IMETT Group

Queensland Motorsport Industry Report

2012

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Executive Summary

The economic impact of the motor sport industry in Queensland is significant. It is estimated that the motorsport industry has an annual turnover of $320 million, employs approx 3,500 people, and has an estimated $430 million invested in motorsport infrastructure and competition cars and motorcycles.

Motorsport event tourism has been an essential part of the Queensland tourism industry since the 1950s, representing one of the earlier forms of events based tourism for the Gold Coast.

Motorsport tourism now attracts visitors from around the world to Queensland, with major events at the Gold Coast, Ipswich, Townsville and the Sunshine Coast.

Major motorsport events conducted in Queensland on an annual basis include the Gold Coast 600 V8 Supercar event on the Gold Coast, the International Rally of Queensland at the Sunshine Coast, the Townsville 400 V8 Supercar event at Townsville, the Ipswich 300 V8 Supercar event at Queensland Raceway, the Winternationals drag racing carnival conducted at Willowbank Raceway at Ipswich, World Series Sprint Cars at Brisbane International Speedway, the historic Leyburn Sprints at Leyburn, and the Australian Superbike Championships at Queensland Raceway.

Queensland has also produced many international motorsport champions over the years including Mick Doohan, Casey Stoner, Jason Crump, Scott Dixon, Scott Christopher and Trent Koppe, Chris Vermeulen, Chris Atkinson, Will Power, Gregg Hansford and Darcy Ward, whilst many others have subsequently settled in Queensland including Sir Jack Brabham, Geoff Brabham, Troy Bayliss, Ivan Mauger, Alan Jones and Kork Ballington.

Whilst the Queensland motorsport industry is dominated by infrastructure and events in South East Queensland, the industry is diversified with infrastructure and events conducted right across the state.

Specialist operators have developed Small to Medium Enterprises (SME) with either dedicated motorsport or significant motorsport focus, providing services such as race track engineering, race engine construction, component supply, race tyre supply, specialist suspension and drive train services, dyno tuning, race clothing, motorsport merchandising, motorsport public relations, and race experience or driver training opportunities.

The major motorsport infrastructure in South East Queensland includes Queensland Raceway, Lakeside Raceway, Morgan Park Raceway, Willowbank Raceway and Brisbane International Speedway.

The majority of motorsport infrastructure in Queensland was developed between the 1960's and 1980's and generally reflects the style of competitor and spectator facilities appropriate to the time.

It was generally located in remote areas where land was inexpensive to buy, and the broad acre, open space style of these facilities did not need to address noise considerations.

This infrastructure does not provide appropriate facilities, however, for international and major national events (where safety requirements and spectator facilities need to be of a higher standard) and are therefore better suited to state and lesser national events.

It is obvious that Queensland's motorsport infrastructure has not kept pace with the higher standard of facilities developed by other sports, such as football (all codes) where the majority of the newer and major sporting infrastructure in Australia has been developed by various state and local governments.

By contrast, the Queensland State Government currently invests some $10 million in motorsport events that are conducted in temporary facilities, down from approx $15 million in 2009. Regrettably, however, this has no lasting infrastructure or benefit for the Queensland motorsport industry.

This situation is a direct result of the fact the Queensland State Government does not have an industry policy for the motorsport industry, unlike the emerging aerospace and marine industries where the government has developed comprehensive industry policies over the past decade.

Similarly, the Gold Coast City Council has provided some financial and practical support to the Gold Coast Indy/Gold Coast 600 V8 Supercar event conducted on the streets of Surfers Paradise, but has not recognised the significance of the motorsport industry on the Gold Coast.

Whilst acknowledging the presence of the V8 Supercars Headquarters, and a number of V8 Supercar race teams based at Yatala, the Gold Coast City Council has not identified the motorsport industry amongst its list of 12 business sectors for policy and support by BusinessGC, the economic development unit of the Gold Coast City Council.

Whilst motorsport businesses are evenly distributed across Queensland, a significant motorsport cluster has emerged at Yatala, largely based around a number of V8 Supercar teams.

This motorsport cluster comprises race teams, component suppliers, service providers, and high technology support. The majority of these businesses are SME businesses, generally privately owned and employing a dedicated team of highly trained professionals. They are highly regarded, often work to tight deadlines, are innovative, and enjoy an ability to transfer their skills and experience to a range of industry sectors, particularly the aviation and marine industries.

It is beyond belief, therefore, that BusinessGC does not even acknowledge the motorsport industry as a part of its business development programme for the Yatala Enterprise Area despite a significant number of large and small high technology motorsport businesses being based there.

The motorsport industry technicians in Queensland are of world class standard, and there is considerable scope for the industry to develop a niche role in expanding motorsport export services to the Asia Pacific region, and beyond.

Access to education is a critical requirement, however, for industries operating in a high technology segment, including the motorsport industry. In Australia, motorsport education is a relatively new, and niche, market with a limited number of service providers. The majority of motorsport education programmes are TAFE based but there is a need for specialised undergraduate programmes to be developed for Australian conditions.

Given the importance of quality education to expanding the export potential of the motorsport industry, it is disappointing to note the only motorsport education programme in Queensland was discontinued in June 2010.

The emerging nations in Asia and the Middle East however have recognised the significance of motorsport as a means of developing industry and tourism as part of their national economies

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This has necessitated the development of new international standard motor racing circuits, many of which have merged built form with art to create iconic developments.

Many of these new motor racing circuits have involved grand vision and large capital development costs, whilst others have been more functional and involved more modest budgets.

Traditional motor sport nations such as Australia have been left behind, with few new permanent motor racing circuits constructed over the past 20 years.

Those few permanent motor racing circuits that have been constructed in Australia have been developed to national standards, and are not suitable for the conduct of international events.

As a result, it is likely there will come a time when new motor racing circuits in the Middle East and Asia emerge as competitors for Australia but if Australia has continued to grow its motorsport industry that competition should prove beneficial.

Australia will have to “compete” to retain existing motorsport events, or to secure new motorsport events.

In order to compete, Australia will require a combination of new international standard motor racing circuits (preferably in desirable locations), the ability to pay increasingly higher event sanction fees, and to consider changes in race event times.

The Australian motorsport industry needs to focus on developing a long term future, with a permanent international standard motor racing circuit and support infrastructure forming the basis for a viable export industry.

Introduction

The Queensland motorsport industry has a long history of developing world class competitors and events, despite the limited investment in quality motorsport infrastructure.

The economic impact of the motor sport industry in Queensland, however, is significant. It is estimated that the motorsport industry has an annual turnover of $320 million, employs approx 3,500 people, and has an estimated $430 million invested in motorsport infrastructure and competition cars and motorcycles.

It is estimated that one quarter of all Queenslanders have attended a motorsport event in the past year, either as a competitor, pit crew, race official, or as a spectator.

Despite the significance of the motorsport industry to the State's economy, and its potential for high technology transfer and development, it does not appear that a detailed study of the sport or the development of policy initiatives been conducted to date.

This Report has been developed to provide an overview of the Queensland motorsport industry as it exists in 2012.

This Report does not attempt, however, to incorporate aspects and impacts of the proposed IMETT motorsport development.

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1 Overview – Queensland Motorsport

1.1 History of Motorsport in Queensland

The first recorded motorsport event in Queensland was conducted at the Brisbane Cricket Ground between motorcycles on 10th September 1904.

Motorcycle racing quickly developed as the dominant form of motorsport during the early years, particularly speedway racing, with speedways being established across Queensland.

A hillclimb event was conducted at Mount Coot-tha in May 1916 however the Queensland Police subsequently implemented a ban on motor racing events on public roads that continued through to the 1950's.

The end of World War 2 provided some relief for motor racing enthusiasts in Queensland when a number of former war time airstrips were made available for motor racing.

The former RAAF Airfield at Lowood commenced operations as Queensland's first permanent motor racing circuit in 1948, followed by the former RAAF Airfield at Leyburn which hosted the Australian Grand Prix in 1949.

