INTERNATIONAL JOURNAL
OF THE FIA: ISSUE #4

AUTO

P42

LOOK WHO'S TALKING

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ISSUE #4

AUTO

INTERNATIONAL JOURNAL OF THE FIA

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THE FIA

The Fédération Internationale de l'Automobile is the governing body of world motor sport and the federation of the world's leading motoring organisations. Founded in 1904, it brings together 232 national motoring and sporting organisations from 134 countries, representing millions of motorists worldwide. In motor sport, it administers the rules and regulations for all international four-wheel sport, including the FIA Formula One World Championship and FIA World Rally Championship

THE FIA FOUNDATION

The FIA Foundation is an independent UK registered charity that supports an international programme of activities promoting road safety, the environment and sustainable mobility. It was established in 2001 with a donation of $300 million from the FIA and is governed by a Board of Trustees. Among its activities, the Foundation participates in various UN road safety and environment related partnerships and is a member of the UN Global Road Safety Collaboration.

THE FIA INSTITUTE

The FIA Institute is an international not-for-profit organisation that develops and improves motor sport safety and sustainability. It leads projects that encourage the rapid development of new and improved safety technologies; that facilitate higher standards of education and training; and that raise awareness of safety and sustainability issues. The Institute was established in October 2004 and funds its activities through annual grants from the FIA Foundation.

FASTER, SMARTER, SAFER, GREENER

New technology brings with it new challenges. But it also brings new opportunities.

In this issue, AUTO examines the latest technology helping everyday road cars to become more connected and smarter. Ever-more efficient and powerful communications capability will see vehicles tell you the shortest and most environmentally-friendly route to your chosen destination and even rearrange your meeting if you're stuck in traffic. They also have the potential to hugely improve road safety by, for instance, communicating with other cars and providing intelligent warning signals to the driver. AUTO takes an in-depth look at these connected cars and the profound effect they will have on our driving future.

Another technological leap is underway at the Bloodhound project, which is attempting to not only beat the FIA World Land Speed Record but to do it by breaking the 1,000mph barrier. The faster you go the more important safety becomes and that is why the project team has called in the leading safety researchers from the FIA to provide solutions for the vehicle's all-important cockpit.

More major changes are afoot in Formula One with the introduction next season of a new turbo-charged V6 engine. AUTO examines the new features of this engine, which is set to bring the highest levels of efficiency and cutting-edge eco-technology to motor sport's marquee championship.

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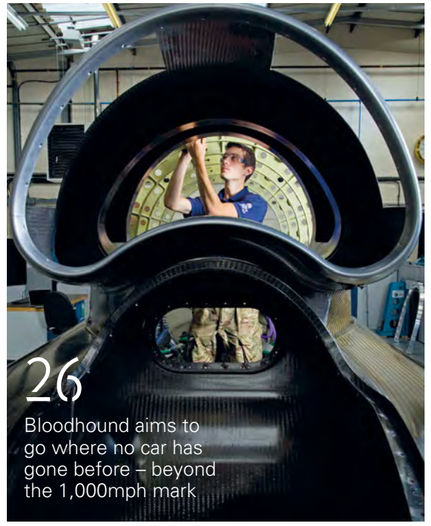

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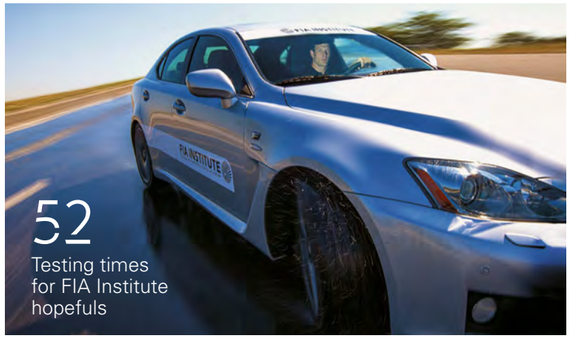

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Not the most practical solar charging design, but easily the most sophisticated, SDA's concept for the Volvo V60 could be the shape of things to come.

Sustainability

SOLAR SYSTEM

Access to charging points is often cited as a sticking point in the decision to purchase hybrid and electric cars, so when Volvo launched its new V60 plug-in electric hybrid with a competition to design a mobile pavilion that would showcase its new model at motor shows, winners Synthesis Design + Architecture (SDA) might just have come up with a possible future solution.

The Los Angeles-based firm's 'Pure Tension' pavilion features what it calls a "continuous organic form composed of vinyl encapsulated polyester mesh fabric with integrated flexible photovoltaic panels by Ascent Solar Technologies tensioned over CNC-bent aluminium pipes."

