STATE
CORONER
VICTORIA

8th February, 2002

Case No: 621/01

INCIDENT AT THE 2001 AUSTRALIAN GRAND PRIX

Inquest into the DEATH of Graham Francis Beveridge

Held at Melbourne Magistrates Court between 3rd and 20th December 2001.
Also at the Coroners Court, Southbank on 7th February 2002

FINDINGS

Identity, Date, Place and Cause of Death

The death of Graham Francis Beveridge[1] occurred at the Albert Park Australian Grand Prix Motor Racing Circuit on 4th March 2001 from 1(a) multiple injuries including a ruptured heart.

[1] **Coroners Case Number 621/01**

The general background of the 2001 Australian Grand Prix

History of the Albert Park motor racing circuit

The Albert Park motor racing circuit was established for the 1996 race to facilitate the annual running of the Australian Formula One Grand Prix following the event being transferred from the Adelaide circuit. Albert Park, like its predecessor in Adelaide, is a temporary street type circuit erected shortly prior to the event and then dismantled.

Historically, motor racing had previously occurred at Albert Park between 1953 and 1958.[2] The first Australian Grand Prix motor racing event was held in 1928 at Phillip Island and continued there until 1935. Thereafter the race took place variously at Victor Harbour in South Australia, at Albert Park, Point Cook and Sandown Park in Victoria and other circuits throughout the Country ranging from Longford in Tasmania to Bathurst in New South Wales.

In 1985 the international sport of Formula One racing was first introduced to Australia and ran in Adelaide from that year until the new temporary street circuit was established at Albert Park.

Summary of the background and responsibilities of the parties involved

Introduction

A number of parties appeared at the inquest representing various interests. The parties included the British American Racing Team (BAR),[3] the Confederation of Australian Motor Sports (CAMS), the Australian Grand Prix Corporation (AGPC) and Brown and Root Asia Pacific Pty. Ltd (Brown & Root). The international body controlling sport, the Federation Internationale d'Automobiles (FIA) although represented for a short time by Messrs Ray and Blanden, withdrew its instructions and chose not to be represented at the inquest. The FIA's head of safety, Mr. Charlie Whiting, chose not to give evidence at the inquest, despite being requested to do so and offered the opportunity of using a video link at a time convenient to him. However, it is noted that one representative of the FIA, Mr. John Large did assist by giving evidence. Large is the CAMS representative at the General Assembly of the FIA and a member of the World Motorsport Council of the FIA. Also one of the CAMS witnesses, Mr. Brian Shead, was a member of the FIA Circuits Commission.

The Australian Grand Prix Corporation

The Corporation is a statutory body which was established under the *Australian Grand Prix Act* 1996 (Victoria). According to section 20 of the Act the functions of the AGPC include:

(a) to negotiate, enter into and vary agreements under which Formula One events are held;
(b) to undertake and facilitate the organisation, conduct, management and promotion of Formula One events ?;
(c) to establish at Albert Park a temporary motor racing circuit and supporting facilities for Formula One events ?

In the definition section of the Act (3) ``*promote*'' includes ``*?organise or conduct.*'' Under section 22 of the Act, the AGPC may:

> ``*? by instrument under its common seal, delegate to a member or to the Chief Executive Officer of the Corporation or, with the approval of the Minister, to any other person or body, any power of the Corporation, other than this power of delegation*''.

Under this power the AGPC contracted the responsibility of safety in the running of the Australian Grand Prix to CAMS by virtue of an Organisation Agreement dated 2nd March 1999. According to the AGPC submission the corporation has ``*no contractual organisational responsibility in relation to the technical, sporting and safety aspects of the Australian Grand Prix?*''[4] CAMS acted as the FIA's representative in Australia and was:

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[2] Tuckey W.P. ``*The Book of Australian Motor Racing*'', K.G.Murray Publishing Company, Sydney, p.86 (see also Blanden and Floyd)

[3] BAR is not described in this summary – but see discussion under the heading – ``*Submissions and evidence on the performance of the wheel tether system at Albert Park.*''

[4] Submission, p.7

``responsible for exercising authority over the Australian Grand Prix in all technical, sporting and safety (but not commercial) aspects of any motor racing activities occurring on the circuit during the Australian Grand Prix pursuant to the power granted to CAMS under the Organisation Agreement and such authority is to be exercised in accordance with the terms of the CAMS-AGPC agreement, the FIA Formula One World Championship Sporting Regulations, the Sporting Code and the National Rules.''[5]

CAMS was responsible to undertake a variety of organisational and safety matters from advising the AGPC of preparatory work, organising medical services, providing flag/track marshals, fire and rescue services to de-briefing a range of agencies.

Counsels' submission on behalf of the AGPC states that notwithstanding the ability to delegate, the AGPC:

``regards itself as having a coordinating role in the management of the event particularly in the development and implementation of a risk management process involving all key stakeholders in the event.'' [6]

And:

``The AGPC works closely with CAMS and the FIA on matters of design and circuit safety, and does not abdicate its responsibilities. Often, the AGPC and CAMS initiate improvements, for example, the Melbourne kerb and the pit lane fire protection and the SCP system. The AGPC does not simply accept the advice of FIA and CAMS, and conducts independent evaluations, relevantly, the analysis of the safety and compliance of the Adelaide panels prior to their use at Albert Park.''[7]

Both the AGPC and CAMS have joint responsibilities under the Organisational Agreement including:

- *Obtaining all national and sporting authorisations required for the event to be run including government, municipal and police authorisation.*
- *Ensuring that the circuit, its equipment, its personnel and the safety measures put into effect (and in particular the medical team and equipment) comply in all respects and for the whole duration of the event with the regulations and requirements of the relevant FIA bodies and commissions and with the national laws in force on the day of the event.*
- *Ensuring that the circuit has been or will be eligible for the grant of a FIA track licence and for undertaking all the safety work demanded by the FIA and for ensuring that the advice of the FIA Safety Delegate is respected. Both bodies are responsible for ensuring that modification of the track is not carried out without the prior written approval of the FIA.*
- *Responsible to the FIA and liable to sanctions or proceedings provided for by the FIA International Sporting Code for delays in the timetable, lack of medical or safety (including fire) equipment.*
- *Responsible for working together on the Race Organising Committee to ensure the satisfactory preparation for and conduct of the meeting.*[8]

The Confederation of Australian Motor Sport

Under the AGPC/CAMS Organisational Agreement CAMS is responsible for the organisation of safety on the track. CAMS is regarded as the FIA's authorised representative in Australia. The AGPC submission pointed out that under:

``?the FIA's International Sporting Code, CAMS has been delegated the FIA's sporting powers in Australia and has the power to act on behalf of the FIA.'' [9]

Furthermore, as agent for the FIA in Australia CAMS:

``is the main conduit between the AGPC and Brown & Root and the FIA. However, it has the responsibility for ensuring that the requirements of the FIA are implemented. The relationship between the FIA and CAMS is a two

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[5] Submission, p.5

[6] Submission, p.8

[7] AGPC et al submission, p.5

[8] AGPC et al submission, p.8-9

[9] AGPC et al submission, p.6

way street and CAMS, particularly Brian Shead, is intimately involved in the process of evaluating circuit safety and conceiving improvements. He is also a member of the FIA Circuits Commission and is one of the few people entitled to certify tracks in their own country."[10]

Brown and Root Asia Pacific Pty. Ltd.

Brown & Root (formally Kinhills) are consultant engineers to the AGPC. They had previously been involved with the Adelaide Grand Prix. The AGPC submission explained the engineers' relationships as follows:

- *Brown & Root is responsible for the provision (as requested by the AGPC) of expert comment, advice or services in the field of circuit design, event planning and project management.*
- *Brown & Root is responsible for using its best endeavours to comply with all applicable laws including, but not limited to the rules and regulations of the FIA and CAMS.*
- *As part of its track design responsibilities, which were initially undertaken in the design of the Albert Park track, Brown & Root is responsible for:*

    - *Undertaking a comprehensive review of the proposed track design. This includes comment on track layout, length, speed profiles, safety, marshal openings, barriers and track access.*
    - *Reviewing and fix the locations and suitable types of race facilities.*
    - *Investigating and identify locations for and suitable types of grandstands and corporate facilities.*
    - *Giving recommendations on circuit access.*
    - *Liaising with CAMS and formulate an appropriate schedule for a formal submission of design documentation to the FIA via CAMS.*
    - *Preparing a master program for design, construction and dismantling of the circuit.*[11]

That the contractual arrangements with the AGPC and Brown & Root ``*is contained in a Consultancy Agreement between the Melbourne Grand Prix Promotions Pty Ltd and Kinhill Engineers Pty Ltd entered into in 2000."* [12]

Counsel submitted that their clients, the consulting engineers, are ``*the most experienced engineers in Australia in this very specialised area"* and have a ``*dedicated team"* of up to 50 personnel during the race period ``*working on the Grand Prix design and engineering issues."* Also detailed engineering analysis is undertaken for any new safety measure or ``*other track improvements."* [13] Counsel also pointed to some of the difficult and complex issues required to be allowed for in the running of a Grand Prix event:

> ``*In the example of the design of the barriers, Brown & Root is contracted to design, (and subsequently to superintend the building of) a barrier which is both safe, and which complies with the FIA guidelines (Smith p.687), and all applicable laws."*[14]

The Federation Internationale d'Automobiles

As it was not represented at the inquest details on the history and responsibilities of the FIA had to be distilled from a reading of its regulations, various texts and the general documents produced during the investigation and hearing. The CAMS Risk Analysis and Mr. John Large's summary in his evidence was also beneficial in this regard.

The CAMS Risk Analysis Report following the incident at the 2001 Australian Grand Prix states that Motor Sport throughout the world is directed and controlled by the FIA and that CAMS has been a delegate since 1953. There are a number of regulations and codes established by the FIA which govern the events. These include:

- The International Sporting Code;
- Sporting Regulations for the FIA World Formula One Championship;
- Technical Regulations for the vehicles competing in the FIA Formula One World Championship;

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[10] AGPC et al submission, p.4-5

[11] AGPC et al submission, p.9

[12] AGPC et al submission, p.5

[13] AGPC submission, p.5

[14] AGPC et al submission, p.4

- Regulations concerning the safety of the circuit are contained in Appendix 0 to the International Sporting Code... and also in the document entitled FIA Internal Guidelines for Motor Racing Course Construction and Safety? [15]

Throughout these documents ``*safety*'' is found to be a key focus of the objects and functions of the various regulations and codes.

The FAI has a General Assembly that has two arms – the World Council for Touring and the Automobile and the World Motor Sport Council (the Council). The Council is concerned with all the major forms of motor sport including Formula One. There are 24 members of the Council. The FIA has 21 specialist sporting commissions, each of which can make recommendations to the Council.

As far as Formula One is concerned there are three commissions:

1. The Safety Commission;
2. The Circuits Commission; and
3. The Formula One Technical Working Group (which comprises the senior engineers from each constructor's team).

Mr. Large stated that:

> ``*the Safety Commission has an overriding interest in any aspect of safety in any branch of motorsport and this effects any of the work of the other commissions which touches on safety matters?.*
>
> *The Circuits Commission works with the Safety Commission on relevant matters, and its Chairman sits on the Safety Commission. The Circuits and Safety Commissions share an executive officer?.*''[16]

And that:

> ``*Through the process of review of all incidents that take place in Formula One racing, the Circuits and Safety Commissions are constantly reviewing relevant international racing experience and through their work and recommendations, this experience is fed back into the process of constant safety management overseen by the FIA. The aim of the constructors is to improve the performance of their cars, constantly, and they are extraordinarily competitive. This results in non-stop competitive tension between the constructors and the FIA to contain the ever increasing performance of the cars to ensure that they can perform safely within the capacities of the existing circuits.*'' [17]

The AGPC and CAMS submission pointed to the fact that:

> ``*The FIA guidelines embody the accumulated learning gathered over several decades of international motorsport. By requiring all circuits to comply with its guidelines before granting a licence to operate, the FIA ensures that acceptable standards of safety are met and that reasonable consistency is achieved between different countries. The FIA also conducts a post race review by Charlie Whiting which feeds into the process of continuous improvement.*'' [18]

The AGPC and CAMS submission suggested that the FIA is responsible for:

- *Laying down the Sporting Regulations.*
- *Approving the circuit – granting the FIA Track Licence.*
- *Setting the regulations and requirements for the circuit, its equipment, its personnel and the safety measures put into effect.*

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[15] CAMS Risk Analysis Report Australian Grand Prix 2001 and Appendices (Exhibit 96)

[16] Large statement, p.2

[17] Large statement, p.2

[18] AGPC et al submission, p.4

- *Consenting to / approving advertising.*
- *Issuing passes and tabard (this can be done on the FIA's behalf by CAMS).*
- *Issuing criteria for documents, regulations, programmes, etc.*[19]

Before the 2001 event the FIA had indicated that the local organisers are responsible for safety.[20]

Conclusion – agency responsibility for safety

Ultimately responsibility for safety must rest with the statutory authority, the AGPC who has the statutory role to organise the Australian Grand Prix. However, it can delegate the management of this issue to another agency, such as CAMS. It is also entitled to seek expert advice on safety related issues from CAMS (and its National Track Safety Committee), FIA and Brown & Root.

Clearly the FIA, in spite of its broad international expertise (and a safety charter), track licensing and inspection role, does not regard itself as responsible for safety at Albert Park.[21] Accordingly, in the future the local agencies working on the safety issues associated with this event may need to take their own additional steps in relation to managing risk.

The collision between race cars at the 2001 Australian Grand Prix

Incident summary

At about 2.10pm on 4th March, Mr. Beveridge, aged 52 and a volunteer Spectator Marshal from Queensland, was fatally injured as a result of an incident occurring during the fifth lap of the Australian Formula One Grand Prix when a BAR Formula One racing car being driven by Jacques Villeneuve collided with a Williams team car being driven by Ralf Schumacher. On the approach to Corner 3, Villeneuve's vehicle struck the rear of Schumacher's car causing the former vehicle to become airborne rotating in an anti-clockwise direction. The BAR vehicle then struck the concrete and wire mesh spectator fence and, at high speed, continued to slide along the fence where eventually the right rear wheel became dislodged at a gap in the fence designed for marshal and driver entry and exit. The dislodged wheel went through the gap, travelled about 8 meters and struck Beveridge in the chest causing fatal injuries. Eight spectators in the vicinity of the gap in the fence were also struck by flying debris and received minor injuries.

The evidence of the drivers

Both Messrs Schumacher and Villeneuve made statements to investigating police. However, it was decided not to call either of them to give evidence at the inquest. Ralf Schumacher stated:

> ``*I know that Jacques VILLENEUVE was behind me. I saw him behind me then concentrated on my approach to turn 3. Because I was on the inside of the track, I had to slow earlier to allow me to successfully negotiate the right hand turn. I was at the 100 metre mark and would have been travelling at a higher speed and was probably in 7th gear.''* [22]

And:

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[19] AGPC et al submission, p.6

[20] See for example Kinhill memorandum, 2nd July 1998 (Exhibit 79) `There has been an effort by FIA to move from the proscriptive to `*? a reference for the assessment of a circuit..'* and `*-..Although constructors of new circuits are advised to respect the recommendations?the guidelines are subject to interpretation?'* and `*?operators of a circuit are responsible for the safety conditions prevailing within its precinct'*

[21] There appears to be some inconsistency with the submission by AGPC/CAMS that ``*CAMS acted as the FIA's representative in Australia''* and was:

> ``*responsible for exercising authority over the Australian Grand Prix in all technical, sporting and safety (but not commercial) aspects of any motor racing activities occurring on the circuit during the Australian Grand Prix pursuant to the power granted to CAMS under the Organisation Agreement and such authority is to be exercised in accordance with the terms of the CAMS-AGPC agreement, the FIA Formula One World Championship Sporting Regulations, the Sporting Code and the National Rules.''*[21]

[22] Schumacher statement p.1

``As I started to brake, I felt a car run into the rear of my car. I know that it was Jacques who ran into me. My car then started to spin out of control and as I was spinning I could see Jacques' BAR spinning through the air." [23]

After viewing the video footage Mr. Schumacher stated that he *``could see no reason for the collision"* as he *``took no sudden moves or changes for direction that may have caused the collision."* [24]

The other driver, Mr. Villeneuve stated that before the collision he was following Ralph Schumacher and had *``been behind him for two laps, but I hadn't attempted to overtake him during those two laps."* [25] That:

``As I approached turn 3, on the straight between turn 2 and 3 Ralph was in front of me, in the middle of the road, and as he approached the end of the straight he was slightly more to the right hand side of the track.

I was intending to overtake Ralph on the left hand side, in the braking zone prior to the bend.

I made the decision to overtake on the left and started to move over to the left. I had only moved over about half a car length. As I started to move over Ralph started to slow down. It took me by surprise because I wasn't expecting him to slow down yet. I felt that he braked earlier than that bend required; however he may have had a problem with his car to cause him to brake earlier." [26]

Mr. Villeneuve was in sixth gear and considered that his car was probably travelling at about 280 km/h. He was very close behind Schumacher *``and probably no further than one car length"* when the Williams driver braked. On observing the braking vehicle Villeneuve stated that he:

``reacted by lifting my foot of the throttle with the intention of braking, however I was unable to slow down in time. I'm not sure if I was able to get my foot onto the brake pedal prior to hitting him from the time I realised he was braking to when I drove into him was only a matter of a couple of tenths of a second. With those cars he would have already reduced his speed by 60 kph in those tenths of a second. You can lose about 200 kmh in 60 to 70 metres in those cars as the braking is so sudden." [27]

And then:

``My nose hit Ralph's left rear wheel. I took off. My car was launched into the air. I then hit the wall on the left hand side of the track with the front of the car. That turned the car and I again hit the wall with the rear of the car. I then slid and hit the gravel track and the car started rolling?." [28]

Formula One racing cars do not have brake lights.

Mr. Schumacher was not injured in the incident and Villeneuve suffered sprains and bruises. Villeneuve was later taken to the Alfred Hospital for observation.

The Chief Racing Steward's Assessment

Mr. Garth Wigston was Chairman of CAMS National Stewards Committee and Steward for the 2001 Australian Grand Prix. He reviewed the incident at Turn 3. He also interviewed both Schumacher and Villeneuve. Wigston stated:

``During the interviews with the drivers, SCHUMACHER indicated he had kept to his line into the corner, but may have braked earlier; whilst VILLENEUVE suggested that at the moment he had decided that he would attempt to pass SCHUMACHER on the left, SCHUMACHER may have braked earlier than previous laps, which is when the cars collided.

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[23] Schumacher statement p.1

[24] Schumacher statement p.2

[25] Villeneuve statement p.1

[26] Villeneuve statement p.1-2

[27] Villeneuve statement p.2

[28] Villeneuve statement p.2

Having discussed the incident with Jacques VILLENEUVE and Ralf SCHUMACHER and having reviewed the video tapes of the incident, it was apparent to the Stewards that there was no unusual, sudden, or otherwise significant actions taken by either driver immediately prior to the incident." [29]

And:

``Given the estimated speed of cars at that part of the circuit (approximately 290 kilometres per hour); human reaction times; the vicinity of Cars 5 and 10 to each other and the highly competitive nature of the competitors; the Stewards concluded that given the circumstances, there was nothing which could suggest blame could be apportioned to either driver and thus the incident was a racing incident." [30]

Mr. Wigston also explained that in *``the environment in which Formula One races are held, it is not uncommon for what may appear to an outsider to be a significant incident, to have in fact been triggered by a simple human error of the most minute proportions, but to which it is not reasonable to appoint blame."* [31]

The Police Engineer's Assessment

Sergeant Peter Bellion, Police collision investigator and civil engineer, examined the telemetry data in relation to both of the Formula One racing cars and also viewed the video footage and still photographs of the crash sequence. Bellion also viewed an FIA report containing an analysis of the telemetry data. He was requested by the investigating police officer to examine the data to determine - *``Speeds of travel at the time of impact and whether the location where each vehicle was braked coming into Turn 3 was consistent with where they had been braked on the previous four laps."* [32] Bellion stated that the BAR vehicle driven by Villeneuve was initially travelling at 303 km/h before *``backing off on the throttle and braking."* Further there was:

``a rapid slowing of the BAR vehicle from 288.5 km/h down to 243.2 km/h over a distance of 5 metres. Representing an average deceleration between these points of about 19g, this level of deceleration is consistent with an impact."[33]

Sergeant Bellion also examined the telemetry of the Williams vehicle and concluded that it was initially travelling:

``at 295 km/h before backing off on the throttle and then braking. It was struck from behind at approximately 248 kph and was accelerated by the impact up to 251 kph before again decelerating, this time to a stop. The deceleration of the Williams vehicle during the first section of post impact movement was at a slightly lesser level than during pre-impact braking but during the last section of deceleration it was quite rapid, probably associated with going into the sand trap at the end of Turn 3." [34]

The points at which each drive backed off the throttle pedal for the various laps (1-5) on the Turn 3 approach were also examined by the Sergeant. He concluded that:

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[29] Wigston statement, p.2
[30] Wigston statement, p.3
[31] Wigston statement, p.3
[32] Bellion statement, p.3
[33] Bellion statement, p.4
[34] Bellion statement, p.4

``Villeneuve lifted off the throttle at a point 13 metres later than for the previous lap at a speed 6 kph quicker. This would be a time difference of 0.15 of a second. Schumacher lifted off the throttle at a point one meter later than the previous lap and 18 meters earlier than on lap 3. There is a variation of – 3 kph to + 1 kph in speed compared to the previous laps." [35]

Sergeant Bellion also examined eight, frame by frame still photographs sequentially showing the impact of the BAR vehicle with the barrier fencing. The photographs were taken by professional photographer Paul Crock with a Nikon F5 SLR camera, which when operating in a continuous mode takes 8.1 frames per second. Crock was operating the camera on the continuous high-speed setting.[36] Bellion used this information for his calculations and stated:

``These photographs show the location of the deceased adjacent to a gap in the barrier. The gaps in the barriers are apparently 4 metres apart. From the photo that shows the right rear wheel of the BAR vehicle hitting the barrier system to the location of the deceased is estimated from these photographs at between 5 to 6 metres. For constant velocity this would give velocities of 5 metres/1/8.1 or 5 x 8.1 = 40.5 metres per second to 6 x 8.1 = 48.6 metres per second. Converting these to speeds gives 145.8 to 174.96 km/h. This suggests the wheel and tyre that came through the fencing struck the deceased in the chest at between 145 and 175 km/h. This would constitute extremely high chest accelerations resulting in significant internal trauma." [37]

Legal Submissions

The BAR submission suggested that the:

``initial collision between the vehicles was a racing incident. A racing incident is one where there is no clear evidence that there is any fault on any party, or where the fault was of such minute magnitude, given the facts surrounding the incident, that it would not be considered possible to have taken avoiding action. (Statement of Garth Wigston, page 4.) The evidence before the Coroner was that no blame or fault could be attributed to BAR or Jacques Villeneuve arising out of the accident." [38]

Counsel for AGPC, CAMS and Brown & Root submitted *``there is no evidence of fault attaching to the drivers. Save for it forming an essential part of the narrative, the circumstances of the collision do not warrant extensive scrutiny in these submissions."* [39] In their summary Counsel assisting the Coroner suggested that the accident *``occurred in the normal course of driving and there was nothing exceptional about the driving."* In addition, the approach to Turn 3 is *``an area where cars brake and slow down very rapidly."* [40]

Conclusion – the drivers and the collision

The very nature of Formula One motor racing where drivers push their vehicles and their own performance to the limits necessitates decisions being made in split seconds at very high speed, which inevitably means that human errors will be made. Decisions to brake, overtake or change an approach to a corner are often made by a driver where other vehicles are in close proximity travelling at similar speeds. Any error, even of a relatively minor nature can (as observed in this incident), eventually result in disastrous consequences.

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[35] Bellion statement, p.5
[36] Crock statement p.1
[37] Bellion statement, p.5
[38] BAR submission, p.2.
[39] AGPC,CAMS and Brown & Root submission, p.1
[40] Counsel Assisting *``Outline of submissions"* p.5

On the evidence there is no reason to consider the incident is anything other than one which is regarded as a normal part of motor racing where, inevitably as drivers push themselves and their vehicles to the limits to gain race advantage, collisions will occur. There is no evidence of any breach of racing rules by either driver.

The role of the marshals, observations of the collision, injuries to spectators and track design and safety

Introduction – the history of debris fencing from Adelaide to Albert Park

Following the death of Mr. Beveridge, CAMS undertook a ``*Risk Analysis Report*'' (prepared by Mr. Bruce Keys) into the incident which also summarised the history of the design and development of the debris fence system for temporary circuits. The Report states that the:

> ``*design and method of construction of the physical protection system of the circuit in Adelaide i.e. the concrete block/debris fence/spectator fence system, broke new ground for a circuit that was to be used for the Formula One World Championship.*'' [41]

The particular debris fence system, which was originally designed by Mr. Kevin Lee[42] for the Adelaide circuit was transferred from that city to the Albert Park circuit when it was opened in 1996. Apparently much of the fencing originally used in Adelaide was purchased by the AGPC and taken to Melbourne for use at Albert Park. Because of the extra length of the Albert Park circuit additional fencing was constructed to the same design as for Adelaide.[43]

In summary, the system provides a ``*first line of protection (primary protection)*'' which is ``*by linked concrete blocks, each 4 metres long and 1m high weighing approximately four tonnes each, joined at each end by 100mm diameter steel pins.*'' The second line of protection, which is called secondary protection or ``*the debris fence*'' is:

> ``*constructed from a reinforced welded wire mesh panel, which is located on top of the concrete blocks and linked together by an extension of the concrete block pins.*'' [44]

There is also a third line or ``*tertiary*'' protection behind which spectators are located and this is:

> ``*a personnel restraining barrier, usually a wire strand and plastic webbing fence approximately 1.2 metres in height, which is located at the appropriate distance behind the first (and second) line of protection. Its purpose is to delineate the area set aside for the public and therefore to provide an appropriately secure area in which those personnel required to operate in the Marshal Zone may do so unhindered.*'' [45]

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[41] Report, p.4

[42] A civil engineer employed by Pak-Poy and Kneebone Pty Ltd, Adelaide.

[43] Report, p.23

[44] Report, p.4

[45] Report, p.5

Mr. Keys' Report emphasised that the integration of the concrete blocks with the debris fence effectively placed on top provides:

> ``*an advantage of additional protection to personnel (who are required to operate behind the primary protection) than is the case at the majority of circuits throughout the world on which Formula One Grands Prix are held. These are mainly held on ``permanent'' tracks. Specifically designed for motor racing activities. The protection systems of which are generally constructed so that there is a gap between the primary and secondary protection barriers, thus denying the additional protection of the debris fence to those persons (including marshals) required to operate immediately behind the primary protection barrier.''* [46]

Apparently, at the permanent circuits marshals do not have the added protection of the higher wire debris fence protection. At permanent circuits marshals only have the protection of the concrete blocks with the upper part of the body potentially exposed to flying debris (unless the marshal reacts quickly and ducks down to seek the full protection of the concrete barrier).