The Australian Grand Prix was then hosted at a street circuit at Southport in 1954, and the following year the Australian Motorcycle Grand Prix was hosted on the same street circuit.

Queensland's first purpose built motor racing circuit opened at Lakeside in 1961, and in 1966 the Surfers Paradise International motor racing circuit was opened by Keith Williams. This latter facility also included a drag racing strip.

Willowbank Raceway opened in 1985, whilst Queensland Raceway opened in 1999.

The most significant motorsport events included the following:

1954	Australian Grand Prix conducted on a temporary street circuit at Southport.
1955	Australian Motorcycle Grand Prix conducted on a temporary street circuit at Southport.
1966	Surfers Paradise International Raceway motor racing circuit opened.
1968	Surfers Paradise Raceway hosted a round of the Tasman International Series for the first time. Featuring international Formula One Grand Prix drivers, rounds were conducted on an annual basis until 1975.

1969	Surfers Paradise International Raceway included drag racing and introduced the first Concours d'Elegance as part of the Speedweek motorsport festival.
1971	Surfers Paradise International Raceway land was sold although the Raceway continued operations.
1975	Australian Grand Prix was conducted at the Surfers Paradise International Raceway.
1975	Final event of the Tasman International Series.
1987	Surfers Paradise International Raceway closed.
1991	Inaugural Gold Coast Indy 300 event featuring the US based IndyCars was conducted on the streets of the Gold Coast – spectator attendance in excess of 150,000 over three days.
2008	Final Gold Coast Indy 300 event featuring IndyCars – spectator attendance of approx 300,000 over four days.
2009	Combined V8 Supercars and A1 Grand prix event – A1 Grand Prix teams failed to arrive, and V8 Supercars expanded their programme of events to fill the void.
2010	Inaugural Gold Coast 600 V8 Supercar event conducted on the streets of the Gold Coast.

1.2 Motorsport Tourism

Motorsport event tourism has been an essential part of the Gold Coast tourism industry since the 1950's, representing one of the earlier forms of events based tourism for the Gold Coast.

The Tasman International Series brought international motorsport events to the Gold Coast for the first time in 1968, and the IndyCar Series events that commenced in 1991 established the street race carnival as the Gold Coast's largest spectator event with crowds in regularly in excess of 300,000 people each year between 2003 and 2007.

Motorsport tourism now attracts visitors from around the world to Queensland, with major events at the Gold Coast, Ipswich, Townsville and the Sunshine Coast.

More importantly, motorsport tourism also includes visitors who do not travel at event times, but who visit attractions as diverse as the WRX Experience, V8 Rush - The Off Road Experience, the Dick Johnson Racing race team facility, the Holden Performance Driving Centre, and the Peter Brock Museum.

1.3 Queensland – The Home of Motorsport Champions

Queensland has produced many international motorsport champions over the years, whilst others have relocated to Queensland.

These riders and drivers provide inspiration, as well as mentoring, to emerging riders and drivers in Queensland, enabling a new generation to learn from their heroes. These champions currently include the following:

Name	Principal Achievement	Link with Queensland
Sir Jack Brabham	World Formula One Drivers Champion 1959, 1960 & 1966 World Formula One Manufacturers Champion 1966 1967	Gold Coast resident
Geoff Brabham	Le Mans Winner 1993	Gold Coast resident
Mick Doohan	World 500cc Motorcycle Champion 1994, 1995, 1996, 1997, 1998	Gold Coast born resident
Casey Stoner	World MotoGP Champion 2007 2011	Gold Coast born and raised
Chris Vermeulen	World Supersport Champion 2003	Sunshine Coast born and raised
Kork Ballington	World 250cc Motorcycle Champion 1978, 1979 World 350cc Motorcycle Champion 1978, 1979	Brisbane resident
Jason Crump	World Speedway Champion 2004, 2006, 2009	Gold Coast resident
Ivan Mauger	World Speedway Champion 1968, 1969, 1970, 1972, 1977, 1979	Gold Coast resident
Troy Bayliss	World Superbike Champion 2001, 2006, 2008	Gold Coast resident
Chris Atkinson	World Rally Championship driver	Gold Coast born and raised
Scott Dixon	Indianapolis 500 Winner 2008 Indy Car Series Champion 2003, 2008	Gold Coast born
Alan Jones	World Formula One Drivers Champion 1980	Gold Coast resident
Scott Christopher & Trent Koppe	World Speedway Sidecar Gold Cup Winners 2006	Townsville born and raised
Darcy Ward	World Speedway Under 21 Champion 2009, 2010	Gold Coast born and raised
Will Power	Indy Car Series driver	Toowoomba born and raised

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2 Queensland Motorsport Industry

Whilst the Queensland motorsport industry is dominated by infrastructure and events in South East Queensland, the industry is diversified with infrastructure and events conducted statewide.

It is a sport that has many segments, including circuit racing for cars and bikes, drag racing for cars and bikes, speedway racing for cars and bikes, hillclimbs for cars, off road racing for cars and bikes, rallying for cars, motocross racing for bikes, and karting.

The support industry for motor sport in Queensland is also substantial. Some V8 Supercar teams manufacture race cars for their own use as well as for other customer race teams, whilst there is some small scale manufacturing for the speedway segment.

Specialist operators have developed Small to Medium Enterprises (SME) with either dedicated motorsport or significant motorsport focus, providing services such as race track engineering, race engine construction, component supply, race tyre supply, specialist suspension and drive train services, dyno tuning, race clothing, motorsport merchandising, motorsport public relations, and race experience or driver training opportunities.

2.1 Major Motorsport Infrastructure in Queensland

The major motorsport infrastructure in South East Queensland is summarised as following:

Facility	Location	Infrastructure	Business	Other
Queensland Raceway	Ipswich	National level motor racing circuit 3.1 kms in length and approx 9 m in track width limited spectator infrastructure	generally events conducted for competitors, and not promoting spectator participation	Minimal maintenance or upgrade in facilities over past decade Track re-surfaced in 2012 Track fencing upgraded following an accident involving a race car crashing into the crowd during a V8 Supercar race meeting in May 2010
Lakeside Raceway	Lakeside	State level motor racing circuit 2.41 kms in length and approx 8 m in track width limited spectator infrastructure	generally events conducted for competitors, and not promoting spectator participation	Historic circuit recently re-opened after a period of no racing activity

Facility	Location	Infrastructure	Business	Other
Morgan Park Raceway	Warwick	National level motor racing circuit 3.0 kms in length and approx 8 m in track width limited spectator infrastructure	generally events conducted for competitors, and not promoting spectator participation	Track substantially expanded over recent years
Willowbank Raceway	Ipswich	National level drag strip ¼ mile in length broad range of spectator facilities	generally events conducted for competitors, as well as targeting paid spectators with well promoted major events	One of three major drag strips in Australia – club developed facility unlike the newer state developed facilities in WA and NSW
Brisbane International Speedway	Archerfield	National level speedway 400 m range of spectator facilities	generally events conducted for competitors, as well as targeting paid spectators with well promoted major events	Under pressure from residential neighbours, located on a small site in an industrial area
North Brisbane Speedway	Nudgee	State level speedway 320m range of spectator facilities	generally events conducted for competitors, as well as targeting paid spectators with major events	Located on a large site alongside the motorway – club based structure with progressive development
Mount Cotton Hillclimb	Mount Cotton	National level hillclimb 946m bitumen sealed course Range of spectator facilities	generally events conducted for competitors, and not targeting paid spectators	Club based structure

The majority of motorsport infrastructure in Queensland was developed between the 1960's and 1980's, and was generally located in remote areas where land was inexpensive to buy. The broad acre, open space style of these facilities did not need to address noise considerations.

Subsequent population growth has meant an expansion of the residential areas in the South East Queensland region and, as a result, a number of these established facilities are no longer remote but now have residential neighbours. From time to time, this has resulted in a conflict of expectations.