The innovative aspect of the orchid-like structure can be attributed to the photovoltaic cells, which give the pavilion solar charging capability.

"This competition presented us with a unique challenge as architects," says SDA principal and founder, Alvin Huang. "It addressed issues we are constantly working on and offered the potential to address sustainability as something much broader that can also encompass issues of identity, contemporary culture and personal mobility."

The pavilion itself is highly mobile. In SDA's proposal, it is shown arriving in the back of a V60, collapsed into a small tent bag. "It was important that it be easy deploy, break down, and move around," says Huang. ▫

PHOTOGRAPHY: SYNTHESIS-DNA

FIA European Rallycross

BATTLE FIELD

The FIA European Rallycross Championship was relaunched this year with a new promoter in IMG and a whole host of star drivers. It has not disappointed, with the action on the track being matched by the fervour in the stands.

There were 30,000 paying spectators at the recent round in Sweden (pictured) and another 45,000 in France, where rally star Sébastien Loeb was the special guest driver.

Rallycross involves short, sharp, head-to-head racing around mixed surfaces (dirt and tarmac) within amphitheatre venues. The high-powered cars accelerate from 0-60mph in less than two seconds but are robust enough to tackle jumps and ruts, and drift around corners.

"It's the ultimate motor sport battle," says European Rallycross Championship managing director Martin Anayi. "The sport hasn't changed but with champion drivers and a revamped television package, people are now watching it."

But it is not just the fans that have taken to the sport. The drivers seem to be enjoying it too. As DTM star Mattias Ekstrom said after his guest appearance in Sweden: "Nothing beats the feeling of a rallycross supercar. I've tried NASCAR, DTM and Le Mans, but these cars are the best."

The supercars get plenty of air-time at the Höljesbanan during the Swedish leg of the 2013 European Rallycross Championship. Crowd favourite Stig-Olov Walfridson leads fellow countryman Mattias Ekström, driving a VW Polo T16

PHOTOGRAPHY: JKR/ERC24.COM

Stories making the headlines from the world of the FIA family

News

Fox Sports ties up deal for Formula E broadcasting rights

The FIA's new Formula E championship, which begins in September 2014, has signed a multi-year, international multi-media deal with broadcaster Fox Sports.

The deal will see the 10-race series shown in full in the US across the Fox family of networks, including Fox Sports 1, the company's latest sports channel. Fox has also been given exclusive and non-exclusive rights in more than 80 territories including Canada, Latin America/Caribbean, Netherlands, Italy, Australia, Malaysia, Indonesia, Hong Kong, Singapore, Taiwan, South Korea, India and Africa.

"We are very proud to announce this major agreement between Fox and the FIA Formula E Championship and to be partnering a truly global organisation that fully believes in the future of racing," said Alejandro Agag, CEO of the series' promoter Formula E Holdings. "This global broadcasting deal will bring our championship to nearly 90 countries and a potential 180 million households worldwide."

Commenting on the deal, Carlos Martinez, President Latin America for Fox International Channels, said: "With a global approach to acquiring knowledge and fast-tracking technology through the world of international competition, the FIA Formula E Championship is much more than just another weekend at the track, it makes racing an integral part of solving one of the world's most daunting challenges and we are thrilled to be a part of that process."

Elsewhere, the series continues to gather momentum, with renowned IndyCar team Andretti Autosport, led by Michael Andretti, being announced as the third of the 10 teams set to contest the inaugural 2014/15 season. Andretti Autosport joins China Racing and UK-based Drayson Racing as the teams announced so far. The series has also revealed that two-time IndyCar Champion Gil de Ferran has joined as an Official Ambassador. The Indianapolis 500 winner will advise the series on enhancement of the race format.

FIA launches Motor Sport Development Task Force

FIA President Jean Todt used his closing address at June's Sport Conference Week to reveal details of a new Motor Sport Development Task Force, which will define the future of the sport over the next ten years.

"We must have a more strategic and focused approach to developing grassroots motor sport," he told delegates, before going on to announce that the Task Force will be headed up by FIA Vice President and President of the Association of Touring Clubs of the United Arab Emirates, Dr Mohamed Ben Sulayem.

Outlining how the Task Force will work, President Todt said: "This new group will work through the World Motor Sport Council and the initiative will involve all clubs and regions

"It will develop a plan for the global development of motor sport from 2015 to 2025 and it will present its plans to the FIA General Assembly in 2014."