The Report explained that relatively few Formula One circuits are of a temporary nature. The other temporary circuits are Monaco and Montreal. However, Montreal is ``*substantially a permanent facility which is turned into a Formula One circuit by fine tuning rather than significant introduction of infrastructure, as is the case with Albert Park and Monaco.''* By comparison the protection systems used at Monaco are:

> ``*primarily 1 metre high (3 row) guardrail, the upright posts for which are located in rectangular sockets set in the public road system of the municipality. Selected areas are further protected by the erection of FIA standard specification debris fencing. It is generally situated behind the first line of protection.''* [47]

Although, the Report also argued that Albert Park is more akin to a permanent circuit than a temporary one as:

> ``*it is not a ``round the streets'' circuit, but one that follows the contours of substantially natural lake, and there is a mix of high and low speed corners, a rarity in ``round the streets'' circuits.*
>
> *Due to the open and flat nature of the topography, adequate room can be provided for most run off areas and most meet the minimum requirements of the appropriate FIA regulations for a permanent circuit, despite the fact that the circuit is categorised as a temporary street circuit.*

[46] Report, p.5
[47] Report, p.5

The use of verges at Albert Park, as required for permanent circuits?is in excess of the requirements for a temporary circuit." [48]

The Report details additional safety features of the fencing system. The author explains that the concrete blocks are ``*approximately 4 tonnes in weight"* with steel reinforcing rods running ``*longitudinally through the units and form loops on each end. Blocks are positioned end to end and a 100 mm steel pin inserted through the loops to join each block to the next."* The system has proven to be:

> ``*a very effective barrier when used either on bitumen or on earth/grass. Several significant impacts with heavy touring cars at blunt angles during competition (Nissan Skyline (1400 kg) Turn 10 Adelaide 1991 and Ford Falcon (1380 kg) at 13.5 Albert Park 1999) have been examples of the manner in which the progressive tension/compression loads on the blocks and the pins ensure the integrity of the barrier. It must also be said that another example of the effectiveness of the barrier (and debris fence combination) was witnessed during the Villeneuve/Schumacher accident at Turn 3."* [49]

And where, as in Adelaide:

> ``*?most flag marshals operated from the unprotected ends of block runs. In a number of areas at Albert Park officials are required to operate through small reinforced ``holes" made in the debris fence along Lakeside Drive (these are known as a ``Special Control Point" – SCP 1) or operate from a location at the end of a block run which are protected by a 2 metre, 3 high guard rail barrier with a reinforced steel return connecting it to a block of the next block run. (these are known as a ``Special Control Point" – SCP2 and are the units used at the ends of block runs)."* [50]

Also in some areas of the Albert Park circuit additional height debris fence panels have been installed where requested by the FIA. In these instances the panels are 2.5 metres high ``*offering a total height of 3.5m"* [51]

The Report argues that the developments ``*have contributed, with many other initiatives, to the continuing reduction of the risk to these marshals."*[52]

Whilst there may be some problems with the safety system as it applied at the 2001 event[53], there is merit in the argument that the Albert Park circuit had a number of additional safety features. However, in this case one of the central issues is the gap in the debris fencing. The gap (through which the wheel of the BAR race car passed) was designed to provide provision for marshal access to the track and driver escape in locations where specific block overlaps were not provided. It was considered:

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[48] Report, p.23

[49] Report, p.24

[50] Report, p.25

[51] Report, p.26. The debris fence pins are also reinforced with the insertion of a 75mm diameter steel bar within the hollow section of the pin.

[52] Report, p.25

[53] See discussion in the Recommendations and Comments section of this finding.

> ``*appropriate for gaps to be introduced in to the debris fence system. The simplest and most effective manner of achieving the necessary space was to raise an existing panel approximately 0.4m, or the equivalent of four horizontal rungs of the mesh. This was agreed by the National Track Safety Committee (then under the Chairmanship of Professor Rod Troutbeck) and is documented on drawings?''* [54]

The Report comments that the second line of protection (debris fence) ``*is a structure designed to minimise the incidence of vehicle components and other debris reaching spectator areas.''* At permanent circuits the secondary protection is ``*usually constructed using open or loose steel mesh supported by uprights, with tensioned longitudinal cables running between the uprights.''* [55] Furthermore, the:

> ``*structure is 2.5m in height (minimum) and (for permanent Formula One circuits) is located only in designated areas and usually positioned a 2-3m behind the primary protection barrier. This positioning allows personnel who operate immediately behind the primary protection barrier relatively unhindered access to the circuit and provides an easily-scalable obstacle for drivers to c1imb in order to reach a sanctuary from the dangers of the track environment.''* [56]

However, because of the constraints on space for temporary circuits the FIA ``*permits the second line of protection to be placed at the same location of the primary protection barrier.''* [57] This has applied to the Albert Park circuit. The Report also describes in greater detail the gaps in the debris fence system. To ``*overcome the issue of ingress/egress to and from the track''* the second line of protection must be erected:

> ``*so as to provide adequate opportunity for the escape of drivers from stranded cars, and/or the opportunity for trackside marshals to enter the circuit to assist drivers in exiting from vehicles, to extinguish fires or to clear the track of debris.''* [58]

At Albert Park these criteria were achieved by two separate methods:

- *by offsetting and overlapping the ends of runs of concrete blocks (and the associated debris fencing), or*
- *by providing specific ``escape holes'' in the debris fencing, which is achieved by raising a panel of debris fence four rungs of the horizontal bars of the steel mesh, approximately 400mm.* [59]

The ``*escape holes''* were generally placed every tenth block, or every forty metres. This ensures that:

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[54] Report, p.6
[55] Report, p.25
[56] Report, p.25
[57] Report, p.25
[58] Report, p.25
[59] Report, p.25

``an official and/or driver may only need to move a maximum of twenty metres to, or from, any single incident." [60]

CAMS commented that an informal review of the use of marshal/driver access gaps indicated:

``continued success of the use of such access gaps, particularly in regard to permitting rapid intervention to extinguish fires in competing cars, without any instances of injury to marshals or spectators, from the 1985 Australian Grand Prix at Adelaide until the Australian Grand Prix in 2001." [61]

In summary, the overall height of the fencing for most of the Albert Park circuit and, in particular at the point where the incident occurred, is 2.5 metres (concrete 1 metre high and wire debris fencing 1.5 metres). The gap is 4 metres long and 400mm high.

Observations of the incident and management of safety of the marshals

Mr. Wayne Giles, was the Sector Marshal for Sector 3 and Assistant Clerk of Course for the Sector. In his statement he explained that Sector 3 covered an area from *``100 metres south of the bridge between turn 2 and 3, through to a point between turns 3 and 4."* Giles reported directly to the Clerk of the Course at Race Control. He was controlling Flag Marshals, Communicators, Fire and Rescue Marshals, Track Side Marshals, Recovery Crews, Spectator Marshals and various other staff. He was also responsible for briefing all the officials within the Sector.

Mr. Giles briefed all staff on Thursday, 1st March. Beveridge attended this briefing. Giles stated that he stressed:

``?that turn 3 was a high profile area with a high probability for incidents. I say that because of the history of that corner. There was the Brundle incident in 1996, and a number of lesser incidents over the years in both practice and races. It is a prime passing point during the race and drivers are only human and do, on occasions, make errors.

I stressed to my staff that their safety was their number one priority, I said to them that they have no protection other than a pair of white overalls. I instructed them to stop and count to ten after any incident, to allow themselves time to appraise the situation rather than just jumping in, I also emphasized the point that any marshal going track side, that is entering onto the track, will not enter on their own, that they are to enter in pairs, with the second marshal spotting for danger?" [62]

Mr. Giles also indicated that some Marshals received a task specific briefing. However, this was not the case for Spectator Marshals as they:

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[60] Report, p.26

[61] Report, p.26

[62] Giles statement, p.2

``were not considered to be performing hazardous duties as they were confined to the same area as the general admittance spectators. Further to that the level of protection at the Albert Park circuit was of a higher standard than anywhere else in Australia. Most other circuits do not have the debris fence in front of the marshals. Usually the marshals are in front of the debris fence, with the spectators behind it." [63]

This statement was further clarified in a supplementary statement indicating that the spectators were separated from the area where the Spectator Marshal was by a moat area and a star picket and strand wire spectator fence with plastic webbing.

During 1st March, Mr. Beveridge rolled his ankle, was examined by a doctor and then taken to the Course Medical Facility for further review. He was not fit to perform his duties on this day. However, the next day, after a medical examination he was declared fit for duty. On the Friday morning Giles again gave a general briefing to the marshals. He ``*reiterated safety as their primary concern"* and instructed:

``all marshals to be aware that the debris fence and concrete barrier can move if struck by vehicles or debris, and therefore they were not to lean against the fence and to keep some distance between themselves and the fence. I tried to instil a higher level of awareness of what was going on because, being the Friday, it was the first day the Formula One cars were on the track. I also stressed that if any track side marshals attended to incidents, the spectator marshals were to be more aware of what was happening on the track, as they take on the role of observer as the observer's attention is centred on the incident."

Also during Friday Mr. Giles observed Beveridge preforming his duties and that:

``he appeared competent and experienced in what he was doing. He was well aware of what was required of him and he was very alert to what was happening within the crowd and on the track. He still had a bit of a hobble with his sore ankle but he was mobile enough to be able to keep moving throughout the day. He appeared mobile enough to move quickly if he needed. I had no concerns about his injury and his ability to perform his duties as a spectator marshal." [64]

On Saturday, after Mr. Beveridge was again medically assessed and resumed his duties. Also Giles ``*spoke with him on several occasions and watched him working."* He was ``*fine"* and ``*seemed to be working well with the spectators and covered his area of the moat without any problems."* On the main race day (Sunday) Giles again conducted a morning briefing, raised standard safety issues and stated that there was:

``the added issue of race invaders, whether they be `Save Albert Park' protestors or the serial pest that turns up at major events. Because of this risk, I specifically directed to the spectator marshals to be vigilant with their observations of the crowd." [65]

And:

[63] Giles statement, p.3
[64] Giles statement, p.4
[65] Giles statement, p.6

``I made the point that at the start of the race, that is the parade lap through to about ten laps into the race, the spectator marshals are to pay particular attention to the area around the holes in the debris fence. Those holes are where the mesh panel in a single section of fence is raised above the height of the surrounding panels. The opening is about thirty or forty centimetres and is designed to provide access to service an emergency on the track. It allows marshals to get out onto the track and back into the moat, and it allows drivers to get off the track behind the debris fence.

I wanted them to pay particular to these openings because if anyone was to try and invade the track, they would enter it through these openings. They were also told that about five laps prior to the completion of the race. Marshals were to bring all equipment and personal belongings to a safe location at the control point. This is to prevent items being souvenired by spectators and also to stop the invasion of the track at the end of the event. The spectator marshals would again cover those holes at the end of the event." [66]

Also Mr. Beveridge attended at the Medical Centre and was again cleared for duty. After the lunch break Beveridge was patrolling the moat area between Sector 2.5 to Sector 3. He had been directed by Giles to *``take up a position near an opening along his area of the moat."* Giles did not tell Beveridge:

``which opening in particular, as there were several. It was his choice which opening he selected, and the others were covered by police and other spectator marshals. My instructions were not specific as to where to stand in relation to the opening. I just said to cover the area where the openings were." [67]

Mr. Giles could see that Beveridge was situated about ten metres down from the last opening before Control Point 3. Giles observed some of the crash and yelled to the marshals in the Control Point *``incoming."* He stated that they all started to move and *``went for the ground."* [68] At first Giles thought the car would hit the marshals in the area of the Control Point. Giles observed that at the Control Point *``there is no debris fence, just a waist high concrete barrier"* and they *``were quite exposed."* [69] In the immediate aftermath of the crash Giles did not become aware that a marshal was injured. Once becoming aware, he checked on Beveridge's condition, the state of the crews and his own family who were in the vicinity. Giles also observed that Schumacher, who was in the area after extricating himself from the wrecked racing car was looking at Beveridge, appeared near to collapse. Giles asked him to leave the area for his own welfare.

Mr. Giles noted that prior to the incident:

``it was standard practice for marshals not to stand in front of the barrier openings, because debris may come through.

It was never an issue that I have heard of or seen at events where marshals stand down track from barrier openings. Rather it was considered the most appropriate place for a spectator marshal as he could watch the crowd in front of the opening whilst keeping an eye towards where the cars were coming from. In case something happened and he

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[66] Giles statement, p.6
[67] Giles statement, p.7
[68] Giles statement, p.8
[69] Giles statement, p.8

needed to get out of the way. If he was to stand on the upside of the opening, he would not be able to view both the opening and the cars travelling towards him." [70]

Further before the incident he had:

``always considered the barrier openings to be a risk when it comes to debris passing through, however. I only considered them to be a risk for injury and not death because I didn't think any-thing large enough to kill you would come through." [71]

Mr. Giles also noted:

``After this incident I would still stand somebody in the same area that Graham had been placed. I just consider it was a freak accident. I concede that if it hadn't have struck and killed Graham, it would have been one of the spectators. It is the nature of the sport. It is not one hundred percent safe." [72]

Mr. Giles then acknowledged that, although the openings are necessary to allow access on and off the track for the safety of officials and competitors, *``the design of the current openings?.are not necessarily the best option."* [73] During the inquest Mr. Giles gave comment that, as a group they *``never considered that something of that size (a wheel) would get through the hole."* [74] He was questioned on this issue:

``Coroner: For how long had you thought that debris would come through the gap?---For how long?
Yes?---Since – we've always taken care of being not in the gap since the first Grand Prix I attended in Adelaide.
Why was that?---Just because it is open and there is no mesh in that position.
Had that ever been drawn to the attention of other officials?---At the briefing each morning that I have been involved with my crew have been told not to stand directly at the opening and to be vigilant of anything coming towards them.
Why would you tell them not to stand directly at the opening?---Because that is an exposed point there.
But you are behind the mesh? --- At the point where Graham was because of this concept of the car coming towards you - because we have other openings where they are directly in line with the movement of the vehicle, but as far as what happened with Graham – I used the same caution but didn't expect something to come through as it did." [75]

Mr. Giles considered that if the wheel had not struck Beveridge it would have hit a spectator.[76]

In his statement Mr. Giles also raised other safety issues including the size of the moat area (about 2 metres wide) which is *``generally considered"* as being *``too narrow to allow officials to operate properly."* [77] He stated that within the area:

``marshals, photographers, and boundary riders, as well as maintenance staff, have to operate within it. It is compounded by the fact that safety, fire. And rescue equipment is stored within it. As well as our personal belongings, When boundary riders ride past on the motor bikes, officials have to physically place themselves against the safety barrier to allow them past. This is a breach of safety as nobody should be in contact with the safety barrier as it moves when impacted by vehicles or debris." [78]

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[70] Giles statement, p.13
[71] Giles statement, p.14
[72] Giles statement, p.15
[73] Giles statement, p.15
[74] Transcript, p.142
[75] Transcript, p
[76] Transcript, p.145
[77] Giles statement, p.14
[78] Giles statement, p.14

And a further problem is that:

> ``*that the spectator side of the moat is only fenced by star pickets and strand wire with plastic bunting affixed. As the event progresses, the surge and pressure of the spectators behind this fence force the star pickets and fence further into the moat area, further reducing the area officials have to work."* [79]

Mr. Giles raised concerns about the level of protection for Corporate Boxes (by way of example he described the box behind Control Point 3):

> ``*The spectators' feet are level with the top of the debris fence so there is no protection from flying debris. The corporate stand is only about two metres behind the barrier. They require some type of debris fence along the front of the corporate box. That box is not an isolated example. Most of the ones around the track are in similar positions."* [80]

Mr. Terence Buxton was Chief Fire Marshal of the Victorian Fire and Rescue Squad. This organisation had a history of providing a fire and rescue capacity to major sporting events. Buxton had also worked in the safety aspect of motor sport for a number of years. He had also worked at some overseas venues. At the 2001 Australian Grand Prix he was performing the role of Assistant Chief Fire Marshal. He indicated that there was a general briefing each morning for marshals on a number of aspects of the running of the event, and in particular safety. In evidence he stated that part of his role was training of officials and to ensure their safety:

``I ensure the fire marshals under my direct control stay to one side of those openings. They always stay at what I call sort of upwind from it?you have an opening in a fence so there is potential for something to go wrong somewhere. If you put people in front of that hole when you could put them in front of a solid debris fence then you are not exercising due care?" [81]

When asked the further question ``*I am just thinking of managing or controlling, managing the risk to Mr Beveridge and downstream from Mr. Beveridge managing the risk to the spectators. It seems to me from what you are saying to me, there was knowledge that this opening was a potential risk area?"* Mr Buxton responded:

> ``*I regard it as such and I would presume or I would expect any person experienced in motor racing would regard that hole or the holes around the track as an area to be wary of because they are totally different from the rest of the fence. The bigger the hole the more chance there is of Murphy's law, something coming through, and that is one of those things you become very aware of."* [82]

Mr. Buxton confirmed that the Spectator Marshal's role is to look not only at spectators but also to look at on-track activity. That:

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[79] Giles statement, p.14
[80] Giles statement, p.14
[81] Transcript, p.190
[82] Transcript, p.199

``What you are saying, of course, is because there is the combination that you put yourself in a field of vision to take in two different types of activity, you say that is more complex than your task, which is to devote your time to looking at the track?---Yes." [83]

Mr. Buxton described the incident on the track. He was positioned about 8 to 10 metres south east of Point 3:

``I saw a blue and white coloured William BMW (Williams) car approaching the comer very fast from the south-east. I saw a white coloured British American Racing (BAR) car also travelling very fast and closing on the Williams car. I am unable to estimate the speed of the vehicles.

About 150 metres from the corner I saw the BAR car hit the rear of the Williams car. I saw debris start to fly into the air from the collision. I saw the nose of the BAR car start to lift into the air. As the BAR car started to lift into the air I pushed a person immediately in front of me towards the ground and started to drive to the ground towards the front of the corporate grandstand on my right-hand side.

As I did this I was looking at the BAR car. I saw it rise high into the air, shedding debris and wheels as it lifted. It then appeared to strike the debris fence nose first, about two metres above the ground. This point of impact was about forty metres from Point 3.

As this impact took place, I saw a marshal in white coloured overalls and a blue tabard about thirty metres away from Point 3, very close to the point of impact?." [84]

Mr. Buxton also described the scene after impact and a number of emergency actions that he took to manage the aftermath. He also checked on the condition of the fencing. He opined that:

``the current safety wall and fencing is as safe as, and in many cases far superior to any motor racing venue I have visited. I say this because I could not work in an unsafe area at a motor racing venue.

I believe the safety of the fencing could be enhanced by the inclusion of a form of catch area behind the spaces. I believe this could be constructed from the same material as the safety fence and still allow the spaces to be used for their original purpose. These areas could also be aided by a few smaller gaps in the safety wall around the circuit, obviously engineered to maintain the integrity of the safety wall." [85]

Mr. Michael Burton worked as a volunteer marshal at the 2001 event. He came from the United Kingdom and had previously worked in the capacity of volunteer marshal at Formula One events in that country. Before starting the work he received a five-page document entitled *``An introduction to the event organisation and officials' duties."* He considered that this document was *``informative"* and *``better than what we get in*

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[83] Transcript, p.200

[84] Buxton statement, p.4

[85] Buxton statement, p.9-10

England?'' [86] On first visiting the Albert Park circuit he thought the debris fence was too low, and:

``was really surprised at how low it was. At Silverstone the debris fence is at least twice the height almost all the way around the circuit. Even at Silverstone fence height there has been at least two occasions where the whole Formula One car has gone over the fence?.The other thing that surprised me about this circuit was how close the spectators were to the track. I thought they were too close?'' [87]

And he:

``also noticed whilst looking at these barriers, that spaced along them were openings within the debris fences. I knew that these openings were there to allow marshals access to the track and also for drivers to get out. At the time of seeing these openings, I wasn't overly concerned about them but made sure that you never stood close to the down side of them. I always wanted to make sure that I was on the up side?.'' [88]

By comparison Mr. Burton opined:

``At Silverstone, the spectators are a lot further away as there is a grass area beside the track then what's called a bank. This is a concrete wall which is about a metre and a half high, and then behind that it is filled with mud with grass on top. This would be about a metre wide and then you have the debris fence followed by the spectator marshal area which is a minimum of four metres wide. The spectators then stand behind a tubed barrier. I definitely believe that is a much safer spectator area?.'' [89]

In his statement Mr. Burton explained about the morning briefing of marshals on safety and their general work. He then described the incident. Beveridge was just ahead of Burton by about three to five metres on *``the down side of the gap in the fence''* when the collision occurred. Burton commented:

> *``Overall I think the safety at that comer was inadequate. The fences are too low, the crowd is too near the track, and the gaps in the debris fence should be like ones in photograph 2 that I have marked on the photo. If they have to be there, then there should be something behind them. Like a secondary fence.*
>
> *In my experience the safety aspect of that corner was inadequate. I know how far these cars can go, and also from seeing the footage of Martin BRUNDELL's crash in 1996, I think it was. This also includes the two incidents at Silverstone during the mid week practice?.''* [90]

Apparently in each of these two incidents a car cleared the debris fence at the Silverstone track. Mr. Norris Hayes, an ambulance officer, was positioned on Turn 3 with a doctor. He was observing Beveridge when the incident occurred on the track. He stated:

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[86] Burton statement, p.2
[87] Burton statement, p.3
[88] Burton statement, p.3
[89] Burton statement, p.3
[90] Burton statement, p.6

``Early in the event two competitors came together with the second's car becoming airborne. My thoughts at this stage were that the car was going to clear the fence and land where we were. I then observed the front of the car catch the top of the fence and slam heavily into it. At this stage a wheel came through the fence and was heading towards us.

One of the track marshals known to me as Graham was standing between the approaching wheel and myself. At the time of the initial impact between the two cars Graham was facing the track but turned to face the approaching car as it made contact with the fence.

I observed Graham try to turn away as he realised that a wheel had come through the fence. He was struck by the wheel before he could do this?." [91]

In addition Mr.Hayes stated that, before becoming a Paramedic, he had been a qualified boilermaker welder and:

``on arriving at the track for the first time earlier in the week, I had some reservations about the ability of the fence to stand up to a high energy impact high on the fence.

At the completion of the incident I was surprised to see that the damage to the fence was minimal and that it had stood up so well." [92]

Evidence of from the spectators of impact and injuries

Ms. Jennifer Jacob was a spectator at the Grand Prix and attended with her husband and two sons. She was observing the race from turn 3. She recalled:

``seeing a black flash come towards me. I believe it was a piece of tyre rubber. Immediately after that I felt something strike my left arm. I'm not sure if I saw it coming or whether I looked when it struck me, but I recall seeing that it was a jagged piece of black rubber. It was about a foot long. When I was struck I felt very scared. I got a real fright as I obviously wasn't expecting it." [93]

And after she was struck Ms. Jacob:

``looked back up the track to my right and I saw a large cloud of dust and debris flying through the air. The debris flying through the air was on both the track side and the spectator side of the safety barrier."

Ms. Jacob indicated that when she was hit she was against the webbing fence. Jacobs also thought that her 13 year-old son, Joel was struck by debris on his hand and upper body.[94]

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[91] Hayes statement, p.1-2

[92] Hayes statement, p.3

[93] Jacobs statement, p.1

[94] This was confirmed by Joel Jacob's statement

Ms. Marcia Mullavey was also in the area with her husband, daughter (Miranda) and son (Brett). Mullavey did not see the start of the incident and the first thing she knew that something was wrong was:

> ``*?when I got sprayed by something which I later found out was a rubber compound. The next thing I did was cover my eyes with my hands and take one step back. When I looked up I walked up to the fence and saw my glasses hanging off the fence. Brett was folded in half over the fence. It was about now that I realised that an accident had happened between the Formula One cars.''* [95]

Ms. Mullavey then looked around and saw ``*one of the marshals in the air.''* He was then ``*thrown backwards and rotated clockwise half a turn.''* After she checked on her family Mullavey commented a large tarp was put up in the area. She also noted that there was ``*was lots of rubber and vehicle debris about the place and when the crowd had been cleared it was all gone.''* [96] She thought that debris came through the fence, the gap and over the top.[97] But that everything happened very quickly and her attention was focussed on her son.

Ms. Mullavey had a large bruise on her arm and ribs and suffered some soreness. Her daughter, Miranda had bruising and resultant soreness to the stomach and scratches to her scalp. Her son Brett had no bruising in the chest area but was sore for about two weeks. [98]

A number of other witnesses made statements about the incident and having been struck by debris.[99] All of these witnesses received minor injuries. The statement of Mr. Trevor Withers indicated that the debris had done some damage to the plastic fence separating the spectators from ``*the moat''* and the debris fence. Withers stated:

> ``*The police moved us back about three metres from the wire and plastic fence. As we moved back I noticed the plastic fence had been torn after being impacted by some piece of debris. Rather than torn, it was more like it had been shredded.''* [100]

Some of the witness statements would indicate that some of the debris had been souvenired.[101]

Evidence of the organisers and their experts

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[95] Mullavey statement, p.1
[96] Mullavey statement, p.2
[97] Transcript, p.79
[98] Mullavey statement, p.3
[99] Andrew Robson, Matthew Brown, Trevor Withers, Daniel Fuentes, Peter Lodokowski and Ronaldo Pozo
[100] Withers statement, p.3
[101] Robson and Mullavey

Mr. Timothy Schenken is the Director of Racing Operations for CAMS. He was also the Clerk of the Course at the 2001 event. Schenken explained that the track layout remained essentially the same with regard to geometry from its inception. Although:

> ``*?prior to each year's race minor modifications are made to improve safety features. This is an advantage of a temporary circuit that is pulled down after each race, in that you have the opportunity to learn from the previous years event and implement minor design modifications.''* [102]

Evidently each year the circuit is inspected by the FIA track inspector. Mr Schenken was present at all pre-race inspections both in Adelaide and Albert Park. He stated that for the last few years the FIA track inspection was carried out by Charlie Whiting along with Brian Shead who was Chairman of CAMS National Track Safety Committee and Member of the FIA Circuits Commission. The 2001 inspection occurred at 3pm on 28th February. That:

> ``*Present during the inspection were Charlie WHITING, Brian SHEAD, representatives from the engineers Brown and Root and myself. There were also several of my assistants and a FIA observer. The inspection was carried out on foot and took about two and a half hours. There were not any serious issues that arose out of the inspection. Charlie WHITING was satisfied with the circuit and approved the track for the running of the 2001 Australian Grand Prix. Any of the minor issues that may have been raised during the inspection would be followed up on immediately after the inspection was complete. To the best of my knowledge, the approval has always been given verbally. I do not recall ever seeing a written report being generated by Charlie WHITING as a result of these check inspections.''* [103]

Early on the morning of the race Messrs Schenken and Whiting again inspected the track and were ``*satisfied that everything was in order.''* [104] Another inspection was carried out at 1pm with Schenken and Whiting in separate vehicles. During the race Schenken observed the collision on a monitor, and having observed a considerable amount of debris on the track, after consultation with Whiting deployed a Safety Car.