This motorsport infrastructure also reflects the style of competitor and spectator facilities appropriate to the time, and is better suited to state and lesser national events.

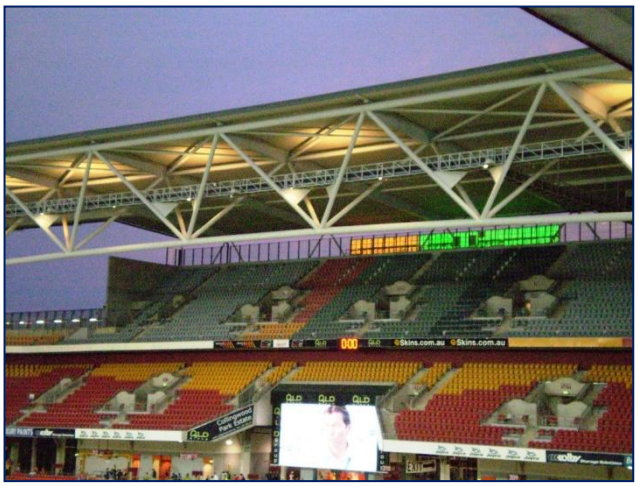
They do not provide appropriate facilities, however, for international and major national events, where safety requirements and spectator facilities need to be of a higher standard.

Regrettably, Queensland's motorsport infrastructure has not kept pace with the higher standard of facilities developed by other sports, such as football (all codes).

Much of the newer and major sporting infrastructure for ball sports in Australia has been developed by various state and local governments but, surprisingly, those same state and local governments have invested in major motorsport events on temporary street circuits that offer no long term benefits to the motorsport industry.

If that same approach had been taken with other sports for example, there would not have been the government investment in Suncorp Stadium in Brisbane, the development of Skilled Park on the Gold Coast, the upgrade of the MCG and the development of the National Tennis Centre and AAMI Stadium in Melbourne, the upgrade of Adelaide Oval in Adelaide, the development of AK Reserve in Perth, or the development of ANZ Stadium in Sydney.

With club based structures, or SME ownership/management of motor sport facilities, it has proven difficult to finance major upgrades of existing motorsport infrastructure or to develop new infrastructure.



Accordingly, Queensland's permanent motor sport infrastructure is no longer capable of attracting international events, and can only conduct national events with some limitations.

2.2 Major Motorsport Events in Queensland

There are a number of major motorsport events conducted in Queensland on an annual basis. These include the following:

Gold Coast 600

The Gold Coast 600 is the re-incarnation of the event formerly known as the Gold Coast Indy. The Gold Coast Indy event commenced in 1991 and was based on a round of the US based Indy Car Series that was conducted on the streets of Surfers Paradise.

The event brought an international flavour to the Gold Coast, along with the excitement of high powered open wheeler race cars. The event grew quickly and, at its peak, attracted in excess of 300,000 people to the Gold Coast for the 4 day racing carnival.

Following a split in the Indy Car Series competition, the event slowly lost its influence along with many of its best drivers and teams.

V8 Supercars, who were a support category on the race event programme, progressively assumed equal billing for the race carnival, and outright billing as the lead category following the departure of the Indy Car Series at the end of 2008.

The reputation of the Gold Coast Indy event was then tarnished by the non appearance of the A1GP Series at the 2009 event. A1GP, who were an emerging international open wheel series, were contracted to replace

the departing Indy Car Series but failed to arrive as contracted, leaving the event organisers with little time to make alternative arrangements.

The Queensland Government subsequently negotiated with V8 Supercars to assume management of the event, and V8 Supercars have re-positioned the event as a family friendly event based around V8 Supercars, but with an experimental international co-driver concept.

The 2011 event attracted 181,486 spectators, and the new format is developing a following.

The event is promoted by V8 Supercars Events and is partially funded by the Queensland Government.

International Rally of Queensland

The Rally Queensland event was elevated to a round of the Asia Pacific Rally Championships in 2008.

Now known as the International Rally of Queensland, the event is based at Caloundra and is conducted over a 3 day period in the forest country of the Sunshine Coast.

Whilst recognised by the FIA as a major international event, it has limited appeal for spectators and generates delayed television coverage.

The event is promoted by the Brisbane Sporting Car Club and is partially funded by the Queensland Government.

Townsville 400

The Townsville 400 is a relatively new event, first conducted in 2009.

It involves a V8 Supercar event conducted over a three day period on a temporary street circuit in Townsville.

The 2010 event attracted 152,074 spectators, and proved to be an outstanding success, although the 2011 event saw a substantial reduction in the number of spectators to the extent the final count was withheld.

The event is promoted by V8 Supercars Australia and is partially funded by the Queensland Government.

Winternationals

The Winternationals is a long standing drag racing event conducted over 4 days at the Willowbank Raceway.

It forms part of the ANDRA National Championship Series, and attracted 39,000 spectators in 2010.

The event is promoted by Willowbank Raceway.

World Series Sprintcars

The Queensland Round of the World Series Sprintcars is conducted at the Brisbane International Speedway at Archerfield, and is the premier speedway event of the year.

This event is promoted by Brisbane International Speedway.

Leyburn Sprints

The Leyburn Sprints is an annual commemoration of the Australian Grand Prix conducted at Leyburn in 1949. This event has been conducted since 1999, and attracts some 10,000 people to Leyburn (population 250) each year.

This event is promoted by the Leyburn community and is partially funded by the Queensland Government.

Australian Superbike Championships

The Australian Superbike Championships are conducted at Queensland Raceway each year. This event attracts some 4,000 people each year.

This event is promoted by the International Entertainment Group.

2.3 Major Motorsport Industry Organisations in Queensland

The following organisations represent a small example of Queensland businesses that are largely focussed on the motorsport industry, and demonstrating the diversity of segments within the industry.

Category	Organisation	Location
Administration	Motorcycling Queensland	Ipswich
Administration	CAMS	Milton
Category management	V8 Supercars Australia	Gold Coast
Category management	V8 Utes Racing	Gold Coast
Category management	Keltic Motorsport	Yatala
Event management	Brisbane Sporting Car Club	West End
Event management	Yeehah Events	Gold Coast
Motorsport facility management	Queensland Raceways	Ipswich
Motorsport facility management	Warwick District Sporting Car Club	Warwick
Motorsport facility management	Willowbank Raceway	Ipswich
Race team	Team Vodafone	Banyo
Race team	Stone Brothers Racing	Yatala
Race team	Dick Johnson Racing	Yatala
Race team	Tekno Autosport	Yatala
Race team	Triple F Racing	Yatala
Race team	JR Racing	Yatala
Race team	VIP Pet Foods Racing	Ormeau
Race team	Victor Bray Racing	Kallangur
Race team	Stuart Bishop Racing	Brisbane
Motorsport services	BAM Media	Gold Coast
Motorsport services	BAM Travel	Gold Coast
Motorsport services	Chris Nixon	Gold Coast
Motorsport services	Integrated Event Delivery Management	Gold Coast
Merchandising	R3 Race Rally Road	Oxenford
Race services	Performance Management	Gold Coast
Race services	Pace Innovations	Gold Coast
Race experience	V8 Rush Off Road Experience	Norwell
Race experience	WRX Experience	Pimpama
Driver training	Performance Driving Centre	Norwell
Motorsport manufacturing	PWR Performance Products	Ormeau
Motorsport manufacturing	Ian Boettcher Race Parts	Ipswich
Motorsport manufacturing	Sewell Racing Frames	Lower Wonga
Motorsport museum	Peter Brock Experience	Yeppoon

2.4 Queensland is Under Represented in Australian Motorsport

Perhaps surprisingly, Queensland is under represented in Australian motorsport.

Despite having a wealth of world class motorsport champions over a long period of time, and being home to V8 Supercars and a number of V8 Supercar teams, there are very few areas where Queensland motorsport is a leader.