Since the announcement Dr Ben Sulayem has met with North and South American member clubs at the FIA's recent Latin American Congress and also travelled to the FIA Confederation of African Countries in Botswana to consult with motor sport stakeholders.

"We're bringing together a team of hand-picked specialists from around the world who have skills and expertise in a range of areas, not just in motor sport," said Dr Ben Sulayem of his plans for the Development Task Force.

FIA President Jean Todt speaking at Goodwood recently

F1 visor is a life-saver

The protective visor strip on Max Chilton's F1 helmet, developed by the FIA Institute and used by all drivers this season, was responsible for shielding him from flying debris during the recent German Grand Prix.

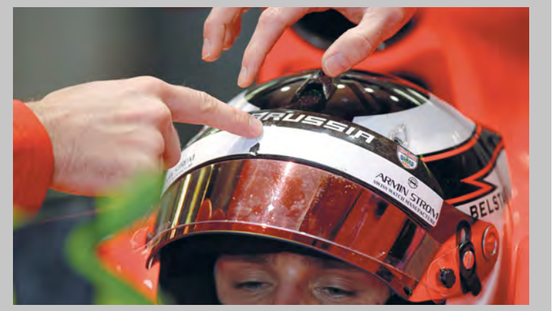
It is thought that the debris – possibly a stone – was tossed up by another car and flew into the Zylon strip running above the driver's visor with enough force to cause serious damage. But Chilton was unharmed.

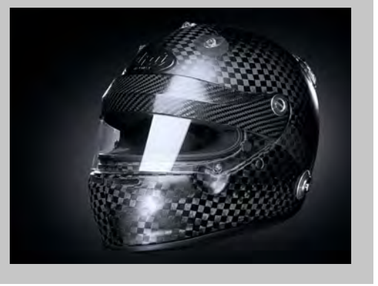
The FIA Institute will now perform a reconstruction of the incident to assess whether further protection is needed.

"A reconstruction in test conditions will determine the energy transfer involved and then we will be able to quantify the safety benefits of the Zylon panel," said Andy Mellor, FIA Institute Research Consultant.

The strip was developed after the vulnerability of the visor area was exposed at the 2009 Hungarian Grand Prix. Ferrari driver Felipe Massa was struck by a loose spring, which impacted his helmet at exactly the point where visor and helmet shell meet, with the same force as a bag of sugar travelling at 160mph.

Massa suffered a serious injury and while he has made a full recovery the incident prompted the FIA Institute to look into making further safety improvements to the top-level 8860 helmet.





Above: Engineers inspect Max Chilton's helmet after the incident. Right: The protective visor strip is made of Zylon, a polymer used in bullet-resistant body armour

Gerhard Berger at Goodwood unveiling a first example of an F4 championship car

PHOTOS: LAT

FIA in call for F4 manufacturers

As Gerhard Berger, FIA Single Seater Commission President, unveiled the first example of the car designed for the federation's new Formula 4 championship, the World Motor Sport Council called on manufacturers to come forward to supply the new series.

Following its restructuring of the Formula 3 category and the establishment of the European Formula 3 Championship, the FIA Single Seater Commisssion has designed Formula 4 as a bridge for young drivers seeking to graduate from karting to single seat racing.

At Goodwood, UK, in June, on the final day of the federation's inaugural Sport Conference Week, Berger unveiled a chassis for the new series.

The ten-time Formula One grand prix winner told an audience that included a number of members of the World Motor Sport Council (WMSC) that the new category is a key component of the FIA's vision for a streamlined racing ladder and would be aimed at 15- to 16-year-old drivers.

At the following day's meeting of the WMSC, council members announced that the body will be registering engine and chassis manufacturers, so that it can then supply national sporting authorities (ASNs) with a list of potential suppliers.

Manufacturers will then be allowed to enter their cars in championships from 1 January of the year following registration.

The FIA has given strong support to ASNs launching national championships, in order to provide for a standard technical and sporting framework for single-seater championships in each territory.

Subject to compliance with a policy based on four main pillars – securing organisational consistency, technical fairness, sporting relevance and the stability of the championship – an 'FIA Certified' label will be granted to the ASN for its national F4 Championship.

FIA calls for safety collaboration

FIA President Jean Todt has called for greater co-operation between nations and organisations in the battle for improved global road safety, citing Argentina's success in reducing fatalities by more than 20 per cent as an example of how countries can make a difference through collaboration.

Speaking at the Encouraging Road Safety Behaviour forum in Buenos Aires, organised in association with the Inter-American Development Bank (IADB), President Todt told an audience that included Argentina's Interior and Transport Minister Florencio Randazzo, IADB president Luis Moreno and representatives of the World Bank that road safety success can only be obtained through collective effort at all levels.