Mr. Brian Shead, Chairman of CAMS National Track Safety Committee and member of the FIA Circuits Commission, gave evidence that the gaps in the debris fence were first introduced in 1985 for the Adelaide race. There is not a similar system elsewhere in the world (although there are gaps at the bottom of the debris fence for permanent circuits to allow marshals to roll under and seek protection of the wire fencing that is behind the primary concrete barrier).[105] As indicated, the raised panel system for entry to and from the track was developed in Adelaide and there were no guidelines for the system. [106] Shead oversaw the construction and it was decided that approximately one in every ten panels would be raised (an opening every 40 metres). However the:

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[102] Schenken statement, p.2

[103] Schenken statement, p.2

[104] Schenken statement, p.3

[105] See discussion Transcript.p.404-05, 407.

[106] Shead statement, p.2

``figure of one in ten was not hard and fast, and adjustments were made in various places to ensure that the raised panel was not in an inappropriate area. By that I mean an inappropriate place for people to enter or exit the track, or in an area that would place marshals, drivers or spectators at unnecessary risk." [107]

And:

``Over a period of several years and a number of races at Adelaide, we had been reducing the number of these openings at areas that we had identified as vulnerable. These areas were generally popular with media photographers. As we reduced the number of these available openings eventually the photographers formed a delegation expressing their concerns regarding diminished opportunities to photograph the race. There was consultation between myself, the engineers Kinhill, the then current FIA Track Inspector (Roland BRUVNSERAEDE), the Australian Grand Prix Authority and a media representative. It was agreed to cut a series of openings of various sizes and heights in the mesh of the debris fence to enable photographs to be taken. In this way we did not have to revert back to having the entire debris panel raised at the photo points." [108]

Mr. Shead also stated that towards the latter part of the Adelaide race:

``there was an issue over one of the raised panels. It was the one situated on the left hand side of turn 2 where there was a spectator area set aside for disabled people. It was identified that the disabled spectators were particularly vulnerable with regard their inability to move quickly in the event of an incident in their immediate area. I am not sure who raised the matter. It may have come from some CAMS medical personnel as they were located nearby the disabled area. As a result of the concerns raised we relocated that opening further downstream towards turn 3." [109]

During questioning at the inquest a number of these issues were explored further and Mr. Shead stated that:

``?The design came to us and it was essentially passed on to the FIA, but in any case it's very difficult to analyse the effect of this because it depends very heavily on the angle of approach of the debris relative to the opening in the fence.

Yes?---If it is approaching at a blunt angle obviously there is more chance of it going through, and conversely if it is running beside a straight the angle is very acute so therefore the effect of the actual window in the mesh is less.

In any event, it seems that a fair bit of debris got through the fence one way or another on this occasion?---I guess it has been shown, I don't believe it has been conclusively shown that debris went over the fence, I don't think anyone really identified that; and once again I think what actually came through the fence hasn't been quantified either, and my gut feeling on it, for want of anything better, is that probably most of it actually came through the opening." [110]

And:

``Because what I seems to me that there's really been no scientific or careful analysis at any time from 85 onwards of the risk of marshals and spectators being struck by debris coming through the fence, over the fence, or through the gap as a result of a vehicle collision?---Yes, that's right in a technical sense, but the anecdotal evidence is, I guess, we have had 17 Grands Prix with a huge amount of vehicle activity and the figure, I did a very conservative extraction of data from all of those events, Formula One activity, as has been previously mentioned, and I came up with a figure of at 12 million passes by individual cars of the openings in that 17 year period, that did not include any of the support activities at the event, which if it was included would add dramatically, certainly at least double that number, and the number of kilometres travelled by the cars in that time is over 300,000 kilometres, so we didn't have a lot of reason to be too concerned about it. I mean, it was certainly something that was always in our mind and in terms of the build of the circuit we tried, wherever we could, to minimise the chances of that sort of thing happening, but obviously in hindsight we should have done more." [111]

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[107] Shead statement, p.2-3

[108] Shead statement, p.3

[109] Shead statement, p.3

[110] Transcript, p.407

[111] Transcript, p.409-10

Mr. Shead also gave evidence about a potential problem with the positioning of a group of disabled spectators on a platform behind one of the gaps at turn 2 at the Adelaide circuit. The panel was moved as the identified problem was that:

> *``the angle of approach of a car hitting the tyre barrier there is such that if something flew off the car, a mirror or part of the car or whatever, it would take a trajectory through the opening. As I say, we attended to that as soon as it was pointed out. We didn't have any problems, there was no problems with stuff coming through?''* [112]

And:

> *``Why would you shift the openings?---Well, because you have a look and you say, ``Well, is this the safest place for marshal to get on the track?''*
> *Putting that aside, is there any other reason you shift the opening?---Yes, in terms of where the spectators are in terms relative to the angle of the car.*
> *Why would you do that then? Why would you think about the angle of the cars and where the spectators are in relation to the openings?---Because, I mean, the most likely scenario in terms of things going through fences and debris and whatever is when the car hits the barrier at 90 degrees to the barrier because all the load then is heading off the track, whereas when the cars are driving down the straight, generally speaking the debris carries down with the car, it maintains that momentum. Obviously components could change course but it is less likely. That's the sort of problem there.*
> *Was there any risk analysis of this occurring?---No, the risk analysts was just ongoing in us walking around and coming back and doing it.''* [113]

As to the comparative work between driver safety and marshal/spectator safety:

> *``?Coroner: Mr Shead, the question I'm going to ask you is directed – the FIA have obviously done an enormous amount of work on driver safety?---Yes.*
> *One can see that demonstrated in the collisions and the survival, how the drivers walk away - - - ?---Yes.*
> *In spite of the fact that it is only a tiny shell they are sitting in?---Yes.*
> *What sort of amount of work has actually, comparative work has gone into marshal safety and spectator safety?---I would have to say nowhere near as much. I mean, what's happened - -*
> *I can see there's a paper in March in relation to the fence, we have a copy of that?---Yes, I mean, look, there are various – what happened was, going back many, many years..*
> *That's the one to TRL?---Yes, going back many, many years most circuits around the world were generally deficient in safety overall, and certainly spectator safety was included in that. Probably from the 70s on, leading up to, I guess, probably the late 80s or thereabouts there was a lot of concentration of work done on improving the primary protection for the spectators and obviously the marshals as well up to a point but, and the driver side was a little on the neglected side, so bearing in mind the amount of money that was available, and maybe these things shouldn't revolve around money but unfortunately this kind of technical research costs a great deal of money --?''*[114]

And:

> *``---The drivers became more united in terms of wanting something done for themselves. There was a general perception they got the spectator safety up to a reasonable level, so the emphasis did shift towards the drivers in that sort of whole period from then up to now, and Formula One in particular has grown dramatically, it's income has risen dramatically and there is now quite a substantial amount of money available for research, and that research initially started off still heavily aimed at the drivers but it is now, the last sort of two years or so, has started to shift, so it covers a broader spectrum.''* [115]

Mr. Shead also noted that CAMS did not have the resources to have a Safety Research Section.[116]

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[112] Transcript, p.434

[113] Transcript, p.434-35

[114] Transcript, p.410-11

[115] Transcript, p.411

[116] Transcript, p.421

At the inquest Mr. Bruce Keys, Manager Safety and Medical Services for CAMS gave the following evidence about the gaps in the debris fence:

> ``*See, Mr Keys, in relation to the witnesses I have already heard from, the marshals have given evidence, the fire marshal and the other marshal, and they seem to have an impression that there was a risk of material coming through that gap before the incident occurred?---There is a risk that it will happen but, as I have said, we were very confident that the risk was low enough for it to continue in the manner the circuit was constructed.''* [117]

Mr. Harnden, Chief Executive Officer of the AGPC (and an engineer), gave evidence that there was a long and detailed process about the design of the track, but there was no detailed risk assessment about debris going through the gaps. He said:

> ``*at the process that was commenced in perhaps February 1994 right through until this instance now has continuous risk assessment with a 1ot of the parties involved looking at all of the various issues, various dangers and trying to make certain the measures that are put in place are both proper and prudent.''* [118]

And:

> ``*you have actually got a system where a fair bit of time and thought has gone through quite a long process which in a lot of ways is of the types of things Mr Dohrmann is talking about in relation to specific engineers doing specific calculations on trajectories of debris from an accident. I think we have also heard throughout that the course, that the safety standards of circuits and the amount of, I suppose you could say, technical analysis that has been done is something that has improved continuously over the years and the level it has been done to than I think it has been, on-going.''* [119]

Mr. Harnden was aware of the changes in 1990/91 at Adelaide relating to disabled people where the gaps were moved because of the risk of debris. [120] He had some discussions with Shead about the issue (there was an issue of a car going through the barricade near the gap). Harnden confirmed there was no evidence that debris actually went through the gap.[121] He also said:

> ``*?My thoughts on your question would be that there had never been any evidence of anything going over a fence or through one of those openings. I think with regard to the opening at turn 2, as we said, in front of the disabled area, that it was appropriate because it was in an area of perhaps high impact and I think that the thought process that went forward from that was that in areas if there was an opening in an area where it was considered high impact it would not be appropriate to put that there. As to the exact formalised way that went forward, I could not exactly say, but I think that was the methodology that was used then. I know even after the 1997 event even in one of the FIA reports the question was asked of Charlie Whiting did he still think it was appropriate to have these openings, and not as a result of the process that you are talking about, Your Worship, but he reconfirmed he was happy to have them every tenth panel.''* [122]

On the issue of increasing the height of the fence (corporate boxes) Mr. Harnden confirmed that all the recommendations came from Charlie Whiting. Generally, the AGPC relies on Shead (CAMS) and Whiting.[123] As at 14th December 2001, Harnden considered that the height ``*at 2.5 metres is the appropriate height?''* [124] but that the issue was being re-considered as an ``*overabundance of concern or caution?''*.

Mr. Graham Smith, Project Manager and engineer with Brown & Root (previously Kinhills), stated that his organisation was involved with the Australian Grand Prix in Adelaide since 1987. He was involved in the development of the Albert Park event, as the Engineering Project Manager. The track was designed to comply with FIA requirements and the

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[117] Transcript, p.341
[118] Transcript, p.579
[119] Transcript, p.580
[120] Transcript, p.582
[121] Transcript, p.595
[122] Transcript, p.586
[123] Transcript, p.599
[124] Transcript, p.602

same system of primary and secondary protection barrier as used in Adelaide was used. [125] That the protection afforded to the marshals by the combined track barrier was ``*superior or in protecting both marshals, other officials and spectators in case of an on track incident."* [126] That:

> ``*There was no other risk assessment of the likely damage to marshals or spectators as a result of debris going through the gap, through the fence or over the fence in the event of an accident, except by having design of barriers and safety distances signed off by the FIA?---I would not belittle the sign off by FIA for any circuit."*

Mr. Smith's evidence was that there was no other risk assessment. However, he opined `` – *the Australian circuit probably has the most advanced total circuit protection In the whole of the Formula One."* [127] Apparently there was some discussion about the risk of penetration through the fence (on at least two occasions with Control Risk) but because of confidentiality there was minimum documentation. [128] But it was determined that there was ``*no?unacceptable risk – because there is a risk in motor racing, itself,?"*[129] The following questions and answers are relevant:

> ``*Coroner: What was the debris fence there for?---It was to restrict as much as possible any debris arising out of an incident on the track from actually leaving the track perimeter.*
>
> *Did anyone of you consider that gap in the debris fence would allow larger items of debris at the go through it? This is the marshal gap area?---There were considerations. The area that we had worked on with respect to larger openings than the marshal gap opening, we have openings which are twice the size of the marshal gap for the TV cameras, and where those larger openings are, the risk measure was to provide a secondary row of debris blocks behind that, and in recent years that has increased to four locations around the track where we put in place the secondary row as following on the likelihood of something larger than a small piece of debris passing through it.*
> *But presumably a small piece of debris might hit the person in the right spot and might well do some damage?---I accept that.*
> *Because it might be coming at speed?---Right.*
> *Then it might well result in severe injuries or even death - from minor to severe and even death?---If there was some simple way of precluding that possibility, I'm sure that both we and the Corporation and CAMS and FIA wou1d have already utilized it.*
> *But by designing the current opening with a letter box type protection behind it, surely that is what you're doing, isn't it?---In terms of the larger access points, yes. I'm answering in response to the 90 or 100 space.*
> *I'm not talking about the 90 or 100, I'm moving well away from the 90 or 100. I'm talking about the opening behind which Mr Beveridge was killed.*
> *?Coroner: I want you to appreciate the focus I'm looking at. The focus I'm looking at is the gap behind which Mr. Beveridge was killed. That's the gap I'm talking about when I'm asking you these questions. If the debris fences are there to protect people against debris, being spectator or marshals, then why is it that no one thought about the size of the gap behind which people like Mr Beveridge might stand and the risk of either relatively small or slightly larger pieces of debris coming off a motor car and going in through that gap? Why didn't anyone think about the risk of the possibility of injury? What I'm saying to you is the debris fence is there to protect people against debris. You've got gaps, that's the nature of the problem, the risk you're working with. That's the practicability of it, if you like, because people have got to be able to see through it . But when you come to a larger gap, why is it that the penny didn't drop?---I guess we are fallible. I think in terms of the history of these particular gaps, they had in place for 11 years in Adelaide prior to us utilising the same emergency access openings on the Melbourne circuit, and all I can say is we probably, in f hindsight, following this event and certainly as a result of this event, we have gone back to look at them and made sure that there are no such openings left where this could occur the future?."* [130]

And:

> ``*Coroner: I'm not saying, Mr Smith, and let me make it very clear to you, that there are not advantages in the system –that you put together; there are. There are clear advantages over and above what we have seen at*

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[125] Exhibit 74
[126] Transcript, p.663-64
[127] Transcript, p.670
[128] Transcript, p.666-67
[129] Transcript, p.675-76
[130] Transcript, p.677-78

Silverstone, clear safety advantages but what I`m asking you is why as people that are experienced in risk analysis or who understand the processes, the penny didn't drop about the gaps?---Human failure? (human error).." [131]

On the question of fence heights Mr. Smith acknowledged that his organisation only had ``*the data from our own events here in Australia and not from the 17 circuits around the world."* [132] He accepted that the issue required the type of study contemplated by the FIA.[133]

On comparative safety (between Albert Park and the permanent circuit requirements) of the old/new system (heights), marshal and spectator protection Mr. Smith gave evidence that:

``*What have you looked at overseas, what's been documented in relation to what you have looked at overseas and what's led you to the conclusion that what you have got is okay?---The understanding – and it's based on two sources of information, one is the FIA guidelines with respect to permanent circuits where no protection is provided for marshals or officials operating in the marshal zone area. Our design, which we adopted based on the Ade1aide design, provides, as it proved this year not to be 100 per cent protection but almost 100 per cent protection to the marshals and others operating in that zone, the positioning of the debris fence on top of the concrete barrier actually increases the effective height of the barrier in terms of any flying debris, and if we were to draw – as you have seen on the plan that we have provided,?.the angle of launch of a piece of debris changes as the height goes up, and for our standard fences, about 34 degrees, moving up to about 46 degrees for the stacked piggyback system that we are proposing, but if we took the two and a half metre standard second line of protection three metres behind the primary barrier, the angle of launch would be down around 20 degrees, and so by bringing the two together, c1oser to the track edge, we are actually providing a much safer environment for the spectators standing behind it."* [134]

On the safety of the mesh system used at Albert Park (as against the permanent mesh):

``*?the opening was 7.6 per cent greater than the FIA mesh. We had the advantage of being a welded mesh and therefore the mesh bars were restrained in position whereas the wire mesh that was used in the FIA guidelines is interwoven mesh and an object can actually force the wires apart more easily than our welded system?."*

Mr. Smith also gave evidence on the FIA guidelines as they were relevant to impact strength of a car. The guidelines ask that the fence:

``*withstand the mass of a car at a massive speed for that part of the circuit, and that is why Mr Niall said it's a nonsense?.(5 kilonewtons as compared with 700)?so there is quite a significant difference in the forces that the concrete b1ock must withstand compared to the second line of protection or debris fence."* [135]

But, says Mr. Smith, that in practice ``*we have seen that because most of the attack on the fence is a glancing blow, it will in fact, even though it deforms will still yield, as it did in this case. The car, itself, is restrained within the circuit, even though, if you were to do a structural analysis, it doesn't have the strength to do so, but in practical terms there is give there and all sorts of things are happening to allow it to hold it within the circuit."* [136]

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[131] Transcript, p.680

[132] Transcript, p.661

[133] But that the type of study (on heights) is ``*very minimalist"* (Transcript, p.663)

[134] Transcript, p.668

[135] Transcript, p.681-82

[136] Transcript, p.682

Mr. Robert McNaught was employed by Control Risks Pacific who were involved in advising the AGPC on ``*risk management planning''* in the lead up to and since the first race in 1996. McNaught, in his statement made the point:

> ``*In preparation for the first event, there were very detailed discussions about track safety as there was a major emphasis placed on it. As part of this process, we canvassed a detailed explanation of the design of the track, with a clear explanation in relation to each corner. The dangers at the `low speed' overtaking corners were explained at that briefing It was emphasised that the standards imposed and the rigorous inspection by the FIA would address the risks associated with a collision Understandably, AGPC was extremely concerned about safety at its first event and was very keen to get it right.''* [137]

Mr. McNaught stated that a Risk and Emergency Management Plan was prepared for the 1996 event and thereafter. Apparently, after:

> ``*the first year's exercise, having developed the methodology and applied it to the 1996 and 1997 races, AGPC itself took over the conduct of the risk management process, using Control Risks (and myself) as an independent reviewer and facilitator?''* [138]

A number of organisations are involved in the planning development and:

> ``*3. Each risk is analysed under the heading of the relevant project and beneath that, is listed the project risk management activities which comprise the project.*
> *4. The potential risks are identified and briefly described. My role in this part of the process is to prompt discussion between the stakeholders about the range of potential risks by asking open-ended questions?''*[139]

Mr. McNaught notes that potential risks to ``*marshals and spectators is identified as one of many''* in the category of ``*major accidents''* and are ``*identified as a Racing car accident''* which is specified as:

> ``*(a) Racing accident on track injuring driver*
> *(b) Patron or official struck by car on track who is killed or injured*
> *(c) Race accident resulting in injury to patrons and/or property damage.''* [140]

In the risk analysis ``*each risk identified''* is allocated a qualitative rating from 1 to 4 for both its ``*likelihood''* and ``*effect.''* Those risks identified:

> ``*with a 4:4 rating are the most serious. There are 16 combinations possible, down to those with a 1:1 rating which are much less serious, and for which measures are designed and implemented.''* [141]

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[137] McNaught statement, p.1 (Exhibit 94)
[138] McNaught statement, p.1
[139] McNaught statement, p.1-2
[140] McNaught statement, p.2

Mr. McNaught explained that during the assessment process:

> *``we draw on the contribution of all of the stakeholders and the final result reflects the experience and expertise of the stakeholders, the established standards set by the FIA and CAMS and any relevant incidents at Albert Park or elsewhere. An important additional ingredient in the process is the element of peer review or peer ``consciousness'' which flows automatically from the presence of all the stakeholders drawing on each other's experience and expertise, and providing their perspective on each issue as it affects their own area of responsibility.''*[142]

Mr. McNaught notes, by way of caution, that:

> *``A feature of risk evaluation for low probability events is that the longer one goes without an incident, the more complacent one may get about that risk. This is the main reason why AGPC retains us in the process as an independent agent to prompt and question the stakeholders and disturb any developing complacency.''* [143]

However, the AGPC's approach *``is its very commendable (and not very common) adherence to a rigorous compliance process?.''* [144] Apparently, the theory is that the *``force of peer pressure among the stakeholders and the commitment of the AGPC drives this compliance process.''* [145]

Importantly, Mr. McNaught indicated that on the potential risk to drivers, spectators or officials following a race collision:

> *``there is of course a level of expectation that, by complying with the guidelines set and constantly reviewed by the FIA, in light of international experience, and rigorously inspected and certified by the FIA and CAMS, the track and barrier design addresses the appropriate level of risk minimisation.''*[146]

But that:

> *``we do specifically address, during the risk assessment, whether there are specific points of the track where accidents might occur and whether the protection is sufficient. We do consider whether the safety features such as gravel run offs, verges, tyre barriers and fencing complies with at least the minimum FIA standards. Indeed, it is apparent from the assessment process that in many respects the Albert Park track exceeds the standards set for temporary circuits and meets those for permanent circuits.''* [147]

Apparently there is a review of incidents annually. Mr. McNaught said that each year:

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[141] McNaught statement, p.2
[142] McNaught statement, p.2
[143] McNaught statement, p.2
[144] McNaught statement, p.2
[145] McNaught statement, p.3
[146] McNaught statement, p.3
[147] McNaught statement, p.3

``we also ask what accidents and incidents have happened at the previous Australian Grands Prix and at any other races in the Championship or at other tracks (such as Surfers Paradise) from which we should learn and which should prompt any design or process changes.'' [148]

Also, the information on the 1996 Brundel incident prompted a *``considerable amount''* of discussion in the assessment session. To the best of Mr.McNaught's recollection:

``the effectiveness of the safety features of the track (such as the debris fence and gravel traps) were discussed and were considered to have performed satisfactorily However, I believe that some other aspects of the track and its surrounds were changed.'' [149]

Mr. McNaught agreed, that as marshals have the added protection of the mesh (as compared with permanent track arrangement), the system at Albert Park is far safer.[150] More recently *``the incident where a marshal was struck at Monza was discussed in the exercise prior to the 2001 race.''* As McNaught recalled that *``analysis did not prompt any design change, as the marshal at Monza was struck while in an exposed position, unlike the marshals at Albert Park who operate behind debris fencing.''* [151]

Later in evidence Mr. McNaught acknowledged, in response to the following question:

``If you are aware that the debris that came through there was small amounts of debris, would that trigger you to think in terms of, ``There might be larger amounts of debris come through which might create a greater risk''?--- Any debris reported as coming through those gaps would have signalled to us that that was a risk to be addressed.'' [152]

It is noted that there has been no evidence prior to the 2001 incident that debris actually penetrated the gaps. The evidence is that it was previously identified as a risk.

During his evidence Mr. McNaught stated the view of Control Risks was that:

``in facilitating the risk assessment process was that that organisation being responsible for a wide range of motor racing events, including Formula One, was best placed in terms of expertise and knowledge of the range of incidents to be able to carry out a reasonable risk assessment in themselves, as embodied in the track and other safety features design.''[153]

Importantly Mr. McNaught acknowledged that his organisation did not have expertise in the risks but that it brought the people together for a debate on the issues.[154] On the question of audit the following discussion took place:

``Then part of the structure is the audit process? --- Yes.
Did you advise the Australian Grand Prix Corporation or CAMS or both of them to do an audit of their risks on the track?---Not in as many words, no, but we did ask them in the facilitating role to visit each year the incidents and events that had taken place in the preceding 12 months, not only in Australia but at other overseas events. So they are auditing those incidents in that sense.
So we should have documentation about incidents overseas as part of that audit process?---We should have, I'm not sure that we have had ---'' [155]

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[148] McNaught statement, p.3
[149] McNaught statement, p.3
[150] Transcript, p.772
[151] McNaught statement, p.3
[152] Transcript, p.778
[153] Transcript, p.761
[154] Transcript, p.762
[155] Transcript, p.764. See discussion p.763-65

Control Risks Pacific did not advise the organisers of the need to undertake an ``*external independent audit process*'' but relied on the expertise of the FIA, CAMS and Brown & Root. Mr.McNaught acknowledged that they might ``*tend to look through the same lens at the problem.*'' [156]

On the issue of the Brundel incident and the risk of debris going over the top of the fence Mr. McNaught, having seen the video and observing a piece of debris hitting the top of the fence and bouncing back on the track, considered ``*that the design was satisfactory.*'' [157] And he would:

> ``*take advice from the group of people who in turn were in discussions with FIA regarding the implications of that particular incident and other incidents.*'' [158]

The risk analysis document relating to a race collision is only a brief analysis identifying the risk and consequences.[159] Whilst it is an appropriate starting point there was no in-depth analysis by the experts from CAMS, Brown & Root or (input from the FIA[160]) on the debris fencing relating to the gaps. In view of the risk a careful inspection of the debris fencing system should have occurred at some time between 1996 and 2001. Specifically, the situation of the gaps should have been raised by the experts at the annual risk assessment meetings and addressed. Perhaps the problem is, that the fact that the marshals worked behind the debris fencing, left those managing the event (and the experts) with a false degree of comfort (although some were aware that debris could go through the gaps).

Submissions

In the submissions it is intended to focus on issues associated with the gap in the fence through which the BAR wheel that struck Mr. Beveridge passed. [161] Counsel for the AGPC, CAMS and Brown & Root put in a lengthy submission on the issue associated with management of the risk associated with the gaps in the debris fence. Counsel submitted that the AGPC and CAMS were:

> ``*responsibly discharging their duty to marshals, spectators and drivers by in part relying upon the recognised expertise of the FIA and the NTSC in Australia. The evidence reveals that both the AGPC and CAMS have done significantly more than merely delegate their duty to a third party.*'' [162]

Essentially Counsel for AGPC et al contended that it is necessary to look at the issue of ``*foreseeability*'' in determining whether the various agencies should have done more in relation to the gaps. Counsel posed the question ``*It is also relevant to consider what knowledge was available to the responsible parties which might have indicated to them that*

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[156] Transcript, p.775. See discussion p.771-775 (about the issue of looking through the problem through different eyes)

[157] Transcript, p.769-70

[158] Transcript. p.770

[159] Exhibit 92

[160] Other than issues such as the 1998 requests by the FIA to increase the height of the fencing near some corporate boxes. It is noted that the assessment process conforms to Australian Standard AS4360 on Risk Management (McNaught, Transcript, p.760).

[161] Other issues associated with debris fence height and track design will also be considered under Recommendations and Comments.