- Motorcycling Queensland is the only motorsport administration group based in Queensland.
- Very few motorsport category managers are based in Queensland.
- There are no motorsport print media publications based in Queensland.
- Other than V8 Supercars Television, there are no motorsport television or radio broadcast production companies based in Queensland.
- None of the big four international motorsport events hosted in Australia are conducted in Queensland.
- Queensland does not have a international standard permanent motor racing facility.
- Only one nationally recognised motorsport museum in Queensland.
- Does not have a motorsport education facility based in Queensland.

2.5 V8 Supercars

V8 Supercars is the management group for the leading motorsport category (V8 Supercars) in Australia.

V8 Supercars was established in 1997 to take the long standing Australian Touring Car Championship Series and provide it with a commercial base that would be sustainable into the future.

At the time of its establishment, few of the race teams and drivers were full time professionals.

V8 Supercars is owned by Archer Capital (60%) and the race teams (40%), with Archer Capital managing the operation.

V8 Supercars not only represents the race series which was its original purpose, but has evolved into race event promotion, as well as race event television production.

The V8 Supercar Series is based on the two major domestic car manufacturers, Ford and Holden, although recent changes have encouraged Nissan to join the series from 2013 under the Car of the Future programme.

Under the V8 Supercar business model, the marquee race events have evolved from car races conducted at permanent local motor racing circuits to entertainment events based on V8 Supercar races conducted on temporary street circuits. These are generally underwritten by State and local governments.

Around half of the events are still conducted on local motor racing circuits in Australia, but recent expansion of the series has been in the international arena.

Destinations have included New Zealand, China (discontinued), Bahrain (discontinued) and Abu Dhabi, with the USA as the next destination in 2013. These international events are generally conducted in modern Formula 1 motor racing circuits (with the exception of New Zealand which is returning to Pukekohe after 5 years on a temporary street circuit at Hamilton).

The international events are generally characterised by small spectator attendances but are underwritten by large event sanction fees paid by the event/circuit promoter.

The Clipsal 500 V8 Supercar street race in Adelaide attracts almost 300,000 spectators over a four day period each year, and represents the largest single domestic motorsport event in Australia, and is one of the larger motorsport events in the world.

In addition, the majority of V8 Supercar events are now promoted by the V8 Supercar event division. V8 Supercar promoted marquee events include the Gold Coast 600, Sydney 500, Townsville 400 and the Bathurst 1000.

Just over half of V8 Supercar teams are located in Victoria, with the remainder based in South East Queensland.

The V8 Supercar Series is generally recognised as being one of the world's leading touring car series.

3 Motorsport Technology and Industry

3.1 The Motorsport Cluster at Yatala

Whilst motorsport businesses are evenly distributed across the region, a significant motorsport cluster has emerged at Yatala, largely based around a number of V8 Supercar teams. The motorsport cluster comprises race teams, component suppliers, service providers, and high technology support.

The majority of these businesses are SME businesses, generally privately owned and employing a dedicated team of highly trained professionals. They are highly regarded, often work to tight deadlines, are innovative, and enjoy an ability to transfer their skills and experience to a range of industry sectors, particularly the aviation and marine industries.

From their Yatala base, these businesses support race events all over Australia, as well as at selected events internationally.

The nearest location for testing of race cars and bikes is Queensland Raceway, to the west of Ipswich. To conduct race testing, teams must load their race cars and bikes into their race transporters. Together, the race teams, their race drivers, race technicians and pit crews may number some 300 people travelling a round trip journey in excess of 150kms just to test race cars and bikes.

The missing element necessary to complete a “motorsport cluster” at the Yatala Enterprise Area is an appropriate international standard motor racing circuit, and test venue.

A Formula One standard motor racing circuit was proposed for the former Bullens Lion Park site at Yatala after it closed in 1988 but did not proceed. The Darlington Park Raceway was constructed in Peachey Road in 2000, but was never licensed as a motor racing circuit and closed in 2008.

The IMETT Project is, therefore, the third proposal for a motor racing circuit in the Yatala region.

To date, motorsport has not been identified by the Gold Coast City Council as a significant industry in the Gold Coast region, nor is it listed as a targeted industry for the Yatala Enterprise Area.

3.2 Motorsport Education in Australia

Access to education is a critical requirement for industries operating in a high technology segment, including the motorsport industry.

In Australia, motorsport education is a niche market with a limited number of service providers. These include Edith Cowan University in Perth (WA), West Coast TAFE in Perth (WA), Wodonga TAFE in Wodonga (Vic), Bathurst TAFE (NSW), and Kangan Batman TAFE in Coburg (Vic). Warwick TAFE in Warwick (Qld) previously offered a TAFE motorsport programme but the programme was discontinued in mid-2010.

The majority of motorsport education programmes in Australia are TAFE based, although a number of Universities particpate in the Formula SAE motorsport programme.

Most motorsport education programmes in Australia involve small numbers of students presently but this niche market is still important to the Australian motorsport industry. The market for motorsport education will mature but education providers must be prepared to work with industry to ensure the development of relevant curriculum content.

It should be noted that, following the closure of the TAFE motorsport programme at Warwick TAFE, Queensland no longer has a local motorsport education programme. Queensland students are now completing their motorsport education programmes interstate.

There is a need, however, for specialised undergraduate programmes to be developed for Australian conditions.

3.3 Motorsport as a Catalyst for Change - The Queensland Opportunity

Queensland has strong and diverse aerospace, marine and motorsport industry. The first two have developed over the past decade as a result of Queensland Government policy, and with the support of the Gold Coast City Council (marine) and the Ipswich City Council (aerospace).

The motorsport industry has developed despite a lack of State Government policy, or support from the local government sector. It has developed a base level of motorsport infrastructure, and has high quality leadership provided by organisations such as V8 Supercars Australia.

The motorsport industry technicians are of a world class standard, and there is considerable scope for the industry to develop a niche role in providing motorsport export services to the Asia Pacific region, and beyond.

More importantly, the motorsport industry could provide the critical mass to develop a common high technology base that would serve not only the motorsport industry, but also the emerging aerospace and marine industries in South East Queensland.

A Summary of the Aerospace, Marine and Motorsport Industries in Queensland

Area	Aerospace	Marine	Motorsport
Employees and Economic Impact	16,500 as at 2007 Industry contributed $6 billion to the Queensland economy	4,500 as at 2008 Industry contributed $657 million to the local economy Exported boats valued at $500 million to 30 countries by 2008 30 boat builders producing over 65% of all boats built in Australia 25% of all Gold Coast exports were marine related	3,500 as at 2009 Estimated annual turnover of $320 million across Queensland in 2009 Estimated $430 million invested in motorsport infrastructure , and competition cars and motorcycles
Businesses Industrial areas	900 Amberley Aerospace Park (170 ha) adjacent to the Amberley RAAF Base Da Vinci aviation training and education precinct ($150 million - 44 ha) at Brisbane Airport Archerfield Airport	400 businesses by 2007 Coomera Marine Precinct (250 ha) established since 2001 involving an investment of $200 million $530 million (64 ha) expansion programme for the Coomera Marine Precinct announced in 2010 Steiglitz Marine Precinct, with future expansion planned	600 businesses by 2009 No official motorsport industrial precinct although many race teams, service providers and industry suppliers are based at, or adjacent to, the Yatala Enterprise Area