"In our war – because it is a war – against road accidents, we need partners," he said. "The engagement of national authorities at the highest level is key to success."

Pointing to Argentina's success, President Todt said that the improvements had come as a result of political will allied to a willingness to tap into the resources of a wider global community of safety activists.

He added that getting the issue of road safety onto national and inter-governmental political agendas is crucial. "One way to speed up international mobilisation would be for road safety to be integrated into the UN's Sustainable Development Goals that will follow on from the Millennium Development Goals as of 2015."

Finally, he pointed to the issue of finance, saying that small measures could lead to great funding. "Similar to the taxes that exist on airplane tickets, imagine a very small contribution on car and motorcycle purchase, insurance sales, hire car rental, and other accessories. This could potentially add up to hundreds of millions of dollars."

Luis Moreno (IADB), Michelle Yeoh, Florencio Randazzo, Jean Todt and Penelope Brook (World Bank)

Roads for all

The UN Environmental Programme brought together road safety experts from around the world to discuss the latest developments of its Share the Road campaign.

Created in partnership with the FIA Foundation, and with a grant from the Road Safety Fund, Share the Road is targeting low- and middle-income countries where pedestrians and cyclists are put in danger on road systems primarily designed for cars. It aims to catalyse systematic investment in safer road infrastructure.

"Share the Road is an important example of a sustainable transport initiative. And it is crucial for Africa," said Mounkaila Goumandakoye, UNEP Director at the conference in Nairobi on 25 and 26 June 2013. "We will experience an unprecedented growth in urbanisation from now through to 2030, and we must have the sustainable policies to cope with this."

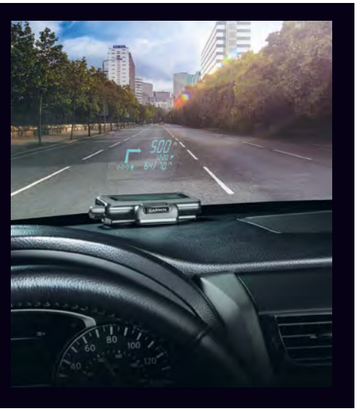
Nairobi was a fitting venue as it's the site of the first Share the Road pilot. The 1.7km UN Avenue in Nairobi has been redesigned and rehabilitated to include a three-metre wide pavement on both sides of the road and a three-metre, two-way segregated cycle lane.

Safer GPS with Head-Up Display

GPS company Garmin has developed the first portable Head-Up Display (HUD), which enables drivers to safely follow sat nav directions without having to switch their focus between their GPS device and the road. It projects route directions, current speed and distance from destination on to the windscreen, with the information hovering in the driver's line of sight.

HUD was pioneered for fighter jets, and has been proven to improve piloting. It's expected to become more widespread in cars in the coming years as the safety benefits of the technology become more readily apparent.

Garmin is leading the aftermarket demand for HUD, but car manufacturers are also adopting the technology. An IHS Automotive report predicts that sales of cars equipped with HUDs will rise to 9.1 million in 2020, up from 1.2 million in 2012. BMW, Mercedes and Audi are all currently offering HUD, but it will gradually become standard on a much wider range of cars.



Green light for Circuit of Wales

The Circuit of Wales, a new £280 million multi-purpose development in Ebbw Vale, has been granted planning approval and will begin construction later this year.

The project has been helped by a grant from the FIA Institute and Motor Sport Safety Development Fund. In 2012, the UK's MSA successfully applied to the Fund to undertake a full Master Plan for the new motor sport facility, part of a larger automotive and high-tech cluster in Wales. The Master Plan included commercial and environmental sustainability as core objectives.

The planning stage is being led by global sports stadia and architecture firm Populous. The circuit will be built to FIA Grade 2 standard and will aim to host international motor sport events such as MotoGP and the World Touring Car Championship.

The project will bring clear benefits to a socially deprived part of the UK, bringing in industry and employment as well as generating tourism receipts. An anticipated 3,000 new jobs will be created during the construction phase, with between 4,000 and 6,000 new jobs once the development is complete.

The 3.5km circuit is due to be finished in 2015/16 and will include an academy and training facility to develop future Welsh and UK talent. An accompanying automotive park will be a hub for research and development companies, with a focus on environmental technology and energy solutions.

The new circuit in Ebbw Vale will form part of an auto and high-tech industry hub.