[162] Submission p.3-4

this very accident might occur." To this end it was argued that the following points should be considered:

- *The evidence shows that a fencing system incorporating 1m concrete blocks and 1.5m welded mesh debris panels (a system which combines the requirements of first line of protection, the 1m high concrete barrier, designed to help the cars on the trackside of the barrier, with the second line of protection, a 2.5m high debris fence designed to prevent collision debris penetrating the crowd), with a raised mesh panel approximately every 10 panels to constitute an emergency access gap was used at the Australian Grand Prix in Adelaide from 1985 until 1995. The same construction was used for Melbourne, after the design had been reviewed for safety and compliance with the FIA guidelines (evidence of Robert Niall, p733-734). The lifting of every 10th panel was once again approved and confirmed by the FIA safety delegate in 1997.*
- *The performance of the system used in both Adelaide and Albert Park in protecting marshals is superior to that used at the majority of other circuits in the Formula One World Championships, in that marshals are behind the debris fence, not exposed as they stand between the concrete barrier and a debris fence (Giles p.157-8).*
- *In 1996, Martin Brundle had an accident at Turn 3. It has been suggested that this accident was expected, that Turn 3 is notorious, and that this accident was an obvious indication of the risk posed to Mr Beveridge five years later. There is no evidence that Turn 3 is ``notorious''. Accidents happen there, and on several other points of the track (Wigston p.2, Exhibits 51 and 52). The Brundle accident was equally as indicative of the system coping with a spectacular crash, as it was of any problems (Schenken p.126-7). In particular the SCP1's performed well and kept the marshals out of the way (Harnden, p598, 631, 632). If drivers have concerns – they can speak to the FIA through Charlie Whiting at a pre-race briefing, they have a drivers' association and for many years had a representative on the Circuits and Safety Commission (Harnden, p598, 592, 631, 635, 636). The FIA also conducts a driver review session of each Grand Prix at the following Grand Prix.*
- *Personnel from AGPC and CAMS did review, consider and analyse the Brundle accident. It was also considered as part of the risk analysis prior to the 1997 event (Bamford p.542-3; McNaught p.768). As a result, the verge was widened to give the drivers more of a feeling of space, so they don't crowd each other in the approach to the turn (Shead, p418, 454; Smith, p712). This was an attempt to attack the root cause of the Brundle accident.*
- *There was recognition that small items of debris <u>could</u> possibly go through the gaps, although there was no actual evidence of this during around 25 million occasions when a car has passed such a gap (Shead, p459) (exhibit 61 demonstrates the estimated number of times a car has passed an emergency opening in qualifying, racing and practice) over 16 events from 1985 to 2000). There is also no evidence that any person believed recognised or foresaw the possibility that a large item of debris such as a wheel would pass through the gap (see below).*
- *This recognition of this potential hazard is demonstrated by:*
    - *The thought process behind not placing emergency access gaps in circumstances where there was, for example, a possibility of a direct 90 degree approach by a vehicle, illustrated by the placing of a back up block and debris fence panel to protect spectators behind a gap for a TV camera position (Smith p.698-9);*
    - *Marshals' evidence of their recognition of the potential for small debris to come through the fence or the gap (Giles p.141, 142, 149, 155, 156, 158, 173-174; Haigh, p 215-216; Buxton, p 202-204); and*
    - *Brian Shead recognising the need, in Adelaide, to relocate an opening in front of a viewing area of disabled persons which had previously been the location of ``high impact'' collisions (head-on for example, a 90º approach) (Shead, p 433, 456).*
- *However, no-one at CAMS, the AGPC or Brown & Root considered that large pieces of debris could come through a gap located in a straight. This was in the light of there being no evidence from marshals at*

Turn 3 of debris through the fence at that point, even during the Martin Brundle accident, (Giles, p 160) and the recognised learning that accident debris is likely to travel in the direction of original momentum, plus or minus 20º (Shead, p 424, 435; Harnden, p 632-633)?[163]

In addition to arguing that the clients had ``*a comprehensive and holistic approach to the question of risk management''* in the construction of the circuit. A close examination of the material indicates that there has been a considerable amount of work on safety issues. Counsel submitted that:

- *The AGPC had the evidence of the history of this design of panels having performed successfully in Adelaide from 1985 to 1995 with no evidence at all of debris going either over the fence, or through the gap, and always having performed as required to cope with collision impact (Shead, p 431-432, 434, Harnden, p 579, 604 and Bamford, p 498).*
- *There was nothing in the performance of the cars in Melbourne in 1996 that increased the risks required to be met by the barrier's performance ie the cars were not significantly faster than those racing in Adelaide (Large, 285 and Shead, p460).*
- *The AGPC commissioned structural engineers to review the Adelaide design and comment on its compliance with the FIA guidelines. Brown & Root were satisfied with the performance of the panels, noting that while they are made of 100 x 100mm welded grid instead of 90 x 90mm mesh, the welded grid is stronger, and provides a rigid structure capable of withstanding 5 kNs at every 100mm instead of every 250mms as strictly required. The FIA requirement is of mesh approximately 90 x 90mm (Niall, p 736-737; Harnden, p 632-633).*[164]

On the other hand, Counsel Assisting argued that the AGPC was ``*not active in circuit design or standards''* and it entered into ``*an agreement purporting to delineate responsibilities and contract the responsibility for safety to CAMS.''* Both CAMS and the AGPC recognised that motor racing was dangerous. The AGPC have a statement on the tickets stating this fact and CAMS acknowledged ``*public attitudes on safety were changing.''* Following an inquest into the death of a driver at the Phillip Island circuit CAMS produced a discussion paper called ``*Lessening the risk.''* Principally, relating to the gaps, the argument by Counsel Assisting centred on the following issues:

- *Turn 3 was always recognised as an incident prone part of the track, emphasised by the Martin Brundel incident in 1996 and the 1997-2001 reports?concerning Turn 3 and the statements of a number of witnesses;*
- *There was no follow up report of the Brundel incident which showed debris hitting the top of the fence and bouncing back onto the track;*
- *There was no risk analysis at any time of the risk of debris coming through or over the fence and the likelihood of injuries to officials or spectators and that the ``equally open conclusion was that this showed what could go wrong.''?;*
- *Reliance was placed on FIA standards;*
- *There had been an occasion in Adelaide to move disabled spectators back from the debris fence?;*
- *Mr. Burton gave evidence that the ``gap was dangerous'' and the spectators too close (see statement). Also Giles perceived the gaps were dangerous;*
- *Mr Giles' crew were warned not to stand directly at gap;*
- *Mr. Buxton considered that ``any person experienced in motor racing would regard the hole in the fence as an area to be wary of.''?.;*
- *Mullavey said that debris came over the fence and through it; and*
- *Marshals were encouraged to stand near the gap to prevent track invasion and Mr. Beveridge was carrying out his duties as instructed, and although ``he probably saw the wheel coming as did other*

[163] Submission p.9-11

[164] Submission p.16

marshals he had no where to go to avoid this, and due to the proximity to the gap may not have been able to take any effective evasive action." [165]

Conclusion – the risk of the gaps and Mr. Beveridge's death

There is clear evidence of a knowledge by CAMS of the risk that debris could pass through the gaps. The difficulty is that an item as large as a wheel was not foreseen as being in the realm of possibilities. Thus the incident has been explained by some witnesses in terms of being of a freakish nature. However, it is sufficient that flying debris going through the gaps was perceived as a potential risk. Debris flying through the gap at considerable speed following an incident, even in the nature of a small particle, could cause injury and in some circumstances death. Once identified as a risk the solution to reducing the potential for the hazard to cause injury (a partial cage behind the gap) that still permitted track entry or exit in an emergency was obvious, not difficult and it was practical. This solution should have been implemented by the organisers of the race many years prior to the death of Mr. Beveridge. His death was avoidable.

While the race was being held in Adelaide this knowledge resulted in the gaps being moved in a particular instance because disabled spectators might not be able to move fast enough to avoid flying debris. The Chief Executive Officer of the AGPC was aware of the issue associated with disabled spectators at the Adelaide Grand Prix. At the 2001 Albert Park event some marshals had been warned about being in the area of the gap because of the risk of debris. Some marshals were already aware of the nature of this risk.

There is no evidence that Mr. Beveridge received any warning about the gaps. To the contrary, he was required to be in the area to prevent spectators from entering the track. To do his job he had to split his concentration to the track to watch for incidents and also on the spectator area to make sure that no one entered on the track through the 400mm by 4 metre gap in the debris fence. If Beveridge was doing his job properly, and there is no evidence that this was not the case, it is understandable that even if aware of the crash, there was the potential to have been looking out for spectators. Because of the speed associated with the incident even a momentary distraction or indecision could result in being unable to move out of the way of the flying debris. However, the evidence of Hayes indicates that Beveridge was facing the track on the initial impact between the two cars and only became aware of the wheel at the last moment.

It is noted that a number of spectators were not aware of the incident until struck by debris. Unlike many marshals they are not warned to be alert for flying debris when a collision occurs. Many members of public would assume that, in spite of the warnings on the tickets (which may or may not be read), that the race organisers would have taken all reasonable steps to protect from injury.

Those who effectively ran the event (CAMS and the AGPC) were aware of the risk of debris passing through the gap. What was not recognised was that a large item of debris (such as a wheel) could pass through the gap at speed and cause injury. Irrespective of this fact, small items of debris travelling at speed through the gap could cause injury and both marshals and spectators should have been protected against this hazard. This is not an issue of hindsight - it should have been foreseen. In some limited respects it was foreseen, but the link in the need for a simple countermeasure was not made.

The Brundel incident in 1996 underscores also the risk associated with flying debris, whether it is at Turn 3 or elsewhere on the track. Whilst on that occasion the debris fence appeared to be successful in containing the hazard, it should have rung alarm bells for race organisers about further issues associated with the potential risk to the public. The video of that event is illustrative of the amount of debris flying about a motor racing track following a high-speed incident.

The argument that accident debris is likely to travel in the direction of original momentum, plus or minus 20º, does not allow sufficiently for the fact that vehicles can be changing direction from the line of the track when collisions occur. It is obvious that there will be variables with the ``*direction of original momentum*'' argument for the spread of debris depending on the direction of the vehicle at the moment of collision (or as a result of the impact) and thus potential consequences for the safe performance of the debris fence.

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[165] Generally see also the evidence of the engineer, Mark Dohrmann about issues associated with investigation of risk and independent assessment (Transcript, p.225-34 [note some of the transcript mistakenly lists Keys as the witness], 722-32, 754-58). Also see discussion of Dohrmann's evidence in this finding under Comments and Recommendation in the sub-heading `*Protective fence design and safety.*'

Vehicle safety – the wheel tether system

Introduction

Wheel tether cables were first introduced by the FIA for Formula One cars in 1999. The purposes are to assist to retain a wheel to a car even if the suspension arms become ineffective and to absorb energy even if a wheel is detached from a vehicle.[166] The FIA's Technical Regulations for 1999 and 2000, as explained in the BAR submission, provide in summary that each wheel was:

> ``*to be connected to the main structure of a Formula One car by one cable restraint. Each cable restraint and its attachments was required to have a minimum tensile strength of 50 kN (equating to a 5 tonne force). The 2001 regulations upgraded the requirement so that each wheel had to be connected via two tethers each with a tensile strength, inclusive of attachments, of 50kN..."* [167]

Also Counsel Assisting submitted that when wheels become attached from Formula One cars:

``*they pose a risk of serious injury to spectators, marshals and drivers. In an attempt to reduce this risk. In 1999 the FIA introduced into its technical regulations a regulation requiring that there be wheel tethers fitted to Formula One racing cars. Originally it was required that there be one tether for each wheel with a minimum tensile strength of 50kN."* [168]

For the racing year 2001 the FIA's requirement was increased to 2 tethers per wheel each with a strength of 50kN. Regulation 10.3.4 of the FIA 2001 Formula One Technical Regulations specifies that:

> ``*In order to help prevent a wheel becoming separated in the event of all suspension members connecting it to the car failing, two cables, each with separate attachments, must be fitted to connect each wheel/upright assembly to the main structure of the car. The cables and their attachments must be designed in order to help prevent a wheel making contact with the driver's head during an accident.*
>
> *The length of each cable should be no longer than that required to allow normal suspension movement.*
>
> *Each complete cable restraint system including the attachments, must have a minimum tensile strength of 50kN and each cable must be flexible with a minimum diameter of 8 mm."*

Mr. Large, in his statement, explained the FIA's approach to safety as:

> ``*Through the process of review of all incidents that take place in Formula One racing, the Circuit and Safety Commissions are constantly reviewing relevant international racing experience and through their work and recommendations, this experience is fed back into the process of constant safety management overseen by the FIA. The aim of the constructors is to improve the performance of their cars constantly, and they are extraordinarily competitive. This results in non-stop competitive tension between the constructors and the FIA to contain the ever increasing performance of the cars to ensure that they can perform safely within the capacities of the existing circuits."* [169]

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[166] BAR submission, p.2

[167] BAR submission, p.2. The submission also summarises the recent 2002 regulations which ``*have further enhanced wheel safety by requiring the tensile strength of each tether, inclusive of its attachments, to be 60kN (equivalent to 6 tonne of force)."*

[168] Submission on tethers, p.1

[169] Large statement, p.4

Mr. Large indicated that this ``*constant process of safety management is not just concentrated on the safety of drivers, but the safety of spectators and officials also.''* By way of example, Large referred to the development of wheel tethers by the FIA:

> ``*they have been a focus of the Technical Working Group and the Safety Commission as they search for suitable materials and designs. The aim is to reduce the likelihood of wheels detaching, and to reduce their residual energy when they do detach. Of course it is not simply s question of making the tether stronger as the tether must be capable of letting go without taking half the chassis with it, which would result in a potentially more dangerous projectile object. I am aware that the design effort is now focusing on an energy absorbing tether mount.''* [170]

The inquest was greatly assisted by information provided by the manufacturer of the tethers used by BAR (Marlow Ropes) and by the technical department of the BAR team.

Submissions and evidence on the performance of the wheel tether system at Albert Park

The impact with the debris fence was oblique and at high speed. Numerous impact and dragging stresses occurred to the vehicle and its wheels from the moment of collision until it eventually came to rest in the run off area in the area adjacent to turn 3. Counsel Assisting the coroner submitted:

> ``*In relation to the crash of the BAR 003 Formula One car on the 4th March 2001 (``the crash''), the wheel tethering system failed to prevent 3 of the 4 wheels separating from the car.*
>
> *The BAR team had obtained its tethers from Marlow Ropes Ltd. The tethers met the specification given by the BAR team. namely that they had a minimum tensile strength of 50 kN. In fact testing by Marlow Ropes showed that the tethers had a tensile strength of 63.27kN.''*[171]

In addition an examination of the tethering system after the crash:

> ``*revealed that there was a design fault in the tethering system of the wheels of the BAR Formula One car. In the crash the nose cone of the BAR car was separated from the car by reason of the force applied by the rear wheels of the Formula One car driven by Ralf Schumacher. In fact, the integrity of the tethering system in relation to the tethering of the front wheels was compromised once their nose cone was removed. With the nose cone removed the inboard mounting points did not perform as intended.*
>
> *This design fault has now been recognised by Malcolm Oastler, the Technical Director of the BAR team. He has given evidence that the car is being redesigned to overcome the design weakness revealed in the crash in relation to the tethering system of the front wheel. Mr. Oastler also gave evidence that this incident in relation lo the effect of the*

[170] Large statement, p.4-5
[171] Submission, p.1

removal of the nose cone of Formula One cars on the tethering system had been passed on to the other Formula One racing teams." [172]

Counsel then submitted that the tethering system for the left rear wheel ``*did its job and that wheel remained attached to the car by the lower tether. The upper tether failed, probably at or around its design load of 63.27kN."* [173]

As to the right rear wheel, which passed through the gap in the debris fence to cause fatal injuries to Mr. Beveridge,:

``*the time that the wheel became detached it has passed through the gap in the fence and was on one side of a 4" diameter steel pole at a speed of 145 – 175 kms per hour whereas the rest of the Formula One car was on the other side of the steel pole."* [174]

Counsel Assisting also referred to the evidence of Mr. Malcolm Oastler, who stated in the report of British American Racing:

``*It is hard to conceive of any rational engineering solution to keeping a wheel attached to the car in those circumstances."* [175]

And the FIA Technical Department's report on wheel tethers and the Villeneuve accident it is stated that the:

``*energy levels involved are such that the only feasible case that a wheel tether system can cope with is when a wheel is hit by another car, the suspension breaks, and the wheel is given a velocity relative to the chassis. Retaining a wheel that has been stopped by a barrier or fence, and becomes involved in decelerating the whole car, is not feasible."* [176]

Also that the:

``*right rear upper tether broke at the inboard loop, probably at around its design load. The right rear lower tether was largely intact, but had failed to secure the wheel because of the breaking of the 5/16" diameter titanium bolt which formed part of the outer outboard mounting. The load required to break such bolt was approximately 55Kn.*

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[172] Submission, p.2
[173] Submission, p.2
[174] Submission, p.3
[175] Report of British American Racing of the 2nd November 2001, p.18
[176] FIA Report, p.3

However, it seems that any tethering system would have failed in the circumstances encountered by the rear right wheel on the 4th March 2001." [177]

Counsel for BAR in his submission put the same view in relation to the right rear wheel:

``The bolt around which the lower tether is looped to form the outboard mount was broken at a strength well in excess of 55kN. (Oastler's testimony?)

The upper tether broke in a tensile manner at an unspecified amount of force. The inboard and outboard mountings remained intact?.

Given the amount of force applied to the tether and mounting system by the shearing force of the fence pole, Mr Oastler' s evidence was that it is hard to conceive of any rational engineering solution to keeping a wheel attached to the car in such circumstances. As stated by Mr Oastler, where the wheel was stuck, the wheel was in effect trying to restrain the car and the forces and energy involved were massive. Nevertheless it is probable that the tethers properly performed their secondary function of reducing the energy of the detached wheel having regard to the evidence of the speed of the vehicle at impact with the fence, and the speed of the wheel after its detachment (Statement Sgt. Peter Bellion, pp 4 & 5)." [178]

BAR also submitted, correctly that its car:

``complied with the FIA Technical Regulations in relation to tethers in all respects. (Oastler`s testimony?).

In compliance with the FIA 2001 Formula One Technical Regulations, the BAR car had each wheel attached with two tethers with a minimum tensile strength (including attachments) of 50kN. In fact, each tether had a tensile strength exceeding 60 kN (Exhibit 42 ?[and]?Oastler `s testimony?).

The mountings of each tether also had a strength in excess of 50kN as did the components to which the mounting point is attached. (Oastler's testimony?) .. For example, tests conducted by BAR on the bolt mechanism used to attach the lower tether on the rear wheel to the suspension mount on the wheel hub, revealed a tensile strength for that bolt of between 65 and 71 kN. (Oastler's testimony?)" [179]

The BAR submission also examined in some detail the performance of tether system on the other three wheels. It is useful to detail these submissions (in part):

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[177] Submission, p.3

[178] BAR submission, p.2 -3

[179] BAR submission, p.3

Rear Left Wheel

``The rear left wheel remained attached to the car following the accident by the lower tether. The lower tether and mounting systems remained intact and performed as intended. (Exhibit 36 – pages 9-1?).

The upper tether broke under an unspecified amount of load. Both the inboard and outboard mountings remained intact. (Exhibit 36 – page 8 and 9: Exhibit 42 – page5)." [180]

Front Left Wheel

``The front left wheel remained attached during the initial collision in the accident although became detached as the BAR car, whilst travelling in reverse, entered the run-off area at the end of Corner 3 (see Exhibit 4?)

The lower tether became ineffectual very early on in the accident following the removal of the nose cone and/or the destruction of the lower front of the chassis which removed the area of the chassis to which the lower inboard mounting is attached (Exhibit 40, page 2). Nothing practically can be done from a design point of view to prevent parts of the vehicle being removed in an accident of this nature. (Exhibit 36 – page 17? Oastler's testimony?)

The upper tether was effective at retaining the wheel during the initial collision and until the car entered the run-off area after striking the wall. The tether did not break at a tensile load but unwrapped itself from the inboard bobbin mounting. The effectiveness of the inboard mounting mechanism was compromised by the removal of the nose cone during the initial collision. Pursuant to FIA 2001 Technical Regulations a nose cone should only detach from the chassis with a constant transversal horizontal load in excess of 40kN (Exhibit 36 – page 17). The BAR car conformed with these regulations and thus it can be assumed that the force on the nose cone of the initial collision was in excess of 40kN. (Oastler's testimony?) The compromising of the front Inboard mounting mechanisms when the nose cone is removed was not something that was foreseen prior to the accident. (Oastler's testimony?)" [181]

Front Right Wheel

``The front right wheel became detached during the initial collision.

The upper tether became severed at the outboard loop consistent with being cut although the tensile load is uncertain (Exhibit 36, page 7; Exhibit 42 page 4)

[180] BAR submission, p.4
[181] BAR submission, p.4-6

The lower tether became detached in a similar manner to the lower front left tether as a consequence of either the inboard mounting being removed when the front part of the chassis was destroyed, or the nose cone being removed impairing the effectiveness of the inboard lower mounting, or a combination of both. (Exhibit 36 – page 7; Oastler's testimony?)'' [182]

Issues associated with future design for safety

Whilst the forces on the right rear wheel were such that any system could not reasonably be designed to prevent break away, other issues have arisen during the investigation. The BAR team noted the design defect associated with the front inboard tether mountings:

``Both the upper and lower front inboard mountings on the BAR car became less effective with the removal of the nose cone. This result was not predicted by BAR prior to the accident. Consequently, the 2002 BAR racing cars have been modified so the front inboard mountings will not rely on the integrity of the nose cone for their performance.

Through the FIA Technical Working Group (``TWG''), on which BAR is represented by Malcolm Oastler, the effectiveness of the front inboard mountings on the BAR car in the accident have been relayed back to the other Formula One racing teams to assist them in designing their tethering systems.

As a consequence of the accident, the nose cone of the BAR car for 2002 has also been strengthened to improve its integrity and to reduce the likelihood of it being removed in an accident.''[183]

In its conclusion on this issue BAR stated that it had changed ``*the formation of the inboard tether mountings to be effectual notwithstanding the removal of the nose cone.''* [184]

The BAR submission also referred to the energy absorbing characteristics of the tethers and commented that the tethers used by its team and on at least seven other racing team cars:

``was made from an artificial fibre known as Zylon. This material has a very high tenacity (weight per unit strength) which enables it to be suitable for Formula One cars. However, it has a very low extension to break load which means that it has lower energy absorption than material with high extension to break load. The tethering system may be more effective if the tether or its mounting were better able to absorb energy?'' [185]

And that the FIA are undertaking an extensive research and development program in conjunction with the Formula One racing teams and various manufacturers to ``*find ways of*

[182] BAR submission, p.6-7
[183] BAR submission, p.8
[184] BAR submission, p.13
[185] BAR submission, p.9

increasing the energy absorbing qualities of the tethering system." But that given the difficulty in finding an appropriate tether material:

> *``one solution is to increase the energy absorbing qualities of the mounting, although this is a very technical and innovative area and the project is still in a very elementary stage. (Exhibit 39) Further, as a result of the accident BAR are more aware of the mechanisms involved in the tethers failing and are undertaking their own research and development to improve the performance of the tethering system, Significant findings will then be relayed back to the other Formula One teams through the TWG. (FIA Technical Working Group – author's note)"* [186]

BAR pointed to the fact that ``*current research being undertaken by FIA to find an appropriate material or mechanism to provide greater energy-absorbing features to the tethering system"* was described by Mr Oastler as ``*a significant technical challenge"* and that it was ``*not a trivial undertaking".* It is a project being undertaken in collaboration with the motor manufacturers involved in the construction of Formula One motor cars.[187] There is little doubt that this type of technical improvement will require considerable work. However it is in the interests of the sport of motor racing that such work be given a priority by the teams and the organisers.

On the issue of the cutting of the yarn of the tethers BAR said that it was ``*unavoidable that sharp pieces of debris will be created when a Formula One car is involved in an accident."* That in the Albert Park incident ``*several of BAR's tethers may have been partly abraded against sharp edges of broken metal vehicle parts."* But that the evidence ``*does not, however, indicate how this abrasion affected the actual performance of the tethers."*[188] This would appear to be correct.