Area	Aerospace	Marine	Motorsport
Education	Aerospace Gateway Programme – a partnership between Education Queensland, Boeing Australia and Aviation Australia Several high schools and universities offering specialist aviation and engineering courses Syllabus approved for trial in nine schools in 2006	A specialised TAFE marine training college was established at the Coomera Marine Precinct in 2008 – with places for 200 students and apprentices	Specialised TAFE Motorsport programme at Warwick TAFE closed in June 2010
Specialist activities	Unmanned Aerial Vehicles (UAVs)	Boat construction and services	V8 Supercars administration
State Policy	The Queensland Government supports the development of Queensland as a major Aviation and Aerospace Hub for the Asia-Pacific region Queensland Aviation Strategy commenced in 2002		
Strengths	Centre for Australia's aerospace industry Centre for Australia's rotary wing industry Centre for Australia's aviation training industry Emerging centre for Australia's general aviation industry Budding hub for research and development of emerging aviation technologies	Sanctuary Cove International Boat Show – an annual event that attracts over 400 exhibitors, 15,000 m2 of display area, more than 100 boats on the water, and 50,000 visitors from USA, New Zealand, China, Taiwan, Korea, Malaysia, Jordan, Turkey and Italy	V8 Supercars Head Office administration and race team base for four teams Diverse motorsport industry base including infrastructure Statewide involvement, with an estimated one in three people in Queensland having attended a motorsport event in 2009, either as a competitor or as a spectator
Council Policy	Not applicable	Gold Coast City Council appointed a senior full-time marine industry liaison officer to its Department of Economic Development to assist companies to relocate to the marine precinct	

3.4 Motorsport Export Opportunities

A nation is deemed to be wealthy when it is able to compete in highly productive industries. To be relatively prosperous, a society must also be able to create "competitive" advantages by increasing its productive capability in desirable sectors eg those with growth prospects where value added is likely to be large in relation to the resources employed.

Economic development raises the productivity of companies, creates economic growth by increasing the value of given inputs, and increases competitiveness.

Globalised markets now provide investors with a wide choice of locations, however supporting networks can attract global businesses to locate whilst providing "home grown" businesses to prosper.

Motorsport is widely acknowledged as being a high technology industry offering well paid employment. In 2007, the authors of the book "Motorsport Going Global" estimated the car based global motorsport industry had:

- an economic impact of £50 billion, representing some 0.23% of global GDP.
- a stock of more than 600 permanent paved motor racing circuits, excluding kart tracks.
- more than one million official racing licence holders.
- 56 global motorsport events.

Based on 2005 inputs, the major motorsport nations were ranked as following:

Ranking	Country	Economic Impact
1	USA	£13.00b
2	UK	£6.00b
3	Japan	£4.00b
4	Germany	£3.00b
5	Italy	£2.00b
6	France	£1.50b
7	Australia	£1.50b
8	Spain	£1.00b
9	Brazil/Argentina	£1.00b
10	Mexico	£0.50b
11	South Africa	£0.50b
12	Malaysia	£0.30b
13	Gulf Region	£0.30b
14	Turkey	£0.30b
15	China	£0.25b
16	Czech Republic	£0.20b

Notes:

- These rankings only relate to all forms of car based motorsport.
- Motorcycle based motorsport is additional, and may change the rankings and will change the economic impacts.

Australia is already recognised as an innovative and successful motorsport nation, and in 2007 was ranked seventh in the world.

Supporting networks, such as a properly resourced motorsport cluster, can create new motorsport export opportunities for Australian businesses.

Queensland has a number of major motorsport organisations based in the state that provide the basis for the development of a major industry with export capabilities. Many of these have located their businesses on the Gold Coast, or in Ipswich.

The development of a new international standard, permanent motor racing circuit by IMETT would provide a substantial incentive for international motorsport businesses to consider expanding their operations to include a representative facility in Queensland. This would also include an element of technology transfer.

3.5 Government Policy

Queensland State Government

The Queensland State Government currently invests some $10 million in motorsport events that are conducted in temporary facilities, down from approx $15 million in 2009.

Regrettably, this has no lasting infrastructure for the motorsport industry.

The Queensland State Government does not have an industry policy for the motorsport industry, unlike the emerging aerospace and marine industries where the government has developed comprehensive industry policies over the past decade.

The motorsport industry shares many skills and technologies with the aerospace and marine industries, and the Queensland State Government could maximise its opportunities with a carefully developed motorsport industry policy.

Gold Coast City Council

The Gold Coast City Council has provided some financial and practical support to the Gold Coast Indy/Gold Coast 600 V8 Supercar event conducted on the streets of Surfers Paradise.

Whilst acknowledging the presence of the V8 Supercars Australia World Headquarters, and a number of V8 Supercar race teams based at Yatala, the Gold Coast City Council has not identifed the motorsport industry amongst its list of 10 business sectors for policy and support by BusinessGC, the economic development unit of the Gold Coast City Council.

The Yatala Enterprise Area is also promoted by BusinessGC but, despite the fact that a number of high profile V8 Supercar race teams and a substantial number of motorsport service providers are located at the Yatala Enterprise Area, BusinessGC does not recognise motorsport as a target category for business attraction for the industrial precinct. BusinessGC's development focus for the Yatala Enterprise Area is on advanced manufacturing, transport and distribution, warehousing, food processing, building and construction, and wholesale trade.

This lack of support for the motorsport industry sits in contrast with the very active role the Gold Coast City Council played in the development of the marine industry on the Gold Coast over the past decade.

4 Regional International Motorsport

4.1 Regional International Standard Motor Racing Circuits

The emerging nations in Asia and the Middle East have recognised the significance of motorsport as a means of developing industry and tourism as part of their national economies.

This has necessitated the development of new international standard motor racing circuits, many of which have merged built form with art to create iconic developments.

Many of these new motor racing circuits have involved grand vision and large capital development costs, whilst others have been more functional and involved more modest budgets.

Motor Racing Circuit	Country	Opening Year
Zhuhai Circuit	China	1996
Sepang International Circuit	Malaysia	1999
Losail Circuit	Qatar	2004
Bahrain International Circuit	Bahrain	2004
Shanghai International Circuit	China	2004
Fuji Speedway (upgrade)	Japan	2005
Marina Bay Street Circuit	Singapore	2008
Yas Marina Circuit	Abu Dhabi	2009
Lippo Karawaci Street Circuit	Indonesia	2009
Suzuka Circuit (upgrade)	Japan	2009
Hampton Downs Circuit	New Zealand	2009
Yeongam Street Circuit	South Korea	2010
Buddh International Circuit	India	2011

4.2 Regional International Motorsport Events

Modern international motor racing circuits can only be justified through the promotion of major motorsport events, with emerging nations in the Middle East and Asia signing long term contracts over the past decade to promote major motorsport events, often involving the payment of a significant sanction fee.

To provide scope to negotiate new event contracts with these new generation motor racing circuits, motorsport series organisers have had to increase the number of major events conducted each year, as well as review and relocate underperforming traditional events.

Many of those relocated events had been in traditional European countries where there was a lesser ability to fund the larger sanction fees arising from increased competition for events.

In addition, many of the traditional European circuits did not have the resources to upgrade existing facilities to the standard being offered by the newer circuits in the Middle East and Asia.

Major motorsport events created through expansion, or freed up by relocation, have generally been allocated to the new motor racing circuits in the Middle East and Asia.

From an Australian point of view, the area of interest for regional international motorsport events spans the arc from South Africa, to the Middle East, India, Asia, and New Zealand, and many of the expansion or reallocated major motorsport events have been made available to motor racing circuits in this area.

This situation has provided both opportunities and threats to Australia however, the opportunities far outweigh the threats.

Opportunities and benefits include the sharing of transport logistics in the conduct of motorsport events, increasing the potential spectator audience, and increasing the demand for motorsport goods and services.

The following regional international events are being conducted either annually or on a bi-annual basis.