Academy Euro Winner

Lithuania's Ignas Gelzinis emerged victorious at the European qualifying round to secure the first automatic spot for the 2013/2014 FIA Institute Young Driver Excellence Academy

To get there, he had to beat off stiff competition from the likes of Belgium's Kevin Demaerschalk, Sweden's Erik Johansson, Michelle Gatting from Denmark and Britain's Jake Dennis. There are a further four qualification rounds in the Middle East, the Americas, Africa and Asia-Pacific to decide the other automatic places.

The Academy, now entering its third year, is a fully-funded training programme that aims to help drivers develop their motor sport careers, whilst increasing safety skills and actively promoting the principles of safety, fairness and responsibility on and off the track. Drivers benefit from the expert tutelage of former Formula One race driver Alex Wurz and former World Rally Champion co-driver Robert Reid.

For those drivers who didn't qualify automatically, there will still be three wildcard slots to fill. And even if they are unsuccessful this year, they will take home valuable lessons about nutrition, team building, career development and the core safety principles of the FIA Institute.

Turn to page 52 for more details

SAFEisFast Driver Tutorials in 64 Languages

The Road Racing Drivers Club's online driver development site, SAFEisFast.com, supported by the FIA Institute and the Motor Sport Safety Development Fund, now features video tutorials with captioning in 64 of the world's most commonly used languages.

The free online resource features tutorials on safety, fitness, mental aptitude, race craft, career development, sponsorship, marketing and more to assist the careers of drivers in all forms of racing. Many of the sport's top names, including champions from Formula One, the Indianapolis 500 and Le Mans, have contributed to the videos.

To date, some 115,000 unique visitors from 136 countries have tuned in to the tutorials, and thanks to the new translations, this is only set to grow.

RRDC President Bobby Rahal said: "English is regarded as the 'universal language' of auto racing but making these videos available in so many languages will broaden its appeal and give non-English speakers an opportunity to benefit from this valuable resource."

Honda F1 chooses UK for European base

PHOTOS: LAT/POPULOUS/MALCOLM GRIFFITHS

Honda recently announced that it would be returning to Formula One in 2015 in a joint venture with McLaren. The Japanese manufacturer was tempted back to top-flight racing by the new regulation 1.6 litre V6 engine with energy recovery systems.

It has now also confirmed that Milton Keynes, UK, will be the base for its European racing operations. Housed within a brand new engine research and development centre, this will be European frontline operation for Honda's F1 team.

The 'power units' will be developed at Honda R&D centre in Tochigi, Japan, and then rebuilt and fine-tuned at the European HQ, whose opening date is provisionally set for June 2014.

Yasuhisa Arai, Chief Officer of Motorsports, Honda R&D, said: "With the confirmation of a new F1 operation base in the UK, our preparation to join F1 has become more specific and concrete. To meet and exceed the expectations of our fans, we will accelerate our development to bring back that unique Honda engine sound to the track."

Yasuhisa Arai will oversee the UK Honda base

AUTO ASKS:

How can motor sport better deal with environmental concerns?

This debate comes direct from FIA Sport Conference Week, where, following the FIA's launch of its 'Action for Environment' programme, which aims to make motor sport an eco-exemplar within a decade, a panel of leading industry figures and environmental campaigners discussed how this can be achieved

The team boss

Jonathan Neale

Managing Director, McLaren-Mercedes

From 2007 onwards we began to take a much more proactive approach to sustainability. We became one of the first 500 companies in the UK to get a Carbon Trust certificate in 2010. We were re-awarded that in 2012 and we were carbon neutral as a team in 2012.

Over four years, group-wide we reduced CO_2 footprint by just under 20 per cent per employee, and this was also externally accredited. And by being more energy efficient we are also more financially efficient, as every penny we save can go towards helping to gain performance from our race car.

This is all relevant to our sponsors and investors. Every listed company on all of the stock exchanges has a requirement to have a corporate sustainability policy and if we're going to charm them into the sport and maintain the longevity we have with them we have to respond to that.

The levels of innovation we now have in F1 – not just in the development of the internal combustion engine but in electronic motors, cell development, power electronics and semi-conductors – is really exciting. The technology and challenges will resonate with employees and will attract more high-calibre science and technology people into the sport.

It will also accelerate the pace of change of this environmental technology in other areas. We already have the McLaren 12C sports car with the lowest CO_2 emissions per horsepower anywhere on the planet and we're about to release a P1 hybrid sports car that is the pinnacle of our brand. Whether we use KERS-related technology or battery-cell related technology in F1, it is all directly relevant to our wider work.

The icing on the cake for us was working with the FIA Institute to develop our environmental management system. We became the first motor sport team in the world to achieve the top level accreditation – Achievement of Excellence – in the FIA Institute's Sustainability programme.