BAR commented that with the current system ``*the centre portion of each tether which runs through the suspension arms on the BAR car is covered with an aramid fibre sheath. This material was used as a protective cover at the suggestion of Marlow Ropes?."* Further it submitted that Mr. Pettit's evidence:

> ``*suggests that it may be possible to increase the abrasive resistance of the tethers by developing different construction techniques on the cover or extending the cover to a greater extent of the tether. ? BAR accepts as valid the observations of Mr Pettit and intends, as far as practically possible, to incorporate them in future designs of its cars. Any solutions will be relayed to the other teams via the TWG."*[189]

It would appear that any improvement in the performance of the yarns of tethers also requires a good deal of work by the teams. BAR commented that the evidence from the tether manufacturer (Marlow Ropes):

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[186] BAR submission, p.9
[187] BAR submission, p.9
[188] BAR submission, p.10
[189] BAR submission, p.10

> ``*suggests that the tether mechanisms could be improved by various mounting and placement changes?.Whilst all of the observations made by Marlow Ropes are acknowledged to be helpful, it was conceded that the recommendations are made by Marlow Ropes without a detailed knowledge of the design of Formula One racing cars or their attachment of tethers to those cars.''*[190]

However BAR does intend to ``*implement these recommendations as best it is able within the constraints of a Formula One car.''* [191]

Also Counsel Assisting emphasised that there ``*is no doubt that there is room for improvement in the tethering systems?''*. By way of example, Counsel also pointed to the design defect for the front wheels and noted, with some caution, that the:

> ``*FIA have now required the tensile strength of each tether to be 60kN. We do point out that it seems that the tethers supplied to the BAR Formula One car, however, exceeded this specification already, and a change of specification would probably make no difference to the capacity of a Formula One car to retain its wheels in a crash such as that experienced by the BAR vehicle.''* [192]

And that it seems from the evidence of Mr. Pettit of Marlow Ropes that:

> ``*of the 4 tethers that failed, all but one of them failed by reason of being cut, to some extent. The tethers are equipped with a cover design to protect them against such abrasions. The cover is capable of improvement, but it is unlikely that from a practical sense it will be able to prevent cuts being inflicted on the tethers in the circumstances of a crash of a Formula One in every circumstance.''* [193]

Counsel Assisting noted that ``*a list of recommendations as to how the tethering system can be improved has been passed by Mr. Pettit to the BAR team, and Mr. Oastler says that he will incorporate such recommendations to the extent that they are practical.''* But that ``*whilst improving the tethering system may to some extent reduce the incidences of wheels becoming detached from Formula One cars in the course of crashes, it is not expected that the system is going to remove the risk.''* Indeed as Counsel noted, the Chief Mechanic of the Bar Team. Mr. Alistair Gibson stated:

> ``*It is my opinion that the purpose of the tethers are to absorb energy in the case of a wheel detaching from the chassis. I do not believe they are necessarily there to keep the*

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[190] BAR submission, p. 10-11
[191] BAR submission, p.11
[192] Submission, p.3
[193] Submission, p.3-4

wheels attached to the tub. If that was the requirement, I am yet to see all 4 wheels stay attached to the car when it is in a major accident." [194]

The commitment by a team like BAR (who have direct experience of a tragic incident) is essential. BAR gave an insight into the possibilities with its vast array of expertise when it submitted:

``BAR is, itself, a substantial technical organisation with 387 employees. Of those, some 18 or 19 are designers, 32 are in research and development, and 26 in aeronautics. It may be reasonably assumed that other racing teams have similar levels of technical expertise and resources devoted in a competitive environment to producing the most efficient machines. Work has already gone into the development of the tether mechanisms. As failings in the current system are discovered by individual teams through incidents, these are relayed to other teams through the TWG. The TWG are also involved with the FIA and Formula One manufacturers in an extensive research project into developing a tether system that will be more effective. This involves the development of new technologies not currently available. This project predates the accident." [195]

BAR also noted that it is:

``committed to developing a better system for tethering. Lessons learnt as a result of the accident have been relayed through to the TWG to assist other teams in enhancing each team's own system?."[196]

On this line of argument, importantly for the future safety of spectators, officials and drivers, Counsel Assisting noted that:

``engineers both within the BAR team and within the FIA technical department see the way forward as being to engineer the tethers so that they absorb more of the energy of the wheels so when a wheel does become detached it is posing less of a hazard. Despite this being so, we foresee that wheels will continue to become detached from cars in circumstances where they retain sufficient energy to continue lo pose a risk of serious injury to persons at the racetrack. It will continue to be necessary for debris fencing to provide protection to spectators at Grand Prix events." [197]

Conclusions – the wheel tether system

The BAR team submitted that the:

``relevant components of the BAR car fixing the right rear wheel to the vehicle properly conformed to applicable FIA Technical Regulations at the time of the accident." [198]

And there was:

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[194] Submission, p.4

[195] BAR submission, p.11

[196] BAR submission, p.11. For the current season it has strengthened the nose cone, increased the tensile strength of the tether mountings to a strength in excess of 60 kN and *``changed the formation of the inboard tether mountings to be effectual notwithstanding removal of the nose cone."* (submission p.12)

[197] Submission, p.4

[198] BAR submission, p.13

``no reasonably practical design feature of the BAR car that could have prevented the right rear wheel of the BAR car that struck Mr Beveridge becoming detached from the vehicle in the accident." [199]

Counsel for the AGPC et al also submitted that:

> *``?it would appear that no wheel tether could have restrained this wheel and prevented it from separating from the vehicle when it hit the upright pin of the debris barrier and detached from the vehicle and hit Mr Beveridge."* [200]

These appraisals of the performance of the tether system as it applied to the wheel that struck Mr. Beveridge appear correct.[201]

The BAR submission also noted that the *``2002 regulations have further enhanced wheel-safety by requiring the tensile strength of each tether, inclusive of its attachments, to be 60kN (equivalent to 6 tonne of force)."* [202] However, Counsel for the AGPC et al made the important point that the ``tethers are not under the control of any of our clients" but, as effectively submitted by all other counsel for the various parties (including Counsel Assisting), that they are:

> *``the subject of ongoing and highly technical development. That is desirable because of the obvious safety benefit to all."* [203]

Continuing development of technical systems like tethers is not only desirable but it is essential considering the acknowledged *``dangerous"* nature of the sport of motor racing. It is essential for the future safety of drivers, officials and spectators. Development needs to be well resourced by the FIA with the technical assistance and cooperation of all of the teams.

Medical management

Introduction

Following the incident Mr. Beveridge was managed medically by an on site team and an emergency operation occurred, in an attempt to save his life, at a temporary Medical Centre established at the Albert Park venue which was run by the Alfred Hospital. A number of medical specialists were present and assisted in the operation.

Dr. David Vissenga was the CAMS Chief Trackside Medical Officer and a member of the Medical Commission of the FIA. He was responsible for the planning, development and operation of the medical services in accordance with the international sporting code of the FIA. Vissenga indicated that the operation of the Medical Centre was in accordance with the provisions of the International Sporting Code and that the:

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[199] BAR submission, p.13

[200] AGPC et al submissions, p.1

[201] See also Exhibit 39 – *``Report on wheel tethers and the Villeneuve accident at the Australian GP 2001"* by the FIA Technical Department, dated 6th December 2001.

[202] BAR submission, p.2

[203] AGPC et al submissions, p.1

``Clinical Supervisor has overall responsibility for the clinical operation of the centre. The Clinical Supervisor has administrative responsibility to me as Chief Medical Officer. (The relationship between myself (Vissenga) and the Clinical Supervisor equates to that between medical administration and clinical director roles within a hospital).'' [204]

Dr. Vissenga also stated that the responding medical and paramedical personnel would follow the established local practice in accordance with the *``Early Management of Severe Trauma (EMST) principles of the Royal Australasian College of Surgeons?''* [205]

It is noted that the CAMS *``Medical Services Operations Manual''* for the 2001 event specifies:

``2.6 ?Casualties becoming fatalities or suspected fatalities from any cause on the track are to be given full resuscitation including intravenous infusion and endotracheal intubation etc. After consultation with the Chief Medical Officer, such casualties will be transported to the Alfred Hospital where appropriate reception has been arranged.''

It is interesting to note that the Metropolitan Ambulance Service *``Operational Plan – Medical''* for the 2001 event provides under the heading DECEASED PERSONS (4.7):

``In the event of a patient becoming deceased two temporary mortuary sites have been established at FAP 4, Stewart King Pavilion, and FAP 7, Beaurepaire Pavilion?.''

The Ambulance plan was the Australian Formula One Grand Prix Operational Plan and should be read in conjunction with the *``Australian Grand Prix Emergency Management Plan and the State Emergency Response Plan.''* However it did not provide for:

``the response to any emergency situation that may occur within the ``on track area''. Such incidents will be the responsibility of RACE CONTROL and are dealt with in the track service medical plan.''

There appears to be a differing procedure for on track as distinct from other deaths at the Albert Park venue.

It is also noted that the agreement for medical services at the Grand Prix which was made between the AGPC and the Alfred in March 2000 provides that the:

``?staff provided by the Alfred agree to comply with the Federation Internationale de Automobile guidelines for management of casualties. In particular, the Clinical Coordinator of Medical Centre Services is responsible to the Chief Medical Officer and will take direction from him, who in turn is responsible to the Clerk of the Course.''

It is noted that the Clerk of the Course, Mr. Timothy Schenken, was not aware that Beveridge had died until after the race concluded. He indicated that the emergency medical

[204] Vissenga statement, p.4

[205] Vissenga supplementary statement, p.1

treatment was conducted under the immediate supervision and control of the Chief Medical Officer, Dr. David Vissenga.[206]

The initial response to the emergency

The initial response phase following the impact is best summarised in a statement of one of the Ambulance Paramedics who observed the incident and Mr. Beveridge being struck by the wheel. Norris Hayes stated that he was positioned at turn 3 with a doctor (Neil Spike) and he immediately *``ran to Graham's aid and on arriving found him to be unconscious, with gasping respiration, very weak pulse, and he had a deep lacerations to his upper lip."* He then quickly returned to his position, collected the resuscitation equipment and summoned Spike. While doing this he also transmitted to the Command Centre that they had an injured track marshal and needed urgent assistance. [207] Then on Hayes returning to Beveridge, he describes that:

> *``the doctor inserted an airway and commenced ventilation on him. I used shears to expose Graham's arm and body to examine the extent of his injuries. I found him to have a large laceration across his chest which had no bleeding I then inserted an IV cannula into his arm and connected an IV drip and commenced fluid replacement."* [208]

On the issue of communications during this time, Mr. Hayes:

> *``made several attempts to contact the Command Centre to request assistance, but while I could hear them they were unable to understand my transmissions. I could not understand why this was the case because the radio test just prior to the start of the race, the radio communication was perfect.*
>
> *After setting up the drip I stood up to give it to an official to hold up for me. I again tried to communicate with the Command Centre. This time they clearly received my transmissions and I realised that communications had been affected because I was on my hands and knees down behind a concrete wall, which obviously had steel reinforcement."* [209]

Mr. Hayes indicated that it was about this time Beveridge *``lost his pulse and cardiac compressions were commenced."* Very shortly after this an ambulance arrived and the patient was transported to the medical centre at the track.[210] One of the doctors who arrived the scene in a *``First Intervention Vehicle"* shortly after the incident, Hugh Reid, stated that the patient *``looked dead"* and that he had a discussion with another doctor (McCoy) *``about whether to pronounce him dead at the time"* but thought that:

> *``this was probably more properly done in a hospital after further management and consideration"* [211]

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[206] Schenken statement, p.3
[207] Hayes statement, p.2
[208] Hayes statement, p.2
[209] Hayes statement, p.2
[210] Hayes statement, p.3
[211] Reid statement, p.2

Dr. Reid stated that the patient was:

> ``*?intubated at the scene by Dr McCoy, and we continued standard resuscitation procedures whilst he was transferred to the Ambulance vehicle and transported to the Medical Centre in the middle of the Racetrack. At no stage did we have any encouraging signs that he was responding to our resuscitative efforts."* [212]

Dr. Reid was of the view that the injuries ``*sustained were incompatible with life. There was nothing we could have done for him that would have made any difference to his survival?"* [213] He noted that initially he had some difficulty in finding the patient.[214]

Ambulance transport to the Trackside Medical Centre

There was an issue about the distance that the ambulance had to travel from the incident to the Medical Centre which was situate in the middle of the race track. To gain access to the Medical Centre the ambulance was required to travel around the track in same direction as the race cars. However, the shortest distance to the Centre would have required the ambulance to travel against the direction of the race cars. Mr. Schenken gave evidence to the effect that moving the ambulance around the track in the same direction as the race, was the safest and fastest option. Essentially, considerable work would have been required to warn drivers of a vehicle travelling in the opposite direction and that this course would have resulted in confusion and raised numerous other safety issues. Both Counsel Assisting and Counsel for AGPC et al effectively agreed.

Medical management of Mr. Beveridge at the Trackside Medical Centre

Mr. Beveridge arrived at the Medical Centre at 1420 hours. Associate Professor David Cooper, Clinical Supervisor of the Trackside Medical Centre and head of Trauma and Intensive Care at the Alfred Hospital summarised what occurred following receipt of the patient at the centre from the track (he had already been intubated and had intravenous fluids running). A number of specialists were also present including a trauma surgeon, cardiothoracic surgeon, orthopaedic surgeon, anaesthetist and a team of trauma and emergency nurses. Cooper stated that CPR was continued throughout the time and:

> ``*1 The patient was examined and confirmed to have no spontaneous cardiac rhythm or cardiac output. His pupils were mid range and fixed to light.*
>
> *2. The endotracheal tube was checked by Dr Cooper and then again by Dr.Maloney and found to be correctly sited. An end-tidal CO2 monitor was connected and a low amplitude trace consistent with a low cardiac output was obtained.*

[212] Reid statement, p.2
[213] Reid statement, p.3
[214] Reid statement, p.2

3 Additional intravenous sites were obtained (left arm, right arm and left leg `cut down' by Dr Moloney) and blood transfusion and other resuscitation fluids were commenced.

4. A chest x-ray was obtained immediately to exclude a tension Pneumothorax. The x-ray demonstrated severe contusion of the left lung, likely ruptured left diaphragm and a very small right pneumotharax. I judged this pneumothorax as not being haemodynmically significant.

5. Intravenous adrenalin was administered.

6. In the absence of any cardiac response Mr. Julian Smith performed a thoracotomy, surgically opened the left chest and reported that the heart was `empty.' Additional blood was then transfused (4 units in total). Intra-cardiac adrenalin was injected by Mr Smith into the left ventricle. There was no cardiac response. Open cardiac massage was performed throughout this time.

7.At the same time Mr. Chris Atkin performed a Laparotomy and confirmed that the diaphragm was ruptured and that the patient's spleen appeared to be in the left chest.

8. Following further exploration Mr. Smith them found and reported that there was a large rupture of the patient's right ventricle and that this was a non-survivable injury.

9. The team then decided at this point that further resuscitation attempts were mot indicated and resuscitation was ceased. Graham Beveridge was declared dead by Dr. Atkin.''[215]

Alteration of the patient's record and helicopter transfer to the Alfred

Professor Cooper and Dr. Paul Temme (Deputy Chief Medical Officer of CAMS) then had a discussion after the patient had ``*been declared dead''*. The effect of the discussion was that ``*the patient should next be transferred by helicopter to The Alfred Hospital with resuscitation efforts continued until arrival at The Alfred.''* Cooper agreed to this course of action:

``on the basis that at the preparatory meetings before this Grand Prix and before each of the previous Grand Prix in Melbourne, both doctors Vissenga (CAMS Chief Medical Officer) and Dr Paul Temme had made it clear that in the event of a death at the F1 race the patient should not be declared dead at the medical centre but should instead be transported with resuscitation in progress to The Alfred for death to be declared there.

Accordingly I dispatched Dr Maloney to accompany the patient to The Alfred and in accordance with CAMS policy I instructed him to carry out external cardiac massage during the short trip by helicopter. The patient was loaded onto the trackside helicopter and flown to The Alfred.

After the helicopter departed, I had a discussion with Dr Paul Temme about the appropriate documentation for this event. He advised me to prepare 2 reports, one for the Alfred, and one for the CAMS Injury report. He advised that the fact of the patient's

[215] Cooper statement, p.1-2. See also Atkin and Smith statements

death should not be included in the CAMS report, Both reports are attached to this statement." [216]

Although a reading of both of the Alfred and CAMS reports would indicate non-survivable injuries, neither indicated that the patient was deceased on transfer to the Alfred.

The statement of Associate Charge Nurse Nicole Gregory also summarises what occurred, following cessation of the procedures:

``At 14.47 hours Mr. Atkin pronounced the patient deceased?

Once the patient was pronounced deceased I asked Dr. Paul Temme of CAMS the logistics of evacuating the patient from the medical centre. I asked Paul because I was aware from previous experience at the grand prix that evacuation needs to be done in conjunction with race control so that they are aware of all traffic movements from the area.

After a few moments Paul asked me to organise the evacuation of the patient from the medical centre to the Alfred by helicopter. He wanted CPR to be done to the Alfred. I advised the other staff in the trauma room of Paul's instructions and then rang the Alfred on the hotline. When I returned the patient's wounds were being closed and at this point I heard Paul speak with Brooke Alexander, the scribe and scour nurse. He asked her to cross out the time of death on the documentation. Brooke then spoke with Chris Atkin and I understand she told him about Temme's instruction." [217]

On transfer to the helicopter Dr. John Maloney was to continue resuscitation. After stating that the patient was not salvageable and the wounds were closed, he said:

``Following discussions with Doctor Temme it was decided to transfer the patient by helicopter to the Alfred. I was to accompany the patient. Resuscitation was seen to be continuing.

The patient was transferred to the helicopter with ventilation and closed chest cardiac compression. This was continued during loading onto the helicopter and until we were airborne. It was recommenced on descent to the Alfred hospital and until we arrived in the trauma lift." [218]

Dr. Mark Fitzgerald, Director of the Emergency Services at the Alfred, made a statement which indicated that the patient was transferred by helicopter with an arrival time at the Hospital of 1505 hours, CPR was continued during transfer and *``life was pronounced extinct at 1508 hours."* [219]Fitzgerald's *``Death Report to the Coroner – Medical*

[216] Cooper statement, p.2
[217] Gregory statement, p.1-2
[218] Maloney statement, p.1
[219] Fitzgerald statement, p.1

Practitioner's Deposition'' indicates *``pronounced deceased after arrival in Trauma Centre.''*

Explanation about the transfer to the Alfred and alteration of the record

In a supplementary statement, Dr. Vissenga explained that the:

> *``medical response to an accident in the motor sport environment uniquely differs from other pre-hospital care situations in that responding medical and paramedical personnel will frequently observe an accident actually occurring and will invariably respond to the scene within seconds. This time-frame differs completely from, for example, ambulance response to a road accident. It follows that in almost every case the severity of injuries, even if they are unsurvivable injuries, cannot yet be determined at such an early stage.''* [220]

Dr. Vissenga also stated that generally:

> *``at every stage of casualty management further assessment, resuscitation, stabilisation and preparation for on-going transport is carried out. The underlying principle has always been that until the casualty arrives at the hospital Trauma Centre (as distinct from the Medical Centre at the track) it will not be possible to determine with certainty whether or not the casualty can be successfully resuscitated. Therefore every effort is to be made, and be seen to be made, to save the casualty's life up to the point at which the casualty arrives in the hospital environment where the eventual determination will be made. It has been the practice to follow this procedure even in those cases where the clinical opinion at the circuit is that the casualty has unsurvivable injuries.''* [221]

Dr. Vissenga also gave evidence that:

> *``Now, is it also true to say that the original protocol didn't take the possibility into account that an exploratory operation would be carried out at the medical centre?---Yes, that's right*
> *And that a surgeon there might make a finding that the patient had died there?---That's right.*
> *And where that happens, it is inappropriate in a sense then to certify the death at the Alfred?---That's correct, yes.*
> *That sequence had not been foreseen back in 1995?---That's right, we had a protocol in place for many years and that protocol worked in spite of the fact it hadn't been foreseen that a surgical operation would take place?.''* [222]

And:

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[220] Vissenga supplementary statement, p.1
[221] Vissenga supplementary statement, p.1
[222] Transcript, p.178-79

``Mr Kennan: The real point is, as you would perceive it, originally it was thought that it was appropriate that death be certified at the Alfred because that was the most expert place where a decision would be made that an unsurvivable injury had occurred and that resuscitation was not possible?---Yes." [223]

Dr. PaulTemme, was the Deputy Chief Medical Officer. His first statement did not add anything significant to Vissenga's explanations. Although at the Medical Centre during some of the procedure Temme said that he was not involved in the clinical treatment and was ``*content to leave that to the appropriate specialist medical teams who were very much in control of the situation."* [224] A subsequent statement was forwarded (during the inquest) to Mr. King Taylor (State Coroner's Police Assistant) at the State Coroner's Office under cover of a letter dated 12th December 2001 by CAMS's solicitors. This was not received into evidence until a special mention hearing on 7th February 2002.[225] The statement is as follows:

``Since I provided my statement to the Coroner on 23 October 2001, I have been asked to answer the following questions:

1. *Whether Mr Beveridge died at the on track medical facility.*
2. *Whether I was involved with the decision to transfer Mr Beveridge to the Alfred Emergency Department.*
3. *Whether the transfer was undertaken for medical purpose or for death certification.*
4. *If it was done for death certification, why was not Mr Beveridge certified dead at the on track medical facility.*

My response to each of these questions is as follows:

1. *Mr Beveridge died at the on track medical facility.*
2. *I was notified of Mr Beveridge's death when the decision to cease resuscitative efforts was made during his thoracotomy laparotomy. I rang the Chief Medical Officer, Dr David Vissenga in race control on the `hot line' telephone at the medical centre and discussed whether he should be transferred to the Alfred. Dr Vissenga advised that this should occur.*
3. *The transfer was undertaken for death certification.*
4. *1 believe that Mr Beveridge was certified dead at the Alfred because of the long standing procedures in place to do so."*

At the special mention hearing Counsel Assisting submitted that the statement ``*does not go to the facts of what actually occurred".* Counsel for the other parties effectively agreed.

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[223] Transcript, p.180

[224] Temme statement, p.2 (the statement was faxed to the Coroner's Assistants Office on 24/10/01). The supplementary statement bears the receipt date stamp - 15 Nov 2001 (not a Coroners Office stamp)

[225] Mr. Taylor was on leave and it remained in his correspondence tray until after the close of evidence. The letter and statement now are listed as Exhibit 103

It is noted that Mr. Beveridge did not just have ``*unsurvivable injuries''* - he was dead. Apparently there was an earlier understanding on this issue agreed between the Royal Adelaide Hospital and the South Australian State Coroner. According to Dr. Vissenga prior to the 1996 Grand Prix discussion was held between himself and Dr Jenny Bartlett who was:

> ``*the member of the Medical Administration at the Alfred Hospital having responsibility of the arrangements of the hospital's involvement with the Grand Prix to be conducted in Albert Park. Dr Bartett told me that she had had formal communication with the State Coroner, Victoria, and that the arrangements which had applied in Adelaide would continue in Melbourne with the Coroners approval?.''* [226]

The AGPC/CAMS submission suggested that:

> ``*it is clear that the cause of death was multiple injuries including a ruptured heart. It would seem that there was a strict adherence to a protocol that led to death not being certified at the track but later at the Alfred Hospital. When developed, the protocol was an appropriate reflection of the medical reality that track side facilities were invariably less adequate than hospital facilities. In such circumstances all attempts at resuscitation and extension of life should be continued until arrival at the hospital. There is however a new protocol which will enable death to be certified at the track in appropriate circumstances and thereby recognise the nature and quality of the medical track side facility.''*[227]

It is noted that correspondence (dated 27 September 1995) to the Victorian State Coroner's Office from Dr. Jenny Bartlett, Director of Medical Services (Non-Acute) at the Alfred Hospital, has been discovered in the hospital's files (but not any Coroner's file), indicating that the hospital had undertaken to provide medical services for the event and which also stated, in part:

``*In the unlikely event of a fatality at the track, the patient will be transferred to the Alfred Hospital and subsequently certified deceased and then transferred to the Coronial Office?''* [228]

In a letter to the Coroner's Assistant Senior Constable King Taylor dated 31st July 2001 Dr. Bartlett indicated that it was her ``*memory''* that she ``*had a positive response to the letter and systems were put in place to ensure that it was followed.''* No correspondence in reply has been discovered (evidently there is no response in the hospital file). It is noted that the letter to the State Coroner was only discovered recently as a number of files were stored in an area of the hospital that was quarantined due to asbestos contamination.

In his supplementary statement Dr. Vissenga also commented that the arrangements ``*have been an evolving process over many years?''* and that no specific meetings would have taken place. He stated:

> ``*The State Coroner, Victoria, comments that Dr Temme and I would have discussed other items at these meetings but as noted above specific meetings were not held. The*

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[226] Vissenga supplementary statement, p.2

[227] AGPC et al submission, p.1-2

[228] Exhibit 20

State Coroner, Victoria asks why it was necessary to have a deceased patient transported, etc. I believe that the narrative?explains this." [229]

Dr. Vissenga then explained that the procedure that was followed:

``*did not take into account the possibility that a casualty would undergo an exploratory operation at the Medical Centre and that an unsurvivable injury would be identified. This had never occurred before. Therefore the pre-arranged procedure was followed as described above."* [230]

Associate Professor David Cooper believed that the group was contractually obliged by the CAMS Medical Services Operations Manual to ``*transport"* a patient ``*with resuscitation."* [231] The Manual had been developed at a time when the medical services provided to Grand Prix events were not of the level provided at the 2001 Albert Park race. His understanding was summarised in the following question and answer:

``*?.the protocol in place or the CAMS Medical Services Manual was designed to take into account the fact that because historically there had not been the medical services available, it was inappropriate to certify death at a place where there weren't services, but attempt to continue resuscitating until arriving at a tertiary hospita1?---Yes."* [232]

It is noted that Dr. Temme's (CAMS Deputy Chief Medical Officer) supplementary statement is not consistent with the evidence of Cooper or the statement of Nurse Gregory about the requirement for CPR to continue during the transport to the Alfred. It is also not consistent with the explanation given by Vissenga or the resultant CAMS submissions on the issue.

As result of a question from the Coroner Professor Cooper agreed that it was not ``*appropriate to alter"* the medical record in this case.[233] The following exchange took place between the Coroner and Mr. Beach SC, Counsel for the Alfred Hospital:

``*Coroner: As I understand, your client is saying it shouldn't have occurred. That is what your client is effectively saying.*
Mr Beach: Indeed. It thought it was contractually bound to. Your Worship has seen the documents. It is inappropriate. It should not have occurred and steps have been taken, to make sure it won't happen again." [234]

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[229] Vissenga supplementary statement, p.2
[230] Vissenga supplementary statement, p.2
[231] Transcript, p.574
[232] Transcript, p.575
[233] Transcript, p.576
[234] Transcript, p.576-77

It is understood that new protocols will be developed and incorporated into the Medical Services Operations Manual to ensure that this type of problem will not be repeated.

Forensic evidence about the patient's cause of death and chances of survival

Dr. Michael Burke, Forensic Pathologist, whilst finding the cause of death as being from ``*Multiple Injuries",* commented that in particular:

> ``*there was a full thickness rupture of the right ventricle. Furthermore, the endocardial (inner) aspect of the left ventricle showed a partial thickness tear and the posterior wall of the left ventricle showed a contusion measuring 2 cm.*
>
> *The left and right lung showed multiple lacerations in association with fractured ribs, The spleen was ruptured with a large portion of splenic tissue in situ within the left chest cavity at the time of the examination. The liver showed multiple stellate tears with rupture into the underlying parenchyma (up to 2 cm). There were multiple fractured ribs."*

He opined that this ``*constellation of injuries?taking into account the clinical findings at the scene of the incident with GCS of 3, unrecordable blood pressure and absent respirations would indicate the injuries were non-survivable."*

The Coroner's process and obligation to report a death under the Coroners Act 1985

There was no formal agreement or understanding with the State Coroner about the processes associated with professional medical management of a person injured at the track and as to how or where this would occur. This is, and was always, a matter for the medical professionals managing the patient.

The correspondence from the Alfred Hospital does no more than confirm the normal arrangements with many deaths that are reported to the State Coroner's Office - the person has to be certified by a qualified medical practitioner as being ``*dead"* before the Coroner has jurisdiction.[235] However, once an obvious fatality occurs at the track the need for certification does not stop the matter being reported to the Coroner as soon as possible. Certification can happen at an accident scene (if a doctor is present) or when the body is taken to a hospital before being transferred to a mortuary for coronial post mortem. In many cases the body is taken to a hospital (like the Alfred) for a doctor to certify the fact of death (not the cause) prior to the body being transferred to the coronial mortuary. In some cases where death is obvious and no medical practitioner has certified the fact of death, Coroner's investigations commence at the scene and the body is later transported to the Coronial Services Centre via a hospital where a medical practitioner certifies the fact of death. Often, where the scene is in the Metropolitan area, the Alfred is the hospital where a body is taken for certification.

[235] Generally see also the statements of Detective Acting Superintendent Rodney Jouning and Chief Inspector Robert Graham as to coronial investigatory processes adopted for deaths occurring at the Grand Prix. Graham's statement was not received into evidence until the special mention hearing on 7th February 2002 and is marked Exhibit 104. The covering memorandum to Mr. King Taylor (Police Coroner's Assistant) from Graham was dated 5th December 2001 and because Taylor was on leave it was not put into evidence. Jouning's statement is on the brief relating to the medical management of the incident.

As an abundance of caution a medical professional is also necessary (in the cases where injury is not the obvious cause) for the process of certifying the fact of death as there are extremely rare conditions that mimic death.