Motorsport Event	Motor Racing Circuit and Country	Since
FIA Formula One Grand Prix Japan	Suzuka Circuit, Japan	1976
FIA World Rally Championship New Zealand	New Zealand	1977
FIM MotoGP Japan	Motegi Circuit, Japan	1987
FIA Asia Pacific Rally Championship New Zealand	Whangarei, New Zealand	1988
FIM MotoGP Malaysia	Sepang International Circuit, Malaysia	1991
FIA Asia Pacific Rally Championship China	China	1997
FIM World Superbikes South Africa	Kyalami Circuit, South Africa	1998
FIA Formula One Grand Prix Malaysia	Sepang International Circuit, Malaysia	1999
V8 Supercars New Zealand	Hamilton Street Circuit, New Zealand	2001
FIA Asia Pacific Rally Championship Noumea	New Caledonia, Noumea	2001
FIA Asia Pacific Rally Championship Japan	Hokkaido, Japan	2002
FIA Formula One Grand Prix Bahrain	Bahrain International Circuit, Bahrain	2004
FIA Formula One Grand Prix China	Shanghai International Circuit, China	2004
FIM MotoGP Qatar	Losail International Circuit, Qatar	2004
FIA World Rally Championship Japan	Obihiro, Japan	2004

Motorsport Event	Motor Racing Circuit and Country	Since
V8 Supercars China	Shanghai International Circuit, China	2005
V8 Supercars Bahrain	Bahrain International Circuit, Bahrain	2006
FIA Formula One Grand Prix Singapore	Marina Bay Street Circuit, Singapore	2008
FIA World Rally Championship Jordan	Jordan	2008
FIA Formula One Grand Prix Abu Dhabi	Yas Marina Circuit, Abu Dhabi	2009
FIA Formula One Grand Prix Korea	Yeongam Street Circuit, South Korea	2010
V8 Supercars Abu Dhabi	Yas Marina Circuit, Abu Dhabi	2010
FIA Formula One Grand Prix India	Buddh International Circuit, India	2011
FIM World Speedway Grand Prix	Western Springs Speedway, New Zealand	2012

Notes:
1. Not all events have been continuous
2. Not all events have been conducted at the same venue
3. Some events have been discontinued

4.3 Competition from Regional International Motor Racing Circuits

New international standard motor racing circuits have been constructed in Asia and the Middle East over recent years and these have set a high standard for the rest of the world.

Traditional motor sport nations such as Australia have been left behind, with few new permanent motor racing circuits constructed over the past 20 years. Those permanent motor racing circuits that have been constructed in Australia have focussed on national standards, and are not suitable for the conduct of international events.

As the demand from emerging regional international countries for major international motorsport events mature, it is understandable that motorsport series organisers will seek to maximise their opportunities by having the owner/promoters of regional international motor racing circuits compete for event contract rights.

As a result, it is likely there will come a time when new motor racing circuits in the Middle East and Asia emerge as competitors for Australia however, if Australia has continued to grow its motorsport industry, that competition should prove beneficial.

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5 Summary

Queensland has a long and proud history of motorsport on the world stage.

The economic impact of the motor sport industry in Queensland is significant. It is estimated that the motorsport industry has an annual turnover of $320 million, employs approx 3,500 people, and has an estimated $430 million invested in motorsport infrastructure and competition cars and motorcycles.

Motorsport has also been the catalyst for motorsport tourism, as well as encouraging the development of higher technology capability.

The existing motorsport infrastructure does not provide appropriate facilities, however, for international and major national events, where safety requirements and spectator facilities need to be of a higher standard.

New international standard motor racing circuits have been constructed in Asia and the Middle East over recent years, setting a high standard for the rest of the world.

Traditional motor sport nations such as Australia have been left behind, with few new permanent motor racing circuits being constructed in Australia over the past 20 years.

Those permanent motor racing circuits that have been constructed in Australia have only been developed to national standards, and are not suitable for the conduct of international events.

As the demand for major international events grows, it is understandable that motorsport series organisers will seek to maximise their opportunities.

Australia will have to compete to retain existing motorsport events, or to secure new motorsport events.

In order to compete, Australia will require a combination of new international standard motor racing circuits (preferably in desirable locations), the ability to pay increasingly higher event sanction fees, and to consider changes in race event times.

It is now critical for the Australian motorsport industry to develop a long term strategy to ensure the industry can continue to compete at a level that is commensurate with its standing as the seventh ranked nation in world motorsport.

In addition, a modern and permanent international standard motor racing circuit needs to be constructed, one that will form the centrepiece of a vibrant motorsport industry.

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Attachment A

Motorsport is a Catalyst for Innovation – The UK Experience

> **"*Over the past 60 years the motorsport industry has witnessed many radical changes in the design and construction of racing cars including mid-engine layout, composite materials and new aerodynamic features. These have resulted from the motorsport companies constant drive to improve existing products, solve technical challenges and explore new ideas in an industry characterised by a high degree of sophistication and complexity.'***

Source: AIM Research "Racing for Radical Innovation" Rick Delbridge & Francesca Mariotti 2009

Technology Overlap – Motorsport, Aerospace and Marine

The modern Motorsport, Aerospace and Marine industries share many similarities.

Designs are all about improving aerodynamic shape, wings to improve or reduce lift, the use of exotic materials in construction, and the use of specialised equipment in the test and manufacture process. This may include the use of wind tunnels, autoclaves and high capacity computer programmes.

The United Kingdom is a world leader in motorsport, and is second only to the USA in aerospace.

The motorsport industry is a significant part of the UK economy. According to industry estimates approximately 4,500 companies are involved in the UK Motorsport and Performance Engineering Industry and its wide-ranging support activities. The industry has an annual turnover of 6.0 billion pounds, and contributes 3.6 billion pounds worth of exports.

The Motorsport Industry Association has estimated that the support side of the sector alone – involving events management, public relations, marketing, sponsorship and a host of other support functions – accounts for approximately 1.7 billion pounds of the yearly industry total. And in terms of employment, UK Motorsport supports 38,500 full time and part time jobs, including 25,000 engineers.

The motorsport sector's influence and significance extends beyond its scale. Motorsports and performance engineering also has a significant place in the UK as a best practice example of how creativity, engineering, manufacturing and support services, can be combined to produce world class innovations.

The motorsport sector in general, and the Motorsport Valley in particular, have long been regarded as a beacon of the UK's creativity, engineering and innovation capabilities.

Average R & D spend in UK motorsport is 30% of sales turnover – a commitment to R & D which dwarfs those of the UK Pharmaceutical, IT and automotive industries.

The motorsport industry produces cutting-edge technological solutions which are increasingly utilised by many sectors outside motorsport – Defence, Aerospace, Marine, Medical and Automotive.

Motorsport companies have a problem-solving capability, working within unique time parameters offering a real-time laboratory in which innovative solutions are found and rapidly developed. By example, the industry is currently delivering Urgent Operational Requirements (UOR's) in Defence; reducing the weight of airliners and other aerospace applications through the advanced use of composite parts; and introduced new gearbox and jointing technologies to the Marine market.

Motorsport is the UK's NASA when it comes to inspiring young people to pursue careers in engineering. Their interest in, and passion for, the excitement of motorsport, provides a real-life modern context to science, technology, engineering and maths (STEM) subjects.

Currently, 28 Universities and 140 Further Education colleges and hundreds of schools now offer "motorsport engineering" courses or content – meaning that many thousands of young people are involved in motorsport related engineering education programmes each year.

The popularity of motorsport-related College and University courses has led to further and higher education institutions using the powerful brand of "Motorsport" as a marketing tool.

Since 2000, the British Government has worked with the UK Motorsport Industry to improve the manufacturing and operational performance of the UK Aerospace, Marine and Defence industries to gain a technology edge over their competition, and to assist British troops in the field in Afghanistan and Iraq.

"The UK Department of Trade and Industry (DTI), as it was then, came up with a programme of "harnessing a world-class industry cluster in Motor Sport Valley, to gain general advantage for the UK. The DTI commissioned a report from the MIA (Motorsport Industry Association), (subsequently entitled Cluster Development: Industry Commitment Report) to explore how the "concept of harnessing the power of the world-class high performance engineering and motorsport industry cluster, to gain a competitive advantage for the UK as a whole could be implemented. The MIA Report concluded that this concept:

"Moves the high performance engineering and motorsport industry from its originally perceived position, as a sub sector of the Automotive

industry, and places it at the centre of a new community of advanced engineering and services industries.