The agenda setter

Nick Nuttall

Director of Communications, UN Environment Programme

UNEP is no stranger to sport, having worked with the International Olympic Committee since 1994, greening the summer, winter and paralympics. We are currently working on preparations for Sochi 2014.

Since 2006, we've partnered with the FIM on greening motorcycling and promoting the UN's World Environment Day on 5 June.

And we recently signed an MOU with Rio 2016. Working with Brazil, host of the FIFA World Cup 2014 and the 2016 Rio Olympics, will help to green supply chains through sustainable procurement. Brazil also wants more large and, interestingly, medium-sized companies to report on their footprint and is using these two big sporting events to fast track this.

Brazil has asked us to develop a Green Passport for these two big sports events. The passport will promote eco-tourism to spectators as well as sustainable agriculture and food, including organic food available at hotels and restaurants in the host cities.

Motor sports will not be immune to some of the profound sea changes at work around the globe – from environmental and reputational risk to opportunities emerging for business in providing technological and organisational solutions.

Formula One, and motor sports generally, are already providing many breakthroughs in terms of engines, fuels and lightweight, safe designs that are feeding into the wider mobility markets. Sponsors are also looking for greener more sustainable events.

Motor sports, and the men and woman involved, have been about achievement, raising the bar and breaking records. When Donald Campbell raced in his Bluebird in the '50s and '60s it was about personal and national pride.

Today it is just as much about advancing solutions and technologies that have the potential to transform our world into a low-carbon, resource-efficient global Green Economy.

The adventurer Bertrand Piccard just completed his crossing of the US in his solar-powered plane, Solarimpulse. People are excited and astonished by Piccard, but equally by the potential of the technology.

A solar powered catamaran is currently sailing along the coast of North America, tracking changes in the Gulf Stream that have been linked to global warming. The University of Geneva vessel has the UNEP flag on its mast as we are supporting the science but also showcasing the technology that has the power to really transform shipping.

Motor sport is in precisely the same pole position. It is primed to take the kinds of leads that society desperately needs while maintaining its long-standing reputation for innovation, safety and entertainment on and off the track.

The motorcyle man

Peter Gregory

Environmental Commission member of the Fédération Internationale de Motocyclisme (FIM)

Our Environment Code 21 emerged from the 1992 Rio Earth summit, when Agenda 21 was formulated. The motorcycle world looked at their findings and said: "If we don't start making rules to manage our sport sensibly and environmentally, somebody else will, and maybe we won't be able to live with those rules, or be able to afford them."

So in 1993 we began working on it. The code was adopted by the FIM at the end of 1996 and covered issues such as sound levels, pollution of the ground and the management of circuits.

Two years later, in 1998, the FIM formed an Environmental Commission and its first task was to set up a training programme. We required every FIM championship event to have a qualified environment steward on site, to work with the organiser, and to work locally with the city council, as local councils' rules are often stricter than the FIM's.

We also established a training programme that now sees the FIM run approximately 12 seminars a year. Stewards are licensed for three years and we have 270 licensed stewards covering 250 events worldwide.

From the end of 2006, we began to work with UNEP and they have kindly extended that co-operation twice. UNEP has brought new thinking into our arena and that has allowed us to move toward real sustainability. We're beginning to properly educate spectators, to educate riders and to make the sport even more accepted by the global community at large.

In recent years, with the assistance of UNEP, we have appointed what we call Environmental Ambassadors. We have seven and they include multiple MotoGP world champion Valentino Rossi, young MotoGP star Marc Marquez, Ladies' World Trials Bike champion Laia Sanz and Ken Roczen, who is a Motocross champion. The truth is the world accepts such a message from Valentino Rossi far better than it ever will from me.

For 12 years, we have also presented our annual environment award, which has taken on a lot more value since the UN became part of the selection process. It's no longer just an FIM process but a genuine endorsement of a stakeholder's environmental credentials.

Recently we had the KiSS (Keep it Shiny and Sustainable) programme at Mugello. The top riders from the sport spoke to spectators about the sport's environmental message, with the aim of getting spectators to respect the venue and leave it as they found it.