The obligation of a medical practitioner (or any person) to report a ``*reportable death to''* a coroner is contained in Section 13 of the *Coroners Act* 1985:

> ``*(1) A person who has reasonable grounds to believe that a reportable death has not been reported must report it as soon as possible to a coroner or the officer in charge of a police station?*
>
> *(2) The coroner or the officer must inform the State Coroner of the reported death as soon as possible.*
>
> *(3) A doctor who is present at or after the death of a person must report the death as soon as possible to a coroner if —*
>
> *(a) the death is a reportable death;?*

A reportable death for the purposes of this investigation is defined as one which ``*appears to have resulted''* directly from ``*accident or injury.''* [236]

It is also noted that for the first couple of years of the running of the race at Albert Park, Police from the Coroners Assistants Office were stationed at the track to deal with issues associated with a death during the event. After the first two years, these Police were then stationed on call at the Coronial Services Centre, Southbank during the running of the event.

Conclusion - medical management and reporting to the Coroner

Mr. Beveridge's injuries were not survivable. In reality his death occurred shortly after the impact of the wheel. However, the medical teams responded appropriately and professionally in a heroic attempt to save his life. There were some limited problems with communication from the scene, for the team in the First Intervention Vehicle and later for the ambulance in locating the patient. The problem with locating the patient was due to the fact that he was positioned behind ``*a concrete barrier with no-one directing crews to the scene.''*[237] Initially the concrete barrier also provided a restriction for full communications (these communication problems have been dealt with by CAMS/AGPC).

The professional medical response at the Trackside Medical Centre was marred by the fiction in management following the death. This was apparently created by a misunderstanding of the correct contractual and medical procedures following the patient being declared ``*dead''* by a medical professional (even after all possible and practical medical resources were used to save the patient's life). It has been explained on the basis that the procedure was developed at a time when the medical facilities were far better at the trauma hospital than at the track. Presumably, the argument is that the transfer to the hospital would provide an additional chance to save the life with its resources. However, the 1995 letter to the Coroner from the Alfred does not present the case for transporting the body on the basis of better medical facilities but on the need for the fatality to be ``*certified deceased.''*

The management fiction continued during the patient's transfer by helicopter and in the documents recording the death following arrival at the hospital. It is hard to understand how this could have been as a result of the need to continue heroic attempts while the patient was transported to hospital with better facilities. He was dead at the track after all possible systems were used in a vain attempt to save his life. But there can be no criticism of all of the attempts to save

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[236] *Coroners Act* 1985, Section 3 ``*Definitions''*

[237] Metropolitan Ambulance Inter-Office Memo, 16th March 2001

Mr. Beveridge's life. They were appropriate and reasonable and gave him the best possible chance, had the injuries been less severe.

Once Mr. Beveridge was declared dead (at the trackside Medical Centre) there should have been no attempt to alter the record and the fact of death should have been recorded in both of the reports of the Alfred and CAMS. The fact that a medical practitioner was prepared to direct alteration of the record and two practitioners were prepared to agree not to mention the fact of death in reports (because of some misconceived view contractual/procedural arrangements) is of serious concern. It is noted, as a matter of credit, that the Alfred Hospital and Professor Cooper were prepared to publicly admit the mistake. It is also noted that the agreement between the hospital and the AGPC required Cooper to take direction from the CAMS Chief Medical Officer.

The patient's record should be a true and correct record of medical management. It should not be altered for contractual, procedural or any other reason of self-interest. If the processes adopted, namely the resuscitation in transfer to and from the helicopter and in the documentation to the Coroner from the hospital, were an attempt to continue to hide the fact of a death occurring at the track (rather than follow the arrangements explained as having been established when the medical facilities at the track for injured patients were not as good as at a trauma hospital) they were inappropriate.

COMMENTS AND RECOMMENDATIONS

The findings, comments and recommendations will be forwarded to the Victorian Attorney General, Minister for Major Projects, Minister for WorkCover, the Chairman of the AGPC, the Chief Executive Officer of CAMS, the Managing Director of Brown & Root and the Medical Director, the Alfred Hospital. It is also proposed to forward the findings to the British Secretary of State (Home Office), the Minister for Sport (Department for Culture Media and Sport) and the President of the FIA.

Introduction

Historically motor racing has been regarded as a dangerous sport, dangerous for drivers, officials and potentially the spectators who come to watch these events. Those attending Albert Park are warned in information contained with tickets and at entry points to the venue, that ``*Motor Racing is Dangerous''* and ``*accidents can happen.''* They are reminded that although ``*all reasonable care is taken to protect the public''* there is a ``*possibility of an accident causing injury or death?''* and that attendance is at their ``*own risk.''* [238]

There are many references in the writings and texts on the sport, which attest to the risks created by the hazard of flying cars and debris. Also texts on motor racing throughout the years contain many pictorial illustrations of flying debris and document some of the resultant deaths of drivers and spectators.[239] Over the years there have been numerous fatalities of racing drivers, officials and spectators. In some cases, during the 1950's and early 60's, large numbers of spectators have lost their lives when racing cars and debris have flown into the crowd.[240]

A reading of various texts on motor racing and the large amount of material presented during this inquest do show that there has been a considerable change on attitudes and approaches to safety by those charged with organising Grand Prix events.[241] See also the CAMS article ``*Lessening the Risk''* which documents the changing attitudes to safety generally in the sport of motor racing.

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[238] See 2001 ticketing and general ``*Conditions of Entry''* documentation. The documentation and tickets do indicate that, subject to law, patrons acknowledge release of a range of agencies including the AGPC, the Crown in the right of the State of Victoria, FIA, CAMS and Brown & Root from liability (etc).

[239] See BIBILOGRAPHY attached

[240] 1953 Argentina, 1955 Le Mans, 1957 Mille Miglia, 1958 Cuba and 1961 Monza. (Daley R. – ``*The Cruel Sport''*, Studio Vista, London, 1963, p.217) . Over 80 spectators were killed following a collision between Levegh's 300SL Mercedes and an Austin Healy at the 1955 24 hour Le Mans race. Levegh's vehicle veered into the crowd.

[241] See for example the FIA study by the Circuits and Safety Commission on ``*Safety in Grand Prix Racing in the 38 years from 1963-2000''* (Attachment 30 to the CAMS Risk Analysis Report on the 2001 incident – Exhibit 96). The introduction to the 7 page list of incident summaries, injuries and deaths with actions taken states:

Recently modern technology has been used by those organising and involved in the sport to reduce the risks. An example is the development, in 1999 by the FIA, of the system of tethers to reduce the risk of wheels from soaring into the air following a collision between fast moving vehicles. In previous incidents the unpredictable trajectory of loose wheels created a serious hazard for drivers and spectators. No doubt this new safety focus and use of some of the vast army of skills that are, at present, focused on maximising technology aimed at winning an event will be of considerable benefit to help create a safer sport. However, in relation to safety, organisers of Formula One motor racing events would still do well to heed the words of Lord Cullen in the Public Inquiry into the Piper Alpha Disaster:

> ``*?no one incident, even one as disastrous as that on Piper, can point up more than a few important improvements in onshore safety. Equally in practice exactly the same accident hardly ever repeats itself, so management needs to address the spectrum of possibilities and not just seek to prevent recurrences."* [242]

Organisers are conducting an event where, through the various racing teams, drivers are contracted – accordingly there may be some limited occupational health and safety issues arising in the event of an incident where drivers, spectators or officials are injured or killed. In addition, various other general legal duties may also apply to organisers to help ensure that an event is conduced as safely as is reasonably practicable – for drivers, officials and spectators.[243] Warnings to spectators on tickets or at entry gates (or the acknowledgment by marshals of the risks) cannot avoid these various responsibilities.

Clearly, those organising and managing motor racing events such as a Grand Prix need to be imaginative, utilise the full range of expertise (whether within motor racing or from outside) and consider addressing the ``*spectrum of possibilities"* in order to reduce the risks of death and injury to drivers, officials and spectators. The recognised nature of the risk and the currently accepted ``*dangerous nature of the sport"* creates a responsibility to be far more vigilant and pro-active in the area of safety. That is not to say that drivers and teams will not continue to press the boundaries of performance of Formula One racing cars to create the spectacle of a combination of speed, skill and technology that is associated with the international Grand Prix event. But they must do so in the context of an organisational structure that also uses some of that skill and technology in an environment that is continually upgrading its safety focus. No doubt a Grand Prix motor racing event, by its very nature, will continue to have some risk to drivers, officials and spectators but the focus of organisers must be on continuing to work towards practical and innovative solutions to help reduce the risk.

Mr Beveridge was a volunteer Spectator Marshal working at the 2001 Australian Grand when he was killed in as a result of an incident on the track. He was but one of a large number of volunteers who, throughout the years, have given of their time and are dedicated to assisting the sport of motor racing and helping ensure that an event runs efficiently and safely. It is indeed unfortunate that the Race Director and Chief Steward, the FIA's principal

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> ``*This document indicates the development of Formula One racing and the corresponding increase in the number of race incidents, over the period 1963-2000, in which unprecedented advances in the application of technology and aerodynamics to the cars produced remarkable potential for increasing performance. It shows for each period considered the continuous action taken by the FIA and the Formula One Teams in developing and applying measures to progressively contain the consequences of accidents, latterly achieving levels of risk which are minimal for participants and negligible for spectators.*
>
> *Although the example of Formula One only is considered here, the increases in both racing activity and safety have been reflected in every branch of motor sport under the control of the FIA."*

Some of the improvements include – protective clothing and helmets; fuel tank design; seat harnesses; flag signalling code; medical service regulations; supervision of marshals; safety design and construction of vehicles; debris fencing; etc. There are numerous improvements listed in the document.

From 1963 to 2000 there were a total of 26 fatalities. 18 Drivers; 2 Marshals; 6 Spectators.

[242] Lord Cullen, ``*The Public Inquiry into the Piper Alpha Disaster"*, Volume Two, London HMSO Cm 1310, para. 18.3, p.291.

[243] See discussion of a range of these issues in the findings on the Linton Wildfire – Report of Investigation and Inquest, especially Chapters 20 and 23. For motor sport specifically also see discussion in the inquest findings on the death of **Gregg Hansford** (Coroner's Case Number 665/95) attached.

representative at the 2001 event at Albert Park, chose not to give evidence at the Inquest. He was put forward by all at those involved in the sport as being the FIA's principal safety expert for Formula One motor racing. By the giving of evidence (even by video link) his organisation, the FIA, with its charter and expertise could have done much to assist the inquest and help in developing the learning from such a tragedy to further the cause of safety for all marshals both in Australia and at other events across the world.[244] Likewise, it could have assisted with advice and evidence on spectator and driver safety. By stark contrast, the BAR technical director, a manager from Marlow Ropes and a volunteer race marshal all travelled from the UK to give direct evidence to the Inquest. Their evidence, in particular that of the racing team and the manufacturer, was of considerable assistance in helping to understand the incident, the technical performance of the tethers and the possibility for future safety developments. As was stated in the BAR submission, the:

> ``*?level of co-operation, goodwill and commitment to innovation of a better system is shown by the attendance of Malcolm Oastler of BAR and Simon Pettit from Marlow Ropes, the manufacturer of BAR's tethers, as witnesses at this Inquest and BAR's representation throughout the Inquest.''* [245]

Even the AGPC and CAMS acknowledged the problem associated with the lack of commitment to the inquest by the FIA when it was put in their submission, that the:

> ``*?FIA is clearly the most experienced and knowledgeable party in respect of the safety in Formula One. AGPC will continue to rely upon and seek the advice of the FIA on these issues. CAMS is also the most knowledgeable organisation in Australia on motor racing issues.''*

And that, notwithstanding the recognition of FIA expertise ``*the fact that the FIA has not been willing to submit to the jurisdiction at the inquiry''* means that the AGPC will now ``*endeavour to locate an appropriately qualified expert in track safety in Australia or in another country (but who agrees to comply with the laws of Australia) to provide independent advice to it?''* [246]

However, it also must be said that it is to the credit of the FIA that it has developed numerous rules and systems with the obvious intention of improving safety of drivers, marshals and spectators. By way of limited example, over the last few years it has:

- continued the development of standards for debris fencing both at temporary and permanent circuits;
- it licences a particular Grand Prix event and inspects the track for safety prior to the start of an event;
- recommended to the AGPC that the height of the debris fence be raised in certain at risk areas of the Albert Park track;
- introduced to Formula One racing the wheel tether system for race cars; and
- more recently it has commissioned a general study relating to debris fence strength and height.[247]

It is also noted that the FIA Web-site has information on the history of the development of its experimental work on barrier systems specifically for motor racing applications. The FIA notes that it was not until the late 1960's when Jackie Stewart ``*ignited the whole motor racing safety issue'' that ``barriers were considered necessary.''* Until then:

> ``*?with much of motor racing taking place on closed public roads, earth banks, railway sleepers, concrete retaining walls and straw bales were considered adequate to protect the spectators, and it was up to the drivers to avoid hitting them or the unprotected buildings, bridges and trees that lined many circuits. Many drivers paid with their lives, and spectators were all too often victims as well.''* [248]

Apparently until the 1990s ``*the assessment of the impact performance of tire barriers was based on accident outcomes rather than any scientific tests?''*. The FIA began by carrying out impact trolley tests in laboratories in Italy and the

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[244] See also comment in the submission of Counsel Assisting, p.7

[245] BAR submission, p.12

[246] AGPC et al submission, p.28

[247] Exhibit 62 – ``*FIA FENCE DESIGN MODELLING''* study, March 2001

[248] Exhibit 100 - http:/www.grandprix.com/ft/ftpw016.html

USA. The tests provided comparative information rather than examine the actual performance of a racing car on impact with the particular barrier. Following the death of Senna in 1994 a specific test system was developed by the Transport Research Laboratory in the UK. The Web-site summarises the details the testing methods, difficulties and potential. The comment is made:

> ``*Advanced, high-performance barriers must be developed hand-in-hand with the safety features on the cars, driver protection systems and be based on biomechanics research into human tolerances. Component failure at the end of a straight, or two cars touching early in the braking area, provides the most critical safety conditions for both the run-off area and the barriers. If the cars become airborne across the run-off area, they may arrive at the barrier with little loss of speed. The challenge is to ensure the driver is not seriously injured and the spectators are untouched.''*

The FIA concludes (in the site):

> ``*With all the effort going into barrier research, the safety of competitors and spectators still comes down to ensuring that the correct and latest safety systems are installed and maintained at circuits around the world. The effort and negotiating skills needed to achieve this are enormous.''* [249]

Also the FIA has recently developed a Circuit and Safety Analysis System (CSAS) in order to predict the trajectory and velocity of an out of control racing car. The FIA notes (in the site):

> ``*Predicting the trajectory and velocity of a racing car when it is driven at the limit within the confines of a racing track, is now the subject of a great deal of analytical work by almost all teams involved in racing at all levels. However, predicting the trajectory and velocity of a car once the driver has lost control of it has not devoted a great deal of time to. This can now also be analysed to assess the safety features of the circuits on which it is raced.''* [250]

And that the ``*unpredictable trajectories are hardest to plan for?''* The FIA states that the:

> ``*The worst scenario for any safety engineer is when a car ``flies''. Whether it is a big sports or GT car, with excessively pitch sensitive aerodynamics, or an open-wheeled car touching wheels with one ahead of it, if a car leaves the ground it is almost impossible to provide a means of decelerating it. It will decelerate due to aerodynamic drag, and CSAS can assess this case provided the drag characteristics are known as the car tumbles through the air?.''* [251]

The FIA comments in its Web-site that CSAS:

> ``*is an invaluable tool at the design stage of new circuits, avoiding much of the need to revise either track or run-off areas after the circuit has been built, and is providing detailed insights into how existing circuits can be upgraded in the continual quest for greater safety.''* [252]

Whilst the FIA did not accede to the Victorian Coronial Jurisdiction, it is to be hoped that with its charter and historic concern for safety, that it will seriously consider all of the recommendation and comments (especially the comments relating to the evidence on the comparative safety features, strength and performance of the temporary fencing used at Albert Park and the permanent fencing at venues like Silverstone). It is noted that in a letter to the Coroner, dated 25th July 2001, the President of the FIA, Mr. Max Mosley wrote that in motor sport ``*numerous accidents are inevitable''* and:

> ``*Consequently safety measures must be so conceived that, as far as possible, no one gets hurt when the inevitable happens.''*

Furthermore:

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[249] Exhibit 100
[250] Exhibit 100
[251] Exhibit 100
[252] Exhibit 100

``*What matters is that the crash should have no consequences other than, perhaps, material damage.*

It follows that we try to arrange the cars and, in the case of racing, the circuits so that when an accident occurs, no one gets hurt. Because motor sport is so potentially so dangerous, all the commissions etc referred to?and their 140 or so meetings each year are primarily concerned with safety. In particular, the technical regulations are either directly safety-related or indirectly in that they limit the performance for reasons of safety. Within these safety parameters, the FIA and its member national sporting authorities naturally try to ensure the competition is fair, like any other sporting body, but compared to safety this is a relatively simple task."

The parties' work on safety before the 2001 Australian Grand Prix incident

The FIA, CAMS, AGPC and Brown & Root had undertaken a considerable amount of work on safety prior to the death of Mr. Beveridge.

By way of limited example there was a risk analysis prepared by Control Risks Pacific/Sedgwick Limited at the request of the AGPC. Control Risks Pacific have been involved with the Albert Park race almost since its inception.

Also there were many modifications of the circuit before the start of each race including (at the FIA's behest) raising the height of the debris fence in certain locations (where the spectators were located at above fence levels within 6 metres of the track edge) and debris fencing for team personnel working at the pit wall. After the Hockenheim accident in 2000 the AGPC replaced hardened laminated glass at certain parts of the circuit with mesh. There has been work on the performance and design of the run offs at Albert Park. Also the AGPC submission has suggested that the circuit exceeds the minimum requirements as follows:

- *The combined debris fencing and concrete barrier system affords marshals greater protection. This of itself is not in excess of the guidelines for temporary circuits, but the design of the SCP1s and SCP2s <u>are</u> designs which give marshals greater safety, but are not specified in the guidelines. They were originally installed at high speed areas, but will be installed at all flag points for 2002 (Shead, p464).*
- *At permanent circuits, marshals generally work in front of, not behind, a debris fence. At Albert Park, if the debris fence had not been on top of the primary protection, and therefore in front of the debris fence, 600 officials would have been exposed. Because the first and second lines of protection are combined, those marshals are substantially protected, although there remains what was considered a low level residual risk to the marshals, and possibly the spectators, resulting from the gaps (Shead, p405).*
- *The placement of the second line of protection closer to the track increases the effective height of the fence (Smith, p688, 700).*
- *The Adelaide/Melbourne debris fence panels are considerably stronger than the FIA Guidelines require (Harnden, p 632).*
- *The Melbourne Kerb (depressed vallelunga) was developed by CAMS and Kinhill/Brown & Root in 1996 for Albert Park as a safer exit kerb. It has been picked up elsewhere around the world (Shead, p466-469).*
- *The fire shield mounted on the pit lane building to protect patrons (Harnden, p643).*
- *Sprinklered garaging – installed as a result of the learning from a fire at Hockenheim during a mishap in refuelling when Jos Verstappen was burned (Harnden, p643).*
- *Conversion of the glass pit lane wall to mesh (Harnden, p643-644).*
- *At Albert Park there has always been a great deal more attention to tyre bundles than most other circuits, fronting them all with conveyor belting (Harnden, p644) (See also the evidence of Smith, p 703-704 for several of these points).*[253]

[253] AGPC et al submission, p.19 (and see 15 page list of Changes to circuit requested by FIA/CAMS – Exhibit 58). Generally see also Exhibit 82 ``*Design comparison with FIA Guidelines*" – this is a comparison with the Albert Park circuit.

The parties work on safety since the 2001 Australian Grand Prix incident and before the inquest

Introduction

Following the death of Mr. Beveridge CAMS undertook a detailed Risk Analysis Report.[254] That Report made 14 recommendations. The AGPC et al submission commented that Counsel Assisting indicated that ``*since the accident to the time of the Inquest, AGPC has treated the issue as one of the gap only.*'' Its submission made the point that this submission is incorrect. The CAMS Risk Analysis report dated 22nd August 2001 also ``*addressed general safety issues where it was recognised that lessons could be learned from the accident.*''[255]

The detail

The recommendations, in the Risk Analysis Report and the action taken in response to them, are listed in the AGPC submission. It is appropriate to list the actual response by submission to each of the recommendations in some detail (although the submissions have been edited and some references to evidence have been deleted):

`**Consider implementing a system of off-set barriers in lieu of the current method of providing access to/from the circuit by the raising of debris fence panels**'

The AGPC et al submission states that this ``*is the most significant recommendation contained in the CAMS Risk Analysis Report. Very quickly after the accident occurred, the AGPC and CAMS had meetings to discuss how the gap caused by the raised debris fence could be engineered out of the current system. Similarly, the problem posed by the photographer gaps was also given consideration?..The proposed changes have been approved by the FIA and still allow driver and marshal movement through the fences, while minimising the risk of penetration by debris. They are as follows:*

> *The most common type of opening will be the EP1 barrier. This is an opening of approximately 1 metre which faces away from the direction of racing, and is overlapped by a debris fence in front of it. To preserve the energy transfer along the concrete blocks, a unit similar to the SCP2 unit (see below) will be installed between the overlapping fences.*
>
> *Where space does not permit the use of the EP1 barrier, the second type of barrier, the EP2 will be used. The debris fence has a climb-through opening (approximately 2.5m x 0.4m) which is protected by a cage (2.3m high) behind the opening. In turn, the cage has a single opening, facing away from the direction of racing. No marshal will be stationed in the cage; it will only be passed through by drivers or marshals moving to and from the track if necessary.*
>
> *It is proposed that the new barriers, and hence the openings, will be placed approximately every 75 metres around both sides of the track. The traditional method of raising the debris fence panels resulted in a gap approximately every 40 metres.*
>
> *The final proposed change is to the openings for television cameras and photographers. A debris fence panel will have 3 small apertures in it, approximately 0.25m x 0.8m for still photographers. An arrangement for the television cameras, with a cape behind is still in the design and development stage.*''[256]

`**Install SCP 2 units at all relevant locations where flag marshals are required to operate from block-run ends**'

The AGPC and CAMS described its proposals for the safety improvements for marshals as follows:

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[254] Exhibit 34

[255] AGPC et al submission, p.21

[256] AGPC et al submission, p.21-22

- *The AGPC and CAMS will install SCP1 or SCP2 units (photographs of both these units can be found in attachments 11 and 12 of Exhibit 34, the CAMS Risk Analysis Report) wherever flag marshals are required to operate at the end of barrier runs. Although the marshals were already protected by an overlapping debris fence (Evidence of Shead, Transcript pages 465 and 466?, Exhibits 56 and 57), the AGPC in consultation with CAMS and Brown & Root developed the SCP1 and SCP2 units prior to the running of the 1996 race (Evidence of Shead, Transcript pages 465 and 466.. and Smith, Transcript page 694,?). CAMS ensured that the units were placed wherever it considered necessary (Evidence of Smith, Transcript page 694?). The units provide additional protection for the marshals in that they prevent them from straying on to the track by using a system of waist high bars to restrain them.*

- *It is intended that all 1 metre flag marshal openings will be covered by SCP2 barriers and all 3 m openings which were used by flag marshals will be modified: the latest drawing of circuit by Brown & Root incorporates these changes.*[257]

`Increase the length of the Pit Lane signalling wall debris shield'

- *Although not related to the accident, as part of its general review of safety issues, the AGPC will install pit lane debris fence panels along the entire length of the pit wall. Further, the AGPC is taking the step of implementing a new wire mesh design for the debris panels as it is not satisfied that the FIA approved glass panels provide adequate protection?.*

- *CAMS is currently reviewing the plans for the panels which have been drafted by Brown & Root. When CAMS is satisfied with them, the plans will be forwarded to the FIA for approval.*[258]

`The agreed replacement of the current circuit medical centre'

Again, although not directly related to Mr Beveridge's death, processes have been put in place to construct a larger medical centre. This issue was discussed at the 2001 event officials' debriefing (at point 11.2 in Attachment 34 to Exhibit 34, the CAMS Risk Analysis Report dated 22 August 2001) and the Medical Services Sub-Committee of CAMS has agreed the design brief.

`Review the Medical Services procedure with regard to Trackside Medical Teams, to provide for a dedicated communicator, who will be the Trackside Medical Assistant'

- *After a consultation process, CAMS has included this protocol in the draft Medical Services Operations Manual which will be finalised shortly. The draft manual was provided to the relevant personnel at the Alfred Hospital, who checked it and made changes. Then, it was forwarded to the AGPC who reviewed the manual and made changes. The manual was then sent to Dr Vissenga, the Chief Medical Officer who carried out a similar process. Finally, the manual was forwarded to the Alfred who checked the changes made by the AGPC and Dr Vissenga, made some final changes, and then sent the manual back to Bruce Keys of CAMS who is currently finalising it.*

- *Once finalised, the manual requires approval by the FIA.*

`Introduce an optional retrieval protocol, which may be chosen by the First Intervention Vehicle (FIV)'

Again, although not directly related to Mr Beveridge's death, this issue was discussed at the officials' debriefing in 2001 (at point 11.2 in Attachment 34 to Exhibit 34, the CAMS Risk Analysis Report). In consultation with Dr Vissenga, CAMS and the AGPC, the optimal retrieval protocol will be implemented for the 2002 event.

`Introduce a standard nomenclature for use in all radio communications of the Medical Team'

The protocol and procedure for this is currently being discussed Dr David Vissenga and Alfred Hospital personnel. Once finalised, the standard nomenclature will be incorporated into the update Medical Services Operations Manual for 2002. All relevant officials and personnel will be trained in the standard nomenclature to be used.

`Introduce a procedure which positively identifies the location of an accident site at which intervention vehicles are required to stop'

This matter was discussed at the Officials debriefing (in Attachment 34 to Exhibit 34, the CAMS Risk Analysis Report). With input from CAMS, the AGPC and the Alfred, it was agreed that in the event of an incident and

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[257] AGPC et al submission, p.22. It is noted that the AGPC will also **`Install SCP 1 units at locations where flag marshals may be required to operate from when not at block-run ends'**

[258] AGPC et al submission, p.22

where appropriate, yellow flag marshals will move onto the verge and will identify the incident point to approaching FIV drivers. This will be covered in the updated Medical Services Operations Manual once it is finalised.

`Require all ambulance drivers to attend the medical services briefing each year'

Dr Vissenga and Associate Professor Cooper will arrange for all ambulance crews to attend the Medical Services Briefing which is scheduled to be held on Wednesday 27 February 2002 at the Alfred Hospital.