In this position, the high performance engineering and motorsport industry will act as a stimulating business catalyst between the other industries, increasing collaboration, and transferring competitive advantages in high added value, knowledge based development; teamwork; rapid innovation; technology and best practise, across all sectors."

"Full speed ahead: maintaining UK excellence in motorsport and aerospace" Report 2009

House of Commons, Business Innovation and Skills Committee

Motorsport to Defense

In January 2007, the challenge of linking Motorsport to Defence was issued by Lord Drayson (then Minister for Procurement at the Ministry of Defence) and Lord Astor of Hever, Shadow Defence Minister. Fully aware of the advanced engineering skills involved in designing racing vehicles which can attain high levels of performance and reliability over variable terrain whilst enduring extremes of temperature and adverse climatic conditions, both Parliamentarians were convinced of the synergies which exist between the Motorsport and Defence Industries.

Interaction between the two industries has been mutually beneficial since it has enabled the defence sector to utilise a separate set of brains to find novel solutions to its engineering problems whilst granting Motorsport Valley companies to grow their businesses within less seasonally-variable revenue streams. The MIA's Motorsport to Defence initiative has seen motorsport-derived radiators, charge coolers, gearboxes, brakes, suspension components and seals provide real benefit to defence vehicles in the field.

Since 2005 the UK Ministry of Defence has reached out to the country's motorsport industry in an effort to improve the equipment it procures and, in particular to satisfy its urgent operational requirements (UORs).

"Most of the vehicles that we have got in Afghanistan on operations at the moment have actually had some kind of input from the motorsports industry", said Colonel Nick Wills, team leader of the MoD's Defence Equipment & Support Protected Mobility Team.

The crossover of expertise between motorsport and defence often occurs in the development of specialist components and systems. A recent example centred on a contractor who was unable to provide sufficient cooling for electronics systems because the required technical capability was not part of its core business. Col Wills made contact with a motorsport company via the Motorsport Industry Association that was able to devise a solution.

The approach of the motorsport industry is very much in line with the demands of the UORs, which apply tight timescales and require a quick turnaround of proposals and prototypes. The standard way of procuring equipment isn't really cutting it, and so it requires people who think in a slightly different way and then come up with that solution quickly, rapidly prototype it, test it and then come back – and that's the kind of mindset that we really enjoy. In motorsport things happen within weeks.

Jane's Defence Weekly 09 December 2009

Attachment B

London Science Museum Exhibition Demonstrates How the Industry of Motorsport Relates to Our Everyday Lives

Motorsport is about much more than the incredible speeds and the extraordinary human feats that is seen on the racetrack, thrilling as it is. It's about a different kind of thrill, one shared by motor racing professionals, scientists, manufacturers and designers alike. These are people who think up radical new applications for motorsport technology, and test and modify their ideas to come up with innovative products.

In 2009, the Science Museum in London created a temporary exhibition that showcased 20 examples where Formula One technology is impacting on everyday lives, from changing the way hospitals look after patients, the way manufacturers design sports equipment, to maintaining the heating systems in homes.

These examples included:

Formula 1 pedal power

As a racing car speeds around the track, mechanics and engineers receive instant data from sensors paced within the car. This information helps to keep the vehicle operating at maximum performance.

A British company used its knowledge of Formula 1 electronic monitoring systems to create the ultimate training bike for cyclists. Cycling performance could only be accurately monitored on a stationary bike in a laboratory. Since early 2009 it has been possible to record it while out on the road.

As the cyclist rides, information about wheel speed, heart rate, humidity and bike angle is collected and stored ready for detailed examination after the ride. The rider can select the type of information to be collected from a touch screen built into the bike's handlebars.

Checking tyre pressure the Formula 1 way

An incorrectly inflated tyre can mean the difference between winning and losing a race. Formula 1 teams use special monitoring equipment to warn them when tyres are wrongly inflated, as this can affect the safety and performance of the car.

In recent years the technology has been adapted for use in road cars, to reduce the risk of accidents.

Modern car tyres are designed to support the weight of a car for a short period of time after a puncture, and so give little visual clue of a serious problem. Formula 1 tyre pressure monitors fitted to road cars detect the presence of a puncture as soon as the car is switched on, and so alert the driver to the danger before he or she moves off.

Commercial vehicles also benefit from the technology, as low tyre pressure reduces fuel economy and decreases the life of tyres that are purchased by fleets at considerable cost.

Formula 1 goes ballistic

Modern Formula 1 drivers can walk away from high-impact crashes virtually unscathed, thanks to the re-inforced materials and crash structures built into the cars to disperse the energy of a collision. The sturdy shell of the driver's seat also helps by holding the driver securely in place.

Racing cars are made of carbon-composite materials. This material is strong enough to absorb the high impact energy of a bullet or explosion. Troops in Afghanistan and Iraq make use of this material to help reduce serious injuries caused by mine and car-bomb blasts.

Formula 1 engineers have designed a carbon-fibre seat shell for use in lightweight "jeep" style vehicles. This includes a special aluminium honeycomb structure placed beneath the seat that absorbs the energy and reduces 50g blast acceleration to 20g, greatly increasing the chances of surviving an explosion.

High-impact injuries

A Formula 1 car needs to maintain maximum contact with the racetrack in order to achieve top speed. To stop the car bouncing off uneven surfaces, special devices known as hydraulic dampers, are used to absorb the energy of bumps and so keep the car on the road.

Formula 1 engineers have now found a way to use this technology in a special lightweight leg support to help reduce damage and injuries to the knee.

The brace has been tested on US marines, who regularly get injured while standing in fast-moving inflatable boats. As the boats hit the water, the marines' knees absorb the impact – an experience similar to jumping off a 2.5 metre wall every few seconds. The brace helps control the bending of

the knee and realigns the leg before the next impact. It also has potential to help in the healing of knees after surgery.

When medicine and motorsport collide

Measuring car performance can be critical for achieving that millisecond advantage. Formula 1 teams have developed top-of-the-range telemetry systems that monitor 150,000 measurements a second from over 200 sensors on the car. Teams analyse this information to decide whether any adjustments are needed during the race.

Using their trackside experience of remote monitoring, Formula 1 technicians have developed a human telemetry system that can help doctors monitor patients taking part in clinical trials.

Wireless sensors record patient data such as heart rate or motion. This information is transmitted in real time to the clinic, where doctors can assess how patients are responding to treatments, even enabling them to change drug doses remotely.

Crossing the fishing line first

Between 1998 and 2008, Formula 1 tyres had groves cut into them to restrict the amount of ruber in contact with the track. This reduced grip levels and so forced drivers to go more slowly through corners, improving safety.

Today anglers use the same design principles to help them land a prized catch. A ridged or grooved pattern cut into a fly fishing line turns it from a round-shaped line into a star-shaped one.

In the same way that a grooved Formula 1 tyre has a smaller contact area with the racetrack, the grooves in the fishing line mean there is less contact with the fishing rod, so reducing friction and allowing anglers to cast further and with greater accuracy that ever before.

Harnessing the energy of Formula 1

Formula 1 introduced new technology in 2009 with the introduction of technology that captures energy released when the car brakes and stores it ready for use later.

This innovation is based on modern flywheel technology. As the flywheel spins rapidly, up to 600 kJ of energy can be stored – enough energy to accelerate an average road car from 0 to 76 kph without burning any fuel at all. Several leading road car manufacturers have already introduced the

technology into road cars, attracted by the opportunity to reduce fuel consumption and CO2 emissions of road vehicles by a third.

Feeling the heat of Formula 1

Formula 1 cars make use of a special magnetic filter to remove tiny particles from oil that will damage engine and gearbox components and bring races to an untimely end.

Source: Audi R15 Diesel powered Le Mans car. Much of the development of modern high-performance diesels comes from this form of racing together with the use of advanced composites.