Finally, in terms of our programme, we organise seminars for young riders so that at every youth or junior world championship someone from our commission will deliver a seminar for competitors, and often their parents as well, on what is the environment and what they can do to save it. One of the things I always say is that I started in motocross in 1961 and if we behave ourselves and respect the environment, then when you're 61, your children will also be able to practice motocross.□

F1 engines

NEW POWER GENERATION

For 2014 Formula One is set to undergo a radical change as it moves to leaner, greener, more road-relevant engines. But far from being a dilution of its core values, the new power units will keep the sport at the cutting edge >

BY MATT YOUSON

Between the final grand prix of 2013 and the first of 2014, Formula One will undergo a change larger and more far-reaching than anything it has witnessed in many decades. The basic facts are simple – the 2.4-litre normally aspirated V8 engine will make way for a 1.6-litre V6. The new engine will feature direct injection and turbocharging. KERS will be replaced by ERS, comprising two energy recovery systems. The first is the Motor Generator Unit – Kinetic (MGU-K), a more powerful device than the kinetic energy recovery system currently being used. The second is the Motor Generator Unit – Heat (MGU-H), an all-new electrical machine that will harvest waste energy from the exhaust flow.

While this new mechanical architecture no doubt represents a significant change for F1, perhaps the bigger transformation is one of philosophy. In framing the new formula, the FIA has looked beyond the basic sporting requirements of F1 and has instead created a specification and association regulations designed to push Formula One towards engine technologies that are transferable to the road. In the wider sense, F1 will become useful once more.

"The aim of the new regulations is to keep F1 at the pinnacle of motor sport – but to do so mindful of the era in which we operate," says FIA head of powertrain Fabrice Lom. "Yesterday the sole aim of transportation was to travel from A to B as swiftly as possible. Today the technology is such that anyone can go fast – but they do so knowing resources are not unlimited and must be used with care.

"The game is still to go fast but to go fast using less energy and spending less money. This ratio between result (speed) and consumption (money, fuel, resources in general) is what we call 'efficiency'. The new F1 regulations want to promote this: the best power unit should be the most efficient."

The headline numbers in this efficiency drive are a 100kg limit on fuel consumption during the running of a grand prix and the imposition of a maximum fuel-flow rate of 100kg per hour.

"Giving the same amount of fuel to each car is an easy way to promote efficiency – but the requirement is not as simple as that," says Lom. "With no other limitations we might see some extreme and dangerously powerful engines, coupled with exotic strategies. The fuel-flow limitation is there to stop this, enforcing a certain level of control. I say 'a certain level' because the engineers working on this project have an infinite amount of ingenuity, and over time they will certainly deliver more efficient engines with greater power output."

An engineer at Renault Sport F1 (above) with the new turbocharger to be fitted to the manufacturer's 2014-spec engine

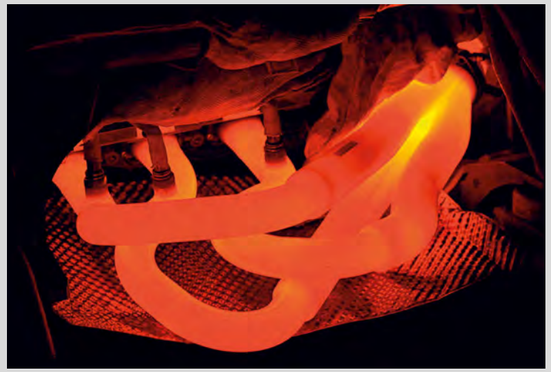
If technology transfer benefits are to accrue from the 2014 specification, those best placed to take advantage are obviously the engine manufacturers involved. Honda has been tempted back to Formula One by the new technical regulations and will partner McLaren in 2015, but in 2014 Mercedes, Ferrari and Renault will give the technology its debut. Andy Cowell, the managing director of Mercedes AMG High Performance Powertrains, believes this is a logical path for F1 to take.

"In terms of our R&D approach, what we're doing is largely evolutionary but it's matching what we do in Formula One with what goes on in the road car world," he says. "That's the key change. Nobody in the road car world is increasing engine rpm, everybody is decreasing rpm. Nobody is increasing engine capacity, everybody is downsizing. Car manufacturers are still achieving good performance because nobody wants a car that's sluggish away from the traffic lights. But they're doing it by boosting the engine and using hybrid systems to recover waste energy under braking.

"In the road car world research is all about seeing how far you can go for a quantity of fuel. We're following that in F1, introducing a fuel-based regulation where performance is achieved through clever engineering on conversion efficiency. The FIA has done a very good job in coming up with a set of technical regulations that steer us toward technologies identical to what's going on in road car development."

'THE GAME IS STILL TO GO FAST, BUT TO GO FAST USING LESS ENERGY AND SPENDING LESS MONEY'

FABRICE LOM, FIA



The 2014 specification is a mixture of tried-and-tested technology alongside the genuinely experimental. A downsized petrol engine combined with a turbocharger and direct injection is becoming the standard response among car manufacturers to the challenges of improving fuel economy, reducing emissions but, crucially, avoiding a corresponding shortfall in power.