`Produce a comprehensive plan detailing entry and exit routes for FIV drivers to follow, including pre-planned routes around obstacles such as gravel traps'

Dr Vissenga has agreed with the substance of this recommendation and it will be implemented. CAMS proposes that a map detailing the routes will be issued to the FIV drivers. They will then need to make themselves familiar with the instructions, which will be reinforced at pre-event briefings.

`Review protocol regarding critically injured casualties'

- *As recognised by Dr Vissenga and Associate Professor Cooper, (Evidence of Dr Vissenga, Transcript, page 179, 6-26 and Associate Professor Cooper, p 575) the existing protocol for critically injured casualties has been revised.*
- *An amended protocol has been discussed with the Alfred Hospital (Evidence of Dr Vissenga, p179, 6-26 and Associate Professor Cooper, p575). Once settled, it will be incorporated into the Medical Services Operations Manual.*

`Consider the Race Control Log recording sheets including reference to lap numbers and the introduction of time identification/stamping systems on tape recordings of communications made at Race Control'

Race Control log sheets will be reformatted prior to printing for the 2002 event. In addition, discussions will be held with technicians regarding the practical implications of `time stamping' the radio transmissions during the event.

Conclusion

It is clear that the AGPC, CAMS and Brown & Root have undertaken considerable work following the CAMS Risk Analysis Report on the incident at the 2001 Australian Grand Prix. They are to be commended for this work.

The inquest – safety responses by the AGPC and CAMS

Introduction – the Recommendations of Counsel Assisting

During the running of the inquest the height of the debris fences became an issue when some witnesses raised concerns over the current total height of 2.5 metres. Most of the issues with the gaps in the fence had been appropriately addressed before the inquest started. Significantly, and to their credit, the AGPC and CAMS indicated that they would be increasing the total height of the combined debris and concrete barrier fences to 3.8 metres for a length of approximately 4 kilometres as *``an overabundance of caution.''* The strength of the debris fence was also discussed.

Also, Counsel Assisting made a number of recommendations to the Coroner in their final submission (it should be noted that the Coroner had no input into the recommendations of Counsel Assisting). The AGPC and CAMS responded, essentially agreeing with most of the thrust of Counsels' submissions. Counsels' recommendations for consideration by the Coroner were:

``6.1 The measures taken to close the gap should be independently evaluated
6.2 The AGPC should commission an independent risk evaluation on the risk to officials and spectators at Turn 3 and it equivalents
6.3 The AGPC should proceed with its suggested increases to the height of the fences
6.4 The moat should be wider
6.5 Subject to an independent risk evaluation, the AGPC should give consideration to the placement of the spectators at Turn 3 and its equivalents
6.6 The AGPC and CAMS should review each meeting minutes of the Circuits Commission, the Safety Commission and the World Motor Sports Council

6.7 The issue of the height of the fences, apart from the immediate suggested measures foreshadowed by the AGPC, is best carried out as foreshadowed by the WMSC and the AGPC and CAMS should use their best endeavours to an input into the proposed study in London

6.8 The AGPC should accept primary and ultimate responsibility for the safety of officials and spectators." [259]

After careful consideration, balancing the AGPC and CAMS response, the recommendations by Counsel Assisting should be regarded as the ***very minimum processes and systems to be adopted by the race organisers***. The notion of an independent risk evaluation (or audit) is also referred to in this Report under the sub-heading – `Independent systems safety audits.' Also see the comments on `Protective fence design and safety', `Flag and marshal safety – reduction of exposure at Albert Park at the SCP2 Barrier and providing a protective area where marshals work' and the `AGPC review of protective fence safety design.'

Response to the Recommendations of Counsel Assisting

The AGPC and CAMS generally responded positively to the recommendations of Counsel Assisting the Coroner. It is appropriate to list the responses in their entirety:

1. Measures taken to close gaps will be independently evaluated

AGPC will appoint an appropriately qualified independent expert to evaluate the proposed measures to close gaps.

There may be some issues though in identifying and locating such an expert over the Christmas vacation.

To the extent that the expert makes suggestions or recommendations that can be reasonably incorporated into the proposed measures, AGPC will do so. However given the proximity of the event, if that expert recommends fundamentally different methods, they may not be able to be introduced in time for the 2002 event but will be reviewed for the 2003 event.

2. AGPC should commission an independent evaluation of risk to officials and spectators at turn 3 and its equivalents

AGPC will appoint an appropriately qualified independent expert to evaluate the risk to officials at turn 3 and equivalents.

Given the necessary skills required to undertake this task, it will take some time to identify and locate such an expert. Such an evaluation will require a detailed, thoughtful and analytical approach to ascertain all known and foreseeable risks.

Further, to fully understand the issues, AGPC believes that it is necessary that such an independent expert attend the event and witness the interaction between track, fences, marshals and spectators at turn 3 and other equivalent areas.

Therefore, while AGPC could conceivably commission such a study in January, it is unlikely to be completed before the 2002 event. It is anticipated that the study will be a continuing one and over time, and could be extended to other turns on the circuit and be reviewed from time to time.

In respect of the 2002 event, AGPC has agreed to increase the height of the debris fence at Turn 3.

3. AGPC should proceed with its suggested increases to height of fences

AGPC will do so. It should be noted that the higher fences are being introduced following a request from AGPC to the National Track and Safety Committee to consider the location of higher fences adopting an "overabundance of caution" approach. It is not AGPC's position that the raised fences are truly necessary, but it will proceed to introduce them.

Given the time pressures, it is not feasible to fabricate all new panels, and a piggy backing system of panels will be adopted in 2002.

In determining the heights of fences in the future, AGPC will also await the outcome of the Independent research currently being undertaken on behalf of the FIA.

[259] Submission, p.7-8

3. The moat should be wider

AGPC will also request CAMS to undertake a survey of sector marshals from the 2001 event to ascertain where the real concerns are regarding the width of the marshal zone.

As a general principle, AGPC will also review the locations of the spectator fence to ensure that the marshal zone "moat" (as far as reasonably practicable) will be at least as wide as the minimum specified in the guidelines.

It should be noted that in several locations around the track, there are trees, permanent structures and services that may prevent this from being possible. In these locations, AGPC will ensure that the marshal zone is as wide as the circumstances permit.

Given the proximity of the 2002 event, it may not be possible to move grandstands and corporate facilities backwards as some are built on permanent footings which may not be able to be moved before the 2002 event. The location of these grandstands and corporate facilities will be fully analysed and assessed before the 2003 event.

4. Subject to independent risk evaluation, AGPC should give consideration to the placement of spectators at turn 3 and equivalents

AGPC repeats its response to Recommendations 3 and 4. AGPC will also look at whether, in the time available, it is feasible to move the corporate facility at Turn 3 further back. If it is reasonably practicable to do so, it will be done.

It should be noted that the higher debris fence will be located in front of this facility in 2002.

5. AGPC and CAMS should review each meeting minutes of the Circuits Commission, Safety Commission and the World Motor Sports Council

AGPC does not have a right to see these minutes as it is not a member of the FIA or the Commissions or the Council.

However, AGPC will request the FIA, CAMS, Mr Large and Mr Shead to provide copies of these minutes to AGPC as well as a summary of the key issues.

6. The issue of the height of the fences, apart from the immediate suggested measures foreshadowed by AGPC, is best carried out as foreshadowed by WMCS, and AGPC and CAMS should use their best endeavours to make an input into the proposed study in London

AGPC agrees with this proposal and will write to the FIA offering its assistance in respect of the terms of reference of the study, as well as requesting the FIA to consider the general issue of the height of debris fences as part of that study. AGPC will also offer such other assistance, documentation or video material that the FIA may require to undertake this study.

7. AGPC should accept primary and ultimate responsibility for the safety of officials and spectators

AGPC acknowledges that it has a statutory function to establish a temporary motor racing facility and supporting facilities for the event in Albert Park. In doing so, AGPC is entitled to rely upon experts in the fields of engineering and motor racing safety. The FIA is clearly the most experienced and knowledgeable party in respect of the safety in Formula One. AGPC will continue to rely upon and seek the advice of the FIA on these issues. CAMS is also the most knowledgeable organisation in Australia on motor racing issues.

Notwithstanding this, and the fact that the FIA has not been willing to submit to the jurisdiction at the inquiry, AGPC will endeavour to locate an appropriately qualified expert in track safety in Australia or in another country (but who agrees to comply with the laws of Australia) to provide independent advice to it.

It should be noted though that if there is an irreconcilable inconsistency between the requirements of the FIA and the independent expert, AGPC will be bound to comply with the FIA requirements. To do otherwise would likely result in the FIA refusing to licence the circuit and therefore the event would be cancelled.

It is submitted that it is not appropriate for AGPC to usurp the responsibility of CAMS in respect of sourcing and training marshals. This is an area in which CAMS has significantly more experience and expertise than AGPC.[260]

Additional comments and recommendations of the Coroner on the matters referred to above

The responses to the recommendations of Counsel Assisting are generally appropriate. However, ultimately the promoter of the event, the AGPC, as a statutory authority, must accept ultimate responsibility to ensure that the event is run as safely as possible. While it does rely on experts such as CAMS, Brown & Root and the FIA for advice, it is potentially problematic, in view of the lessons learnt by the incident in which Mr. Beveridge lost his life, to place the sole reliance on the advice and assessment of these experts. Many experts on motor sport missed the issue of the need to pro-actively manage the risk associated with the gaps. Thus the AGPC must take a pro-active and continuing role in ensuring the best possible protection for the public and officials.[261]

Again ultimately, from a public safety point of view the issue of debris fence design, height, strength and overall safety (including driver safety) is far too important for the AGPC to rely solely on the outcome of a study by the FIA, being conducted in circumstances where input into the design of the study by the AGPC has been limited and where it would appear that the expertise and evidence presented cannot be tested.[262] That is not to say that the FIA does not need to be commended for its new study. It does. But that caution, in relation to public safety, would mean the following of the FIA debris fence study results and possible recommendations need to be reserved until the study is complete.

If possible, the AGPC needs to carefully monitor both the timing and the quality of the FIA study and if necessary, conduct its own independent assessment by both experts who have knowledge of the sport and others who have knowledge of risk management, occupational safety and engineering principles.

Also the AGPC needs to ensure that the training, safety instruction, procedures and supervision given to marshals is of appropriate and adequate quality. It should not rely solely on the expertise provided by CAMS, and thus it may need to regularly monitor these issues.

Recommendation 1

That the FAI provide, in a timely way, to promoters of Grand Prix motor racing events, the minutes and relevant documentation of its Commissions (Circuits Commission, Safety Commission and World Motor Sports Council) where those minutes and documentation apply to safety.

Recommendation 2

That the AGPC regularly monitor (and document the monitoring) the quality of safety training, procedures and supervision delivered to Marshals by CAMS. Accordingly, CAMS should make available to the AGPC all its relevant documentation and expertise to assist in this purpose.

Protective fence design and safety

Introduction

In view of the nature and potential of the hazard of out of control racing cars and debris travelling at speed following a collision on the track, the issue of the design and performance of protective fencing is vital for the safety of drivers, officials and spectators. ***There are no recommendations under this sub-section but all of the comments and issues raised are of significant importance for safety and need to be thoroughly considered by the appropriate agency (FIA, AGPC and/or the relevant Government having jurisdiction).***

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[260] AGPC et al submission, p.26-28

[261] See also comments under the heading ``*Additional comments - independent systems safety audits*''

[262] Although it is noted that the Dossier for the FIA Circuits Commission meeting on 28th August 2001 in Paris notes under the heading of the Debris Fence specifications research that the ``*TRL proposal was circulated to the members, who were asked to send any comments to the secretary as soon as possible.*'' (Exhibit 63, p.4). CAMS has membership rights but the AGPC does not.

The evidence expressed by a range of experts still leaves some safety concerns for marshals and spectators that may require further consideration by the FIA for the future. Many of those concerns do not specifically relate to the temporary circuit at Albert Park but to some of the systems employed at permanent Grand Prix circuits. They have arisen incidental to this investigation as a result of safety comparisons between the design, construction and performance of fencing at Albert Park and fencing at permanent circuits like Silverstone in the UK.

Also, the strength of the Albert Park debris fencing was raised as a potential problem in the event of a more direct impact at high speed by a racing car. Expert evidence indicated that the debris fencing at Albert Park could not withstand a more direct high-speed impact of a racing car. Evidence has indicated that the risk of more direct impact is likely to occur at the end of a straight where run offs are provided to reduce speed and therefore impact.

The close proximity of the spectators to the fencing and the track at the temporary Albert Park circuit is an important balancing factor by way of a safety concern. The close proximity of spectators is not generally evident in the permanent overseas circuits. The distance at the permanent circuits creates an extra margin for safety. However, the evidence also indicates that a closer debris fence (such as at Albert Park) has greater potential to retain debris. Examples of safety concerns can also be found in FIA material. The Dossier for the 22nd May 2001 meeting of the Circuits Commission contains the following pertinent reference (under the heading ``*8.2 Debris fence specifications''*):

> ``*although it was accepted that the strength of the FIA specifications had proved adequate, experience at various circuits, particularly ovals, had lead to some higher constructions. Mr. Whiting observed that the FIA minimum of 2m50 could be meaningless in some locations; the distance from the first line of protection was important. Mr SYMES suggested en increase in the overhang.*
>
> *IT WAS AGREED, IN THE LIGHT OF RECENT INCIDENTS WHERE PARTS HAD BEEN SEEN TO PASS OVER THE SECOND LINE OF PROTECTION, TO PROPOSE AN INCREASE OF 1 M IN THE MINIMUM HEIGHT TO 3M50 AND AN INCREASE OF 10 CM IN THE OVERHANG HEIGHT I TO 30CM''*[263]

Oval circuits are speedways. However, at least one witness (Mr. Burton) has described cars going over the debris fence protection during practice at Silverstone.

It is noted that the FIA has already funded an extensive study on the issue of safety fencing. This is the 2001 ``*FIA Fence Design Modelling''* study commissioned as a result of a meeting of the World Motor Sport Council in March last year. Transport Research Laboratory in the UK is to undertake the work. The document setting out the parameters of the study sets out some detail on the testing of full vehicle and wheel impact. There are five parameters:

- Fence post – spacing, strength/material properties
- Cables – spacing/number, strength/material properties
- Mesh – strength/material properties
- Fastenings – positioning, strength/material properties
- Height[264]

Mr. Smith was concerned, in effect that the study (in relation to the height of the fence) did not go far enough. The following evidence given during the questioning of Smith might need to be considered by the study proponents:

> ``*Mr. Kennan:?.Mr Dohrmann gave evidence that the proper risk analysis would have, in terms of the debris fences, would have consisted of the following: a risk analysis should have been done that gave consideration to what bits of debris or whether a whole vehicle might go over, that would involve an analysis of the movement of pieces of the vehicle, the professional engineers engaged to design the system should have performed calculations as to possible trajectories of debris under a range of possibilities. I take it that work has not been done? --- We did not evaluate it in that sense. They are basically the sort of studies which should be done by FIA if they are going to actually review what is in their guidelines.*
>
> *You wouldn't disagree with the methodology of a comprehensive study which is going to be done?---I'm not sure it is going to be done.*

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[263] Exhibit 53, p.4-5

[264] Exhibit 62, p.2

*Coroner: From what I have seen it doesn't look like that?---**That's why I have that hesitation, I would think that the next step in the process of Formula One safety would include such a comprehensive study.**'' [265] (emphasis added)*

The lack of detail in the study proposal as related issues associated with the height is a matter that should be addressed.

On the matters of risk analysis, fence design and audits some evidence was given by the engineer called on behalf of the Coroner, Mr. Mark Dohrmann. He considered that a risk analysis would need to be undertaken on what ``*debris*'' or ``*even a whole vehicle, might do, where it might go, and that's a matter of fairly straight forward engineering. The word is kinematics?*''. He said that in designing a study he would:

``brief whatever professional engineers were engaged to design the protection systems and the fences and require them to perform those calculations, that is the movement or pro]lection and the trajectories of debris and of vehicles under a range of possibilities?'' [266]

Also Mr. Dohrmann would have expected that a:

``a reasonably sophisticated consideration of past accidents, both at that track, if they did occur, or at other comparable tracks where the geometry was similar. By ``sophisticated'' I mean it would need to look for the data which typically a reconstructionist would need to get a good understanding of the forces involved, the movement of vehicles and parts of vehicles, the state of the road and the environment and with all of that in mind, again require the engineers to commit themselves to taking account of that in their designs of the fences and the barricades.''[267]

Mr. Dohrmann responded to the following question:

``In a situation where you have a promoter of an event using engineers to do the work, are there any steps you would take in relation to an independent review or third party review?---Yes, certainly. In some cases, depending on the magnitude of the event or the situation or the numbers of people or the possible consequences of an accident or a disaster, it is most appropriate to allow or invite an independent and qualified party to look over what, say, the engineers engaged have calculated, to just check that everything is right and there is nothing overlooked. I believe that that should be done.'' [268]

On the risks associated with flying debris and out of control cars, Mr. Dohrmann considered:

`` . It is possible for accidents to occur which cause bits of cars to fly off and to get over that fence quite easily and to travel a long way. I have applied different speeds, initial speeds and different angles for that, and in one scenario quite, I think, reasonable to predict as being possible, I have bits of material travelling nearly 300 metres and reaching a height of 22 metres. The other possibility is a tyre could go over a fence of that height, I think it is unlikely but possible for several reasons.

What are they?---One is the possibility of reasonably high impact speeds where a car mounts another car and starts pointing forwards up like a rocket. Those cars are designed to be stuck to the ground by an upside down wing on the rear. The bodies of the cars are designed, as far as I know, to act in a similar way, to create downward pressure. Once a car takes off and rolls, there are a lot of possibilities that it might float, fly upside down travel quite a distance and it is difficult to say without more information, which I haven't yet got, how high or how far that could go, but on the basis of the video I saw and discussions with a chap that works for me, a former Qantas jet pilot, I am satisfied the possibility is quite real of going as high as that present fence, 2.5 metres?.''[269]

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[265] Transcript, p.713-14
[266] Transcript, p.227
[267] Transcript, p.227
[268] Transcript, p.228
[269] Transcript, p.228-29

Mr. Dohrmann was also concerned about the size of the gaps in the mesh (the 100x100 style) with the ``*potential to injure somebody''*[270] and thought that other measures should be used.

It is to be hoped that the lessons learnt by the organisers as a result of the death of Mr. Beveridge and the range of evidence given by a number of engineers[271] will be thoroughly considered by the FIA and TRL during the modelling study.

Marshal safety at permanent or any other temporary circuits also needs to be considered as a matter of urgency. The issue of fence height (and related placement) may well need urgent and detailed attention. In addition, the evidence of the engineers raises serious concerns about the protective strength under load (or penetrating force) of the required FIA permanent debris fence.

The Albert Park circuit – fence design and safety features

The AGPC submission indicated that the original fence was principally developed by an expert structural engineer, Mr Kevin Lee, who interpreted the requirements of the FIA guidelines. Lee's detailed analysis of the design was set out in a paper ``*Design criteria of Barrier and Debris Fence System as approved for Adelaide''* [272]

The submission pointed out that the Lee design incorporated an angled top section, which was ``*subsequently adopted by the FIA in revisions of the guidelines.''* Apparently the angled top section of the fence adds to its effective height. This is because it ``*catches debris at a lower point of its trajectory than a straight fence of similar height''* and it ``*also assists in confining debris from a collision with the barrier itself, particularly debris rising on a steep trajectory close to the barrier.''* [273]

The AGPC et al submission made a number of additional points about the historical performance of the fencing. In the conclusion in the finding the point about debris going through the gap has already been canvassed. The remaining points that were made by Counsel were:

> ``*The AGPC had the evidence of the history of this design of panels having performed successfully in Adelaide from 1985 to 1995 with no evidence at all of debris going either over the fence, or through the gap, and always having performed as required to cope with collision impact (Shead, p431-432, 434, Harnden, p579, 604 and Bamford, p498)?*
>
> *?There was nothing in the performance of the cars in Melbourne in 1996 that increased the risks required to be met by the barrier's performance ie the cars were not significantly faster than those racing in Adelaide (Large, 285 and Shead, p460).''* [274]

These points are canvassed in the topic sub-headings below (also see the `introduction' to this topic).

Safety and the Albert Park circuit – the issue of debris fence height

During the evidence there was some concern expressed about the height of the debris fence at Albert Park. Ultimately this concern appeared to lead the AGPC and CAMS deciding to follow a cautious approach and to raise the height of the fence to 3.8 metres for a significant length of the track.

To their credit, in their submission the AGPC and CAMS commented that, on:

> ``*considering the issue of fence heights further, John Harnden asked the NTSC to consider where, using an overabundance of caution, they would place additional height debris fencing. The NTSC has come up with a*

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[270] Transcript, p.230

[271] See the evidence of Dohrmann (Transcript, p.225-34 [note some of the transcript mistakenly lists Keys as the witness], 722-32, 754-58), Niall (Transcript, p.732-54), Harnden (Transcript, p.578-658), and Smith (Transcript, p.658-722).

[272] AGPC et al submission, p.16

[273] AGPC et al submission, p.16

[274] AGPC et al submission, p.15-16

number of locations requiring 879 additional panels. This, combined with the increased height panels installed in 1999, and the 25 panels already requested by Charlie Whiting will mean that 40% of the circuit in 2002 will have fencing at a height of 3.5 metres.

The AGPC has asked Brown & Root to consider the engineering options available, and the result is a proposal to use additional mesh panels in a piggyback structure yielding a total height of 3.8 metres.

This structure has had indicative approval of the FIA, pending the resolution of some design issues regarding their instalment, particularly which way the overhang of the lower panel should face?'' [275]

Mr. Smith, the engineer and Project Manager form Brown & Root, whilst noting that his company's brief was not to gather scientific information on fence heights, but was to:

``*conform with the FIA guidelines wherever possible and to present a circuit design which would in fact meet the FIA guidelines and receive in the end a circuit licence for running a Formula One event.''* [276]

Importantly, Mr. Smith noted that the second line of protection closer to the track (as at Albert Park) increases the effectiveness of the height of the fence. A diagram was presented comparing the relative positions of a temporary fence and a permanent fence and mapping the path of debris. Smith said:

``*And the angle of significance is the angle of debris coming from the side of the car to the top of the fence, and the permanent circuit referred to there is 20.2 degrees and on the Albert Park circuit 34.9?---Yes, we would not like to make too much of the actual angle because the car can be on different locations on the circuit.*
Coroner: I noticed that, yes, you have got that on the plan?---As the car gets closer to the barrier, of course, that angle increases to almost 90 degrees directly above the car. What we are demonstrating with this plan is that the effective height of the temporary arrangement that we have at Albert Park, temporary circuit arrangement, is always better than the FIA minimum guidelines for a 2.5 metre second line of protection 3 metres behind the barriers.'' [277]

It should be noted that a marshal from the UK, Mr. Burton, gave evidence about racecars clearing fencing during practice at Silverstone, and, accordingly had concerns about the fence height at the Albert Park circuit. Dohrmann, an engineer called on behalf of the Coroner, considered that the 2.5 metre high fencing was too low[278] and did not adequately provide for the risk of debris clearing the fence. He basically considered that there was insufficient attention placed on the research and risk analysis related to fence height. In 1998 Whiting from the FIA had requested that the AGPC raise the height of the debris fence in a limited number of specified areas adjacent to some of the corporate boxes.[279] Presumably this action was as a result of his safety concerns. This work was completed in 1999. Giles, a marshal, was concerned that a number of the corporate boxes (like at turn 3) were still unprotected from flying debris. Mullavey, a spectator at Turn 3, thought that debris not only went through the gap but over the top of the fence.

A careful study of the video of the Brundel incident in 1996 indicates that a large piece of debris narrowly missed clearing the fence and going into the spectator area. On that occasion it hit the very top of the fence and bounced back onto the track. Such an incident clearly illustrates the need to rely not on good luck, but to consider the ``*spectrum of possibilities''* in any pro-active approach to safety. Although it must be noted that, as the AGPC and CAMS submitted (in part):

``*The AGPC had the evidence of the history of this design of panels having performed successfully in Adelaide from 1985 to 1995 with no evidence at all of debris going either over the fence,?''* [280]

There is an important point of principle to be made. ***The management of risk does necessarily need `evidence' before action is taken to reduce risk.*** By the time `evidence' is available where a hazard like flying debris going into crowds

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[275] AGPC et al submission, p.20

[276] Transcript, p.689

[277] Transcript, p.700

[278] Transcript, p.230 – Dohrmann considered the fence height at Albert Park should be about 5 metres

[279] There is a raft of documentation and discussion in the Transcript on this issue. See for example Exhibit 87 – Kinhill's memorandum dated 9th October 1998, from Niall to Smith (discussion on design issues). It mentions that the higher fences are to be used ``*when the adjacent corporate facility is within 6 meters of the track. FIA have expressed concern following the 1998 event that the debris fence does not provide adequate protection at those locations when the facility is close to and above the height of the debris fence.''*

[280] AGPC et al submission, p.15-16

at speed is the issue (combined with the obvious high potential for injury or death) it will probably be too late. ***Thus considering the ``spectrum of possibilities'' with a pro-active focus is the way to manage risk where a potentially dangerous hazard is involved.***

Albert Park debris fencing/and FIA permanent fencing – comparative mesh panel design and strength

There was considerable evidence and discussion about the implications of the differences in the size of the mesh and comparative performance under impact of the Albert Park temporary fencing and the permanent fencing required by FIA Guidelines. This evidence is important not only for safety at Albert Park but for permanent circuits at other locations.

The AGPC submitted that it commissioned structural engineers Brown & Root to review the Adelaide design and the engineers were satisfied with the performance of the panels:

> *``noting that while they are made of 100 x 100mm welded grid instead of 90 x 90mm mesh, the welded grid is stronger, and provides a rigid structure capable of withstanding 5 kNs at every 100mm instead of every 250mms as strictly required. The FIA requirement is of mesh approximately 90 x 90mm (Niall, p736-737; Harnden, p632-633).''* [281]

It is noted that effectively, the evidence of Mr. Robert Niall, an engineer at Brown & Root, confirmed that the mooted FIA requirement for debris fencing to withstand a static force of 700 kilonewtons (the full force of a car) could ***not*** be achieved.[282] The following question and response is apposite:

> *``Mr Richards: What the requirement seems to be is the mesh fence is as strong as the concrete barrier, it will need to be as strong as the concrete barrier to resist that force?---I was concerned that is what they were saying and I was concerned that was what they meant.''* [283]

The Albert Park debris mesh fencing is designed to withstand a far lesser force of 5 kilonewtons.

