market attachment either a spray unit or a trailer that contributed to the overall demise of each crash and eventual death.

[177] Dr Moore talked about having baffles in the spray unit tanks to stabilise as much as possible the shifting liquid. He talked about better research on the coupling flexibility of purpose built trailers towed by quads etc. There is a genuine lack of available research on these aftermarket products and the impact they have on the stability of the quad bike. This in itself would form part of the knowledge build up.

[178] There is very little scientific feedback on the impact these after-market products have. Whether they are provided by the manufacture or an industry leader which has the ability to widely publish such information, in my view is required.

ATV

[179] Two final points for consideration; firstly, the term "ATV" in my view should be removed from any official description of a quad bike. Manufacturers explain the term ATV has been around for many years and was a distinguishing tag attached to a quad bike and easy to be identified in the market place.

[180] In today's context, the all-terrain vehicle (ATV) is simply not that and should not be referred to as it is misleading.

[181] In many of the quad bike fatalities in which Coroners have dealt with there has been a common result where the deceased has often been trapped under their quad bike for some period of time. They have survived for a period before succumbing to the weight of the bike or the sustained injuries. The carrying of a personal alarm of some sort may lead to saving a life. I would invite the innovators to consider the concept.

[182] Farmers work hard; often in isolation; over long hours; often battling fatigue and tiredness; having an alarm system or communication system that can be activated relatively easily could save a life especially if rescuers are searching and time is of the essence.

[183] Lastly, other Coroners have raised in their findings the use of a mechanical beeper of some sort when the bike is being reversed. It gives a busy farmer who is often on and off their bike all day a warning when in reverse. There have been cases when a rider has reversed backwards over a cliff when they genuinely thought they were in gear to move forward. Is this something the innovators may consider as well?

[184] The same principle could apply by way of engineering intelligence when the quad bike is at risk of rolling over because of unstable terrain; or when it is been ridden across an unsafe hilly slope. It tells the rider to immediately alter their course or to stop. That is a discussion and a suggestion requiring further involvement from industry leaders and innovators.

Eliminate Quad Bikes from Farming

[185] The other consideration is to stop using quad bikes in farming altogether. There have been projects examining this concept in both in Australia and NZ on large commercial operations. Many NZ farmers are transferring from quad bikes to UTI's or side-by-side all terrain vehicles. The two wheel motorcycle is considered safer to use accepting it is very limited in playing multiple roles. There is the rise of small vehicles with a genuine utility role.

[186] The fact remains the quad bike is entrenched as a vital farm tool in NZ.

Recommendations

- (a) I endorse the programmes and projects MBIE have instituted in relation to supporting guidelines for the safe use of quad bikes;
- That riders must be trained and have the requisite experience to ride a quad bike in performing their duties and functions.
 - To ensure that proper judgement is exercised in choosing the right vehicle for the right job.
 - To always wear a helmet.
 - To prevent children riding adult quad bikes.
- (b) That a quad bike should not be referred to as all-terrain vehicle (ATV). It is accepted the acronym ATV was associated with the marketing of quad bikes over many years and has been an accepted term within the quad bike/motorcycle industry. In my view it is misleading and to remove it from Government terminology in relation to quad bikes is appropriate. Quad bikes should be identified by their true definition and not a misleading definition like ATV.
- (c) I endorse the recommendation by all heads of the industry in that a helmet should be worn at all times when a quad bike is in use.
- (d) I strongly recommend the continuation of training and education with the tertiary sector in relation to NZQA to review appropriate levels of funding in ensuring that appropriate training which would include skills-based training; hazard identification and management; the understanding of appropriate maintenance including tyre pressure on the quad bike. Training and education would include a thorough understanding of the limitations and frailties of the quad bike

particularly when after-market attachments like spray units and trailers are attached to it.

Unfortunately, training and education cannot teach common sense or good judgement; nevertheless, they can teach the realities of poor decisions when quad bikes are placed in vulnerable situations as a result of riding them on hilly; sloped or steep terrain. Death and injury can also occur when in slow motion or when turning.

Active riding is one of the most important skills required to safely control a quad bike and must be taught by qualified people.

Making training of quad bikes as accessible as possible not only for corporate units within the agricultural industry; to those in the recreational industry; to those in forestry and other related industries would benefit from a similar type of training.

Whether there is an opportunity to discuss a certification or licensing option would be worthwhile pursuing.

- (e) I suggest consideration be given to supporting a multi-disciplinary taskforce to specifically research and advise on ROPs. As it stands, there is a trans-Tasman group who consider design issues and ROP's etc. The evidence at inquest has shown there is a diverse range of opinions that are entrenched and therefore the issue of safe fitment of ROPs cannot be advanced. This group has adjourned from time to time due to the entrenched positions. Therefore a dedicatory group of professionals within the New Zealand Government regulator set up is worth considering. It may even fit within the new standalone entity.
- (f) ROPs: in continuing this area I endorse the view of closer relationships with Australia and to look to their developments both at the Federal and State Government levels with the fitment of ROPs and to closely monitor the success that comes from their development and further evidence provided by independent engineers and health and safety experts.

To provide further support to ACC in their endeavours to fund more research in joint projects and to continue to develop advanced scientific approach's to reducing risk; harm and fatalities relating to quad bikes.

Further consideration should be given to a specialist unit for quad bikes, tractors and farm machinery. As pointed out by Dr. Moore there is a problem in retaining the technical and sector knowledge and the personnel who have built up expertise over time. To have a dedicated unit not just around quad bikes but other farm machinery would greatly assist the agricultural sector and other similar industries. It may be worth pursuing consideration of a joint venture between industry leaders and the New Zealand Government.

- (g) To have regular testing of after-market attachments and products associated to quad bikes specifically trailers and spray units. To provide better information around risk and compromise in relation to the stability issues of a quad bike. To provide better understanding of limitations and to provide a better and safer message within the industry.
- (h) To give thought to a better message about quad bike maintenance, in particular having the correct tyre pressures and general maintenance of the quad bike reducing risk and potential fatalities – training and education.
- (i) Lastly, recognising quad bike issues are complex in many aspects. Maintenance remains a genuine problem and a contributing negative factor to injuries and fatalities. In the ideal world having quad bikes either registered or licensed or warranted may be of real benefit. Is there any merit in considering this issue?
- (j) To consider fitting a warning signal by way of a beeper or alarm when a quad bike is in reverse or when it is on a slope and potentially at a point of tipping. Whether the issue of artificial intelligence can be attached to a quad bike for safer use is both an academic and technical discussion. It is accepted these are but discussion points

that with the right political will and physical environment may become a reality.



Coroner H B Shortland