Motor sport has been here before. Audi used the concept to dominate the Le Mans 24 Hours race with its highly efficient R8 at the turn of the century, and F1 will advance the science through the rigid demands of its application and the generosity of scale on which it will operate. Where it will truly innovate, however, is with the adoption of an electrical compound loop.

Whereas in a conventional turbocharger, exhaust gases drive a turbine that powers a compressor, the 2014 spec F1 power unit connects the MGU-H to absorb power from the turbine shaft, recovering heat energy from the exhaust gases. Electrical energy from the MGU-H can either be stored or immediately channelled, via the MGU-K, back into the drivetrain. It will also work to regulate the speed of the turbocharger.

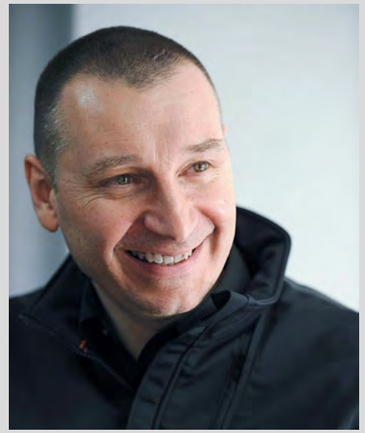
While there are restrictions limiting the amount of energy that can be recovered or restored via the kinetic system, there are no such limits with the MGU-H. The powertrain will be able to use as much electrical energy as it can provide, placing a premium on the development of this new technology.

"Turbocharging and hybrid technology have been around for quite a while but I don't know of any cars with an electrical compound loop – and certainly not of the magnitude we're introducing for 2014," says Cowell. "In this, we have a technology that is very much ahead of the road car world."

While the aims of F1's efficiency drive are noble – and some would say essential to the longevity of F1 – to legions of fans the only thing that really matters is what happens on the race track.

All three manufacturers can reassure enthusiasts that the new hybrids will in no way diminish the thrill of F1. The new units will in fact deliver more power than the V8s, and retain the ear-splitting thunder that is ›

ANDY COWELL, MERCEDES AMG



ROB WHITE, RENAULT SPORT F1

FABRICE LOM, FIA

fundamental to the show. This does not mean, however, that F1 will proceed as it has before.

Over the last seven years, the competition between F1 engines has steadily degraded. Even if the V8s are in no sense homogenised, differences between them have largely been neutralised by a multi-year development freeze, the imposition of engine-protecting rpm limits and the unprecedented levels of reliability this has engendered. With F1 adopting an envelope-pushing, performance-oriented engine formula, undoubtedly this will change.

"It is a very complicated beast," says Rob White, deputy managing director (technical) at Renault Sport F1. "The regulations will be immature, and the engines will be immature too, so it will be extremely challenging to achieve the levels of reliability which we aspire to. Inevitably there will be a period at the beginning where we have some rocky times. And when I say 'we', I mean the whole pit lane."

Given the wider aspirations of the 2014 programme, a reinstatement of the engine freeze would be self-defeating. Equally though, there does not exist within F1 a desire to return to the costly engine wars of the past.

"A multi-year specification freeze is not really where we think the balance should be. But equally, it shouldn't be a development free-for-all that would make the necessary investment unaffordable," says White. "We're heading towards year-on-year tightening restrictions and we think that's a prudent and responsible approach. Renault has invested heavily in this initial preparatory phase and is committed to a substantial ongoing spend in order to continue the development through the life of the engine. But it's important that all of those things remain proportional relative to the benefits that are possible."

At Renault Sport F1 in Viry-Châtillon, near Paris, engineers are fine-tuning the new 1.6-litre V6 in preparation for the 2014 season

'WHAT WE'RE DOING IS EVOLUTIONARY BUT IT'S MATCHING WHAT WE DO IN FORMULA ONE WITH WHAT GOES ON IN THE ROAD CAR WORLD'

ANDY COWELL, MERCEDES AMG

At the time of writing, the power unit manufacturers have completed systems testing on the dynamometer. The next stage is installation in cars followed by a short but intense programme of testing beginning in January 2014.

Nobody really knows what to expect when the cars hit the track, but everyone seems to agree that it will be a brave new world for Formula One. On the track, it promises to shake up the existing order, while behind the scenes it will restate F1's position as the technological pinnacle of motor sport and offer the possibility of it making a genuine contribution to the science underpinning the road cars of the future. ▫

Recovery vehicle