The FIA appears to be well aware of this problem. In the FIA Dossier for the meeting of the Circuits Commission on 2nd May 2000 at Haarlem is the note under the heading ``*7.DEBRIS FENCES''* that:

> *``Mr. Shead observed that the Guidelines ``reinforced fence'' specifications generally referred to stopping a car, rather than debris, which might lead to legal difficulties in case of an accident.''* [284]

Other concerns were raised in the submissions and evidence about the design of mesh specified under FIA regulations. These are the FIA specified mesh:

> *``?although smaller, might allow more, larger-size pieces of debris through the fence if an object penetrated the welded mesh. (See evidence of Niall, p752, 753-754 also Shead, p446-447, 420, contrasting with the evidence of Mark Dohrmann, p230).''*

And that it:

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[281] AGPC et al submission, p.15-16

[282] Discussion Transcript, p.738-39. See also Brown & Root memorandum dated 19th October 2001 from Rob Niall to Graham Smith where Niall opines that the requirement that the concrete blocks ability to withstand a static force of 700 kN when applied to the mesh fence ``*does not and cannot come within a bull's (or an F1 car's) roar of resisting a static force of this magnitude?''* (Exhibit 85)

[283] Transcript, p.739

[284] Exhibit 55, p.3

``may also bulge out (Niall, p753), offering a potential for a head on impact with the car and the pole, whereas the 100mm welded mesh is much less prone to deform." [285]

Mr. John Harnden, Chief Executive Officer of the AGPC and an engineer, also gave evidence that with a 20º angle of approach of debris (which is *``ordinarily"* range of direction of debris), a 100mm mesh effectively becomes 34mm.[286] Also Adelaide/Melbourne debris fence panels are considerably stronger than the FIA Guidelines require.[287]

Albert Park debris fencing/and FIA permanent fencing – comparative safety for marshals

In this case, notwithstanding the death of Mr. Beveridge, the protection offered to marshals by the combination of the first (concrete blocks) and second (debris mesh fence) lines of protection in one fence structure was superior to the protection provided at a permanent circuit like Silverstone. The concrete block first line protection for marshals at the permanent circuit leaves a marshal partly exposed to out of control cars or debris and relies on observing an incident and rapidly responding by ducking down to seek the full protection of the concrete barrier. Reliance on observation and rapid response in the face of cars or debris moving at high speed, is at best problematic as a safety procedure. At worst it appears to be an inadequate response to the risk.

At Albert Park Mr. Beveridge was unable to respond rapidly enough and he took the force of the wheel and thereby possibly saved other marshals or spectators from injury.

The CAMS Risk Analysis Report noted that the second line of protection (debris fence) *``is a structure designed to minimise the incidence of vehicle components and other debris reaching spectator areas."* However that at permanent circuits the secondary protection is *``usually constructed using open or loose steel mesh supported by uprights, with tensioned longitudinal cables running between the uprights."* [288] And that the:

> *``structure is 2.5m in height (minimum) and (for permanent Formula One circuits) is located only in designated areas and usually positioned a 2-3m behind the primary protection barrier. This positioning allows personnel who operate immediately behind the primary protection barrier relatively unhindered access to the circuit and provides an easily-scalable obstacle for drivers to c1imb in order to reach a sanctuary from the dangers of the track environment."* [289]

The AGPC, CAMS and Brown & Root in their submission made the point that at:

> *``permanent circuits, marshals generally work in front of, not behind, a debris fence. At Albert Park, if the debris fence had not been on top of the primary protection, and therefore in front of the debris fence, 600 officials would have been exposed. Because the first and second lines of protection are combined, those marshals are substantially protected, although there remains what was considered a low level residual risk to the marshals, and possibly the spectators, resulting from the gaps (Shead, p405)."* [290]

And that now:

> *``The combined debris fencing and concrete barrier system affords marshals greater protection. This of itself is not in excess of the guidelines for temporary circuits, but the design of the SCP1s and SCP2s <u>are</u> designs which give*

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[285] AGPC submission, p.15-16
[286] Transcript, p.632-33
[287] Transcript, p.632
[288] Report, p.25
[289] Report, p.25
[290] AGPC submission, p.19

marshals greater safety, but are not specified in the guidelines. They were originally installed at high speed areas, but will be installed at all flag points for 2002 (Shead, p464)."[291]

Flag and marshal safety – reduction of exposure at Albert Park at the SCP2 Barrier and providing a protective area where marshals work

SCP2 Barriers

The description of a number of marshals who were in the partly exposed area of the flag point at the SCP2 Barrier (Turn 3) when the incident occurred should alert the race organisers to a potential problem with the design of this area. Accordingly, if not already addressed, it is essential that where flag or other marshals are required to be stationed at the flag points (SCP2 Barriers – Special Control Point) throughout the track, that exposure is reduced by:

- limiting the number of flag marshals working in this area;
- providing an extra observer for the designated flag marshal as a look-out support;
- regularly relieving both flag and observer marshals;
- providing effective supervision;
- extending a lower debris fence panel along the top of the steel AMCO type extension to provide extra protection; and
- ensuring that the marshals working at the SCP2 Barrier have a sufficiently fenced area on the approach to the vicinity of the barrier to adequately exclude all spectators (to limit any distractions for the marshals).

Recommendation 3

The AGPC should consider reducing exposure for flag or other marshals who are required to be stationed at the flag points (SCP2 Barriers – Special Control Point) by:

1. *Limiting the number of flag marshals working in this area;*
2. *Providing an extra observer for the designated flag marshal as a look-out support;*
3. *Regularly relieving both flag and observer marshals;*
4. *Providing effective supervision;*
5. *Extending a lower debris fence panel along the top of the steel AMCO type extension to provide extra protection; and*
6. *Ensuring that the marshals working at the SCP2 Barrier have a sufficiently fenced area on the approach to the vicinity of the barrier to adequately exclude all spectators (to limit any distractions for the marshals).*

Protective work areas for marshals

Marshals are required to perform a number of tasks which, because of the fast moving nature of the sport, needs concentration. Distractions should be kept to a minimum. Therefore where marshals are working on flag and other responsibilities related to what is happening on the track the ability of the public to distract and approach the immediate work area should, as far as is practicable, be curtailed with more secure fencing.

This is a matter that should be examined by the authorities for future races (if possible at the forthcoming 2002 race). It would only require a limited area to be securely fenced to meet this requirement (see Recommendation 3 (6) above). Such fencing should be designed, as far as is practical, so as not to obscure the public's view of either the marshals' work or the event.

Vehicle safety – development of the tether system and track/inboard safety warning devices

The tether system and its benefits and potential for marshal, spectator and driver safety

[291] AGPC submission, p.19

The original development and implementation of the wheel tether system by the FIA is commendable and needs the full and continuing support of the motor racing industry.[292] It is also clear that BAR and Marlow Ropes are committed to this development and assisting in improving the performance of the system. The system is aimed at reducing the potential of flying wheels to come loose from a racing car and cause injuries to drivers or spectators. It is a practical and innovative way of reducing the risk of out of control wheels when trajectories cannot be predicted and other protection systems (vehicle design/fencing) cannot practically fully eliminate the hazard.

Mr. Mosley in his letter to the Coroner explained reasons for the development of the tether system and commented that the:

``problem is that at high speed, a wheel on a Formula One car has enough energy to go some 80 metres (over 260 feet) in the air."

And that after the FIA introduced its tether system the result:

``was an immediate reduction in the number of wheels becoming detached and rolling about after an accident, but the problem was not eliminated. Interestingly that same year the two leading American National single seater championships both suffered fatalities among spectators caused by detached wheels. Both then introduced Formula One-style tethers." [293]

The incident during the Formula One race on 29th July 2001 at Hockenheim also graphically illustrates the potential of flying debris and a wheel. [294] In addition wheels have killed spectators at other motor sport events.[295]

The BAR team, in its submission, highlighted the technical difficulties in developing the tether system:

``The subject of wheel restraint on Formula One racing cars is highly technical and improvements are, to a significant degree, contingent on the development of new technology. These features distinguish this subject from some other subject matters before the Coroner where alternative technology may be currently available and method for improvement may be more readily identifiable." [296]

And:

> *``Research and development projects are being undertaken by FIA and BAR into innovative ways of improving the tethering system with new technologies for public and driver safety. Whilst this work should be acknowledged with approval, there is no requirement for further comment or any specific recommendations."* [297]

It is noted that Counsel Assisting recommended:

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[292] See also Exhibit 39 – ``*Report on wheel tethers and the Villeneuve accident at the Australian GP 2001"* by the FIA Technical Department, dated 6th December 2001.

[293] Letter dated 25th July 2001

[294] See photograph of incident (attached) – Exhibit 12. The photograph also shows a high permanent debris fence with the spectator grandstand relatively close behind. Also see the video of the Hockenheim incident which occurred on the starting grid.

[295] See inquest into the death of **Sharon-Maree Frances Miles** (Coroner's Case Number 1481/88) attached.

[296] BAR submission, p.12

[297] BAR submission, p.13

``1. The FIA and the racing teams continue to liaise with each other and with the suppliers of tethers to continue to refine and improve the tethering systems of wheels.

2. The FIA continue to develop a tethering system whereby the energy of the wheels will be dissipated by the tethering system." [298]

The recommendations of Marlow Ropes are also useful to document for further consideration of the FIA:

- *The tether should be kept 100% straight.*
- *The bobbin or boss should be designed to perfectly match the diameter of the tether.*
- *The diameter of the bobbin or boss should be as large as possible as this distributes the loads more evenly between the yarns.*
- *If the Boss on the Soft Eye of the tether is suitable, there should be no difference between this and a fitted bobbin.*
- *Independent movement of the tether should be allowed in order to achieve maximum break load.*
- *If energy absorption is seen as more important than ultimate break materials other than PBO would be more suitable. This will affect size, weight and dimensions of the tether. If quantifiable energy absorption figures are available we could work with Fl to design a suitable tether."* [299]

The FIA Technical Department's Report dated 6th December 2001 notes that:

``No material is known that can practically absorb the required energy as the tether itself, and so the load transmission and energy absorbing functions have been separated, and a purpose designed energy-absorbing device is under development. Existing tether systems are capable of transmitting the loads, so require little development to become part of the system." [300]

Recommendation 4

That the FAI should be commended for its innovative development of the system of wheel tethers and continue with this pro-active work (in full and continuing cooperation with the racing teams and tether manufacturers) and aim at developing a system that, as far as is practicable:

- *protects the tether cabling from cutting forces; and*
- *dissipates the energy when the wheels come loose from the vehicle components.*

Recommendation 5

That the FAI consider the recommendations of the manufacturer of the tethers on the BAR car – Marlow Ropes.

Inboard and general track safety warning devices

The issue of warning lights on a race track was raised during the inquest as an alternative to the use of flag marshals. It is also understood that the option of the use inboard warnings for drivers has been canvassed in the past.

Potential problems were raised with the use of trackside warning lights as a flag marshal may be able to vary the sense of urgency for an approaching driver depending on the nature of the emergency that is ahead. Lights may not be able to be designed which are able to convey the variety and degrees of urgency that may be necessary.

It is recognised that careful consideration and balancing is needed for a number of reasons, including other unintended safety consequences, the traditional use of the flag marshal as part of the historic nature of the event, etc.

It is noted that there have been previous deaths of flag marshals at Australian Motor racing events.[301]

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[298] Submission by Counsel Assisting, p.4 -5

[299] Exhibit 38

[300] Exhibit 39, p.3

[301] See findings of inquest into the death of **David Crowder** (Coroners Case Number 4308/89) attached.

Recommendation 6

That the FAI examine the issue of providing either inboard warnings for drivers or the option of the use of some warning lights on the track in lieu of the use of flag marshals (with the idea of either reducing or totally eliminating the number of flag marshals operating on the track).

It is recognised that this recommendation needs careful consideration and balancing for a number of reasons including – other unintended safety consequences or consideration of the traditional use of the flag marshal as part of the historic nature of the event.

A safety officer for marshals/spectators

A Safety Officer for Marshals/Spectators

There are a number of positive aspects of the issue of marshal safety at Albert Park. Mr. Beveridge received an injury to his ankle on the first day of the event. He was carefully monitored to ensure that he was fit for duty. Mr. Burton was impressed with the format of the safety briefing given to marshals at the 2001 Australian Grand Prix.

However, in view of the expressed ``*dangerous*'' nature of the sport, it may be appropriate to consider establishing the position of Safety Officer/s for Marshals and Officials to help further identify safety issues associated with the training, procedures, practices and operations of the essentially volunteer work force.[302] Likewise the position (or positions) of Safety Officer for spectators may assist in identifying potential problems for the safety of the public and help ensure that countermeasures are introduced.[303]

Ideally the position of Safety Officer (Marshal or Spectator) would require expertise in risk management and occupational health and safety as well as some basic understanding of the sport of motor racing. This type of coronial recommendation in the area of motor racing has been made in the past.[304] It is envisaged that the Safety Officers would report directly to the Clerk of the Course.

In the event that more than one safety officer is employed for each position it may be appropriate to consider appointing a Principal Safety Officer to co-ordinate the roles.

It is appreciated that these recommendations may not be able to be implemented in time for the 2002 event. However, in the short term, it may be considered appropriate for officers from a government agency like the Victorian Workcover Authority, to help advise on these issues.

Recommendation 7

That the AGPC and CAMS consider the appointment of a professional Safety Officer/s (with appropriate qualifications in risk/occupational safety) to assist in managing and advising on safety issues, training and related procedures associated with Marshals and other officials.

Recommendation 8

That the AGPC and CAMS consider the appointment of a professional Safety Officer/s (with appropriate qualifications in risk/occupational safety) to assist in managing and advising on safety issues associated with spectators.

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[302] See also Recommendation 2 of this finding. See also the Linton Wildfire finding, Chapter 23 (23.5.29 – 23.5.64) for discussion about the issue of Safety Officers and volunteer firefighters. Also see discussion in Chapter 20.

[303] See discussion on the role of the Safety Officer in Linton Wildfire – Report of Investigation and Inquest, Chapter 23 paragraph 23.5.29. And also see Linton on the issue of safely managing a volunteer workforce.

[304] See **David Crowder** inquest finding and recommendations

Independent systems safety audits

The ``*dangerous*'' nature of the sport of Grand Prix motor racing with the ever present risk to drivers, spectators and officials of injury from flying debris, necessitates that those responsible for the organisation and management of a race take a pro-active and innovative approach to safety. Whilst considerable reliance obviously needs to be placed on experts working within the sport, limited external review of safety systems, by way of independent audit, may be of considerable benefit.

The comment was made by the Coroner in the Linton Wildfire inquests (where five volunteer fire fighters died in an entrapment) about the need for a system of independent safety audit:

> ``*Areas of high risk of death or injury (such as wildfire) need pro-active systems to identify safety management deficiencies and introduce appropriate countermeasures in a timely way. A targeted (and timely) pro-active Wildfire Safety Audit system is one method of assisting the firefighting agencies with due diligence and providing another element in a safety system that is truly designed to reduce risk. That audit must* ***hunt for errors*** *in systems and suggest potential countermeasures.*'' [305]

And that a limited, but:

> ``*targeted independent Wildfire Safety Audit* ***hunting for errors*** *should become part of the due diligence of the fire fighting agencies in the management of safety at a wildfire. The audit reports should also become part of a continual management process aimed at improving safety for firefighters.*'' [306]

Whilst wildfire and motor racing have vastly different risks, in the latter there are high risks of death or injury following a collision where adequate protection measures have not been introduced to protect against the hazard of out of control cars or flying debris.

Any, limited independent system of audit, whilst utilising some expertise from the motor racing industry, needs to be undertaken with fresh eyes. Specialists in risk management and occupational health and safety need to be involved as the principals managing the independent audit process. Engineers and designers may need to be consulted as part of the process. They may need to inspect the safety equipment. From time to time new auditors may need to be found to ensure that those managing the events regularly have the benefit of fresh ideas on ways of managing the variety of risks.

The development of industry specific standards for any independent audit process is also important to ensure consistency of reporting and feed back to an industry such as motor racing.

The arguments for such a system and how it should work are more fully described in the Linton Wildfire Report, albeit in the context of safe wildfire management, but are equally as valid for the sport of Formula One motor racing, where the consequences of failure in systems can, in some circumstances be disasterous. [307] This type of audit requires pro-active examination of systems to see whether they work.

An independent systems audit, as part of due diligence by the race organisers would need to be undertaken every two or three years, or where a major safety issue has arisen which may require independent audit as a check on the systems.

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[305] Linton Wildfire – Report of Investigation and Inquest, Chapter 23 paragraph 23.7.7.

[306] Linton Wildfire, Chapter 23, paragraph 23.7.5.

[307] Linton Wildfire – Chapter 23 – Section 7, p. 643-647

Also an independent safety audit may, from time to time, be needed to examine the operations of a particular part of the circuit – ie: debris fencing.

Safety audits should not only examine systems and documentation but also the technical aspects leading to design, construction and maintenance of safety equipment. Most important of all, the auditors need to ***hunt for errors*** in systems and test the safety philosophy and its implementation.

Recommendation 9

That the AGPC introduce a system of regular (every two or three years, where a major safety problem has developed ***or*** *a particular safety system needs detailed examination) independent Safety Audits of all of the safety systems, documentation and equipment used at the Australian Grand Prix with the intention of critically reviewing the systems. Both motor racing and other experts may be necessary to assist with this task.*

The audit should be conducted by independent risk management specialists to ensure that the system is carefully examined with fresh eyes.

Ideally the FIA and CAMS should be involved to assist the auditors.

Recommendation 10

That the AGPC develop a comprehensive audit standard for the independent safety audit referred to in Recommendation. Ideally the FIA, CAMS and the Engineers Brown & Root should be involved in the development of the standard.

AGPC review of protective fence safety design

The 2001 ``*FIA Fence Design Modelling''* study is important for the future design and development of protective fencing at motor racing circuits. However, caution is still required by those responsible for the safety of the public at the Australian Grand Prix. The AGPC may still need to undertake its own review of fencing at the Albert Park event, as ultimately it is responsible for the safe operation of the race. Because of the nature of the risk (***especially in view of the relative close proximity of spectators as compared with the more permanent type of circuit***), in the future it may need to carefully review all aspects of the design, construction and performance of the debris fencing at Albert Park using its own independent experts.[308]

The need for the AGPC to have a research capacity

CAMS, the organisation that manages safety at the race for the AGPC does not have a research capacity. Clearly, where safety is involved and the ultimate responsibility rests with the AGPC to ensure that the events are conducted as safely as possible, a research capacity is an essential component.

[308] The testing regime suggested by Mr. Dohrmann is but one of the issues that should be considered

Obviously, some reliance for research data will be placed on the FIA. However, the death of Mr. Beveridge has shown that there may need to be more self-reliance in the case of a locally run event.

Research is a component of the understanding and improvement in safety systems, and since CAMS cannot provide this facility, the AGPC may need to consider establishing a small safety research unit. The work, efficiency and breadth of such a unit may be able to be further enhanced by establishing links with a research organisation like Monash University Accident Research Centre.

Recommendation 11

That the AGPC consider establishing its own safety research unit to assist CAMS and other relevant agencies with the important work of improving safety at the Australian Grand Prix.

Incident investigation and data collection

The pro-active investigation of significant motor racing incidents is vital for the identification and development of safety systems. This case is illustrative of the need for the experts to think far more broadly about these incidents and address the ``*spectrum of possibilities''* potentially flowing from each event. Had such an approach been taken with the 1996 Brundel incident there was potential for the issue of debris fence heights to have been considered by the AGPC at a far earlier stage. Also a far more through, flexible and ***self-critical*** examination may have revealed the potential for a problem with flying debris along the approach to turn 3, and dealt with the gaps.

Clearly the FIA, CAMS and the AGPC are (and have been) looking at incidents and the potential lessons.[309] Perhaps this case could be treated as an example of what could happen with a more flexible, self critical and innovative approach by the AGPC and CAMS to incident investigation and the lesson potential.[310] After the 1996 Brundel incident the local experts basically considered that the protection fence worked well and no modification was undertaken to the fencing system.

Recommendation 12

That the AGPC and CAMS consider this incident as but an example of the need for a far more self critical, flexible and innovative approach to incident investigation with the resultant potential for possible countermeasures.

FIA information package for race promoters, organisers and design engineers

[309] See for example the format of the FIA ``*ACCIDENT REPORT''* in its Dossier of the meeting of the Circuits Commission, Haarlem, 2nd May 2000 (Exhibit 55). Also see CAMS' ``*Incidents at turn 3, Albert Park''* (Exhibit 52) - in 1997 CAMS had established a general motor racing incident data base that enabled it to find the reported incidents at turn 3.

[310] See also the comments on investigation systems in the Linton Wildfire finding – Chapter 23 (23.7.18 – 23.7.31)

Safety, in a dangerous sport like motor racing depends on a process aimed at continual improvement. As the drivers and teams push the safety envelope so too must those who are responsible for safety respond to protect against the consequences. Standard methods of managing risk should be one focus, and because of the risky nature of the sport, innovative methods are also important.

Whilst, as we have seen in this inquest, much reliance is placed on the expertise from within the sporting organisations, those who are working for the promoters and race organisers (like the engineers) also need as much up to date information on developing safety issues as is possible. With added information they may be able to identify new ways of solving a particular problem, or better help to identify a hidden problem. By example, this potential is demonstrated by the development of the Lee debris fence design for temporary fences for the Adelaide circuit. With this potential in mind the following question was asked of the Brown & Root engineer and project manager, Mr. Smith:

> ``*Coroner: What I'm getting to is what if I was to make a recommendation, thinking ahead, that FIA, of course I suppose it is a matter for them to consider whether they do it or not, that they regularly bundle together a relevant package of information to assist those who are doing the design work on tracks in assessing whether or not on their particular track the guidelines ought to be exceeded?---I am sure we would be very pleased to receive information if FIA was able to provide it from circuits around the world. It would assist us in our assessment of our own circuit.''*[311]

Any information provided by the FIA package would need to be regular and timely, and include a range of detailed material on incidents at other tracks and results of investigations [312] or on new developments, engineering problems and other ideas that are being considered. Engineers and other safety/risk management experts receiving this information would also have an important role of feed-back to the FIA where any problems or solutions have been found (this would be undertaken either directly or through the local race promoter/organiser).

Recommendation 13

That the FAI consider regularly supplying to its promoters and local organisers a comprehensive package of information which covers detail on recent incidents[313] *(with investigation results), new developments and ideas related to safety.*

The aim of the package would be to give to the local organiser an additional level of information to would assist it in recognising potential safety issues at the local venue and provide its engineers and safety specialists with added information to help with design and safety solutions. In turn, it would be expected that the recipients of the information would provide additional and timely feed-back to the FIA.

Medical management and reporting to the Coroner

Once a person is declared to be deceased by a qualified medical practitioner (or alternatively it would be obvious to any member of the community that the injuries are so severe as not to be compatible with life) then the death has to be reported to the Coroner. It is not appropriate that medical records be altered to show a different time of death to that which is regarded as the true and accurate time. In the future, once a treating clinician or any other medical practitioner makes an assessment that a person is deceased, whether at or on the track or elsewhere at the Albert Park circuit, the matter should be reported to the Coroner as soon as possible.

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[311] Transcript, p.691-92

[312] These could be either internal reports or a governmental/coroner's inquiry

[313] This would include videos and photographs

In the future, the CAMS Chief Medical Officer or Deputy should use considerable caution in relation to advising on issues associated with any clinician's decision that a person is deceased. Generally the decision should be that of the clinician (or clinicians) treating the patient. The timing of reporting the death to the Coroner is then a matter for the clinician (and not generally on the advice of the Chief Medical Officer of CAMS or Deputy). Under the *Coroners Act* 1985 the clinician needs to have in mind that the ``*report*'' to the Coroner must be made as ``*soon as possible.*''

Clinicians should **not** place the process of deciding that a person is ``*deceased*'' **above** the best interests of the patient and using all possible steps to save a life. In some cases that may still include transporting the patient from the trackside Medical Centre to the Alfred Hospital. This decision should not be with a medical administrator but with the clinician/s.

It is understood that Police from the Coroner's Assistants Office will be stationed at the Albert Park circuit during the holding of the events leading up to and at the Formula One Grand Prix race. The ready availability at the track of their expertise should help to ensure that proper procedures are followed in the event of a fatality. Their availability (and that of the Police Major Collision Investigation Unit) at the track should be a matter of standard procedure for the running of the event at Albert Park.

Conclusion

In this case, those agencies responsible for organising the 2001 Australian Formula One Grand Prix motor race failed to satisfactorily manage the risk to marshals created by the gaps in the debris fence. The issue of the potential for debris to go through the gap had been identified by CAMS years prior to the running of the 2001 event at Albert Park. The AGPC, through its Chief Executive Officer, was aware of the gap issue. The eventual solution was not only obvious, it was practical, and should have been in place before the racing incident at Albert Park. Mr. Beveridge's death was avoidable.

The AGPC also did not sufficiently monitor the safety systems, had it done so pro-actively (using an audit by independent experts who inspected the track) the problem with the gaps would have been more likely to be identified. Whilst it relied on experts who had been involved in the area of motor racing for a considerable period – they all (including the FIA) missed the obvious. Once it was realised that debris could go through the gaps, and because of the potential and likely velocity of the debris, even a small item could cause injury or death. The fact that a larger item went through, in what has been described by some as freakish circumstances, is not an argument that avoids the need to have managed the risk.

However, to the AGPC's credit it did involve an independent risk consultant to develop a methodology for the assessment of potential risks. Unfortunately, in this case, it then appeared to rely solely on the expertise of the FIA, CAMS and Brown & Root (on advice of the consultant).

On the question of waiting for evidence of the penetration of debris through the gaps in the fence, as with the issue of fence height, there is an important point of principle to be made. ***The management of risk does necessarily need `evidence' before action is taken to reduce risk.*** By the time `evidence' is available where a hazard like flying debris going through a gap at speed is involved, as has been demonstrated by Mr. Beveridge's death and the injuries to the spectators, it is too late. ***Thus considering the ``spectrum of possibilities'' with a pro-active focus is the way to manage risk where a potentially dangerous hazard is involved.***

Whilst some of the comments in this inquest have been critical of the management of this particular risk by agencies such as AGPC and CAMS, it also needs to be said, in a very positive light, that these agencies also have taken many pro-active and innovative steps in relation to safety in the past and appear to be engaged in a process aimed at continual safety improvement. Processes aimed at continual safety improvement are essential if the risks are to be appropriately managed. It is noted that the FIA also appears to have taken a significant number of steps on safety in the area of international Grand Prix motor racing.

Ultimately the AGPC and CAMS must be commended for their actions in raising the height of the temporary debris fencing for a significant length of the Albert Park track.

Graeme Johnstone
State Coroner
8th February 2002

Messrs Ross Ray QC and Chris Blanden (instructed by Allens Arthur Robinson) for AGPC,CAMS and Brown & Root;
Mr. David Beach for the Alfred Hospital;
Mr. Cameron Macaulay for BAR; and
Messrs Jim Kennan SC and John Richards (instructed by the Office of the Director of Public Prosecutions), Assisting the Coroner.