Engineers have now found a way to use the same technology to trap rust and sludge in central heating systems and so reduce the risk of debris clogging up pipes and reducing the efficiency of boilers. This is important for the UK where central heating boilers account for 15% of the country's domestic carbon emissions.

The special magnetic filter – which connects directly into the copper pipework close to the boiler – draws magnetite particles which is also known as sludge out of the circulating water and traps them in specially designed collection areas where they can remain until the filter is removed for cleaning. The technology can also be scaled up for commercial applications and even large installations such as power stations.

Driving the search for better health

Formula 1 cars are at the cutting edge of material and manufacturing design, and for this reason many designers seek out Formula 1's engineering excellence to perfect their products.

Ovei is an immersive diagnostics tool, designed to capture healthcare data and send it to doctors, therapists and psychologists across the world. While the pod looks simple in shape, designing the perfect capsule environment is more complex that it first appears. So the pod's designer Lee McCormack turned to Formula 1 engineers for help.

Like a Formula 1 car, Ovei's bodyshell was engineered as a 'monocoque' structure using strong but lightweight carbon-fibre composites, eliminating the need for internal supports. Keeping the capsule cool was a challenge too – because of the amount of high-tech equipment inside it – so Ovei's internal airflow was also engineered on racing car principles, with Formula 1 guidance.

Rapid refuelling lapped up by tank crews

Refuelling a race car in less than eight seconds is vital to Grand Prix success and safety is essential during a pit stop. Spilt fuel can lead to serious fires.

Rapid and reliable refuelling is a problem also faced by defence force tank crews whilst on active service. They have solved the problem by using special fuel caps designed by the company that makes leak-free fuel caps for Formula 1 cars.

The caps let fuel enter the tank quickly whilst preventing dust from getting in – a problem that puts many a military vehicle out of action. As the fuel is also expensive to fly out from the UK, it is also vital that it is not wasted.

Formula 1: a gripping story

Racing tyres are made from soft rubber compounds which offer the best possible grip. They also have specific tread patterns to allow water to escape when the track is wet.

Taking these ideas, a shoe manufacturer has worked with a Formula 1 tyre engineer to develop slip-resistant footwear. Using a special rubber material and tread pattern, they have designed soles with anti-slip protection for people working in areas with wet and greasy floors.

In a seven-month trial organised by the Health and Safety Executive's laboratory, not a single person had a slip accident while wearing the footwear at a pet-food company in Doncaster, England. This was remarkable as the UK experience was for one person to get hurt in a workplace fall every 25 seconds.

Racing ahead with wheelchair design

At the heart of every modern racing car is a special carbon-fibre shell known as a 'monocoque'. This is an incredibly strong structure that plays two important roles: it encases and protects the driver and acts as a frame to which the car's structural components can be attached.

A British engineering company has used its experience of manufacturing parts for Formula 1 cars to create the world's first commercially available 'monocoque' wheelchair. This has changed the way we think about wheelchair design forever. The new shape offers an extremely strong but lightweight chair with a Formula 1-inspired seat sculptured to fit the driver's body comfortably.

Formula 1: saving the lives of newborns

As high speed collisions can prove deadly, Formula 1 cockpits undergo 15 types of impact tests before being passed 'race fit'.

This same attention to saving lives has now been applied to the ambulance service. Until now, transporting seriously ill babies to and from hospital was hazardous because of the weight of traditional metal incubators.

The BabyPod II is a new Formula 1 inspired solution to the problem. The baby is placed in a self-contained structure similar in design to the driver's cockpit. Formula 1 materials are light enough to allow the carrier to be placed in a wide variety of vehicles from doctor's cars to helicopters, which also reduces the call on overstretched ambulance services.

Put on your racing coat

As a Formula 1 car powers round the track, its exhaust system glows bright orange. Heat released from the exhaust can damage sensitive car parts, reducing performance and creating a serious risk of fire.

Fortunately a special ceramic coating sprayed on the surface acts as a protective barrier and prevents heat transfer. Several Formula 1 teams also apply ceramic coatings to their carbon-composite body panels.

Now, for the first time, the same coating has been applied to road cars since 2009, helping protect delicate internal parts from heat damage. Engineers believe the technology has future potential in aeroplanes and even space applications.

Racing towards the Red Planet

Formula 1 cars used to be made from the same everyday materials as production vehicles. Today Formula 1 teams use cutting-edge technology to optimise the performance of every part of the car. Materials are chosen for their lightness, strength and durability, with careful consideration given not just to performance but also to reliability.

With their specialist knowledge, Formula 1 experts have engineered a solution to meet the extreme rigours of space exploration. In 2003 Beagle 2 was launched on a quest to seek out life on Mars. Sending a probe into space jam-packed with sensitive on-board equipment is no mean feat.

The casing of the Mars lander was made of the same special plastic used on the exhaust systems of Formula 1 cars. The material was light enough to allow the lander to be sent into space but tough enough to cope with the impact of landing at speed on the planet's rocky surface.

Formula 1: a flare for materials

Formula 1 is always looking for new ways to improve safety. Today's cars are built from high-tech composite materials that offer the driver a protected space in which to sit in the event of a serious impact.

Formula 1 engineers have now shared their materials knowledge with space scientists. In 2006 the Hinode satellite was launched to provide vital information on how 'solar weather' affects the Earth.

Aboard the craft was a three-metre long telescope designed to measure the small-scale changes that occur during the critical build-up of a solar flare. To make the telescope as light as possible, UK scientists worked with Formula 1 engineers to build the instrument out of the same materials as those used in a racing car.

When some materials are exposed to the extreme atmospheric conditions of space, they can crack and give off dangerous chemicals that can contaminate sensitive equipment. Formula 1 materials were used to provide a safe housing for the on-board instruments, as they are crack resistant and rigid enough to help them survive blastoff.

Source: Autoclave, used in the manufacture of carbon fibre and composites. .

Dining out with Formula 1

On 6th March 1981 the world of motorsport changed for ever when McLaren unveiled the first chassis made entirely from carbon-fibre composite material. The new frame was both lightweight and super-strong, offering drivers unparalleled protection as they sat cocooned in their cockpit.

The designer of the chassis was an adventurous engineer called John Barnard, who enjoyed the challenge of taking Formula 1 materials research to the limit. Today he is using his Formula 1 knowledge to join forces with designer Terence Woodgate to transform furniture design. In 2008 they released a Formula 1 inspired carbon-composite dining table that is four metres in length yet measures just two millimetres thick.

Formula 1 steps up to the challenge

A modern Formula 1 car is a sleek machine. It has long, free-flowing lines that stretch from the front of the vehicle to the rear – but not for effect. Every surface of the car's carbon fibre body is designed to help it gain grip and allow wind to pass over and under it without creating turbulence or drag that would slow it down.

Now Formula 1 experts are working with architects to push the boundaries of interior design and produce a staircase with as much elegance as the cars. Together they are using the unique structural properties of carbon fibre to

come up with an eye-catching staircase. No other ultra-thin material has the flexibility to produce such curves with the durability and rigidity to withstand heavy use. Each step is only 4 mm thick but can hold more than 100 times its weight.

Pit-stop operations

Pulling off perfect pit stops requires remarkable teamwork and communication, as split-second decisions can make or break a race.

A similar demand is placed on medical teams who have to perform complex tasks under pressure when transferring patients from operating theatre to intensive care. Even minor delays during the handover process can seriously affect patient recovery.

Doctors at the Great Ormond Street Hospital reckoned they could learn a thing or two from pit-stop mechanics. Working with Formula 1 experts, the doctors studied their teamwork techniques in detail and applied their findings to their own hospital. The result has been a streamlining of the handover process and a reduction in errors. Other hospitals around the world are now keen to use the Formula 1 inspired methods.

Notes:
The exhibition, Fast Forward: 20 ways F1 is changing our world", opened in March 2009 and closed in August 2010.
The Science Museum is London's major science museum demonstrating applied science in action, and attracts 2.5 million visitors each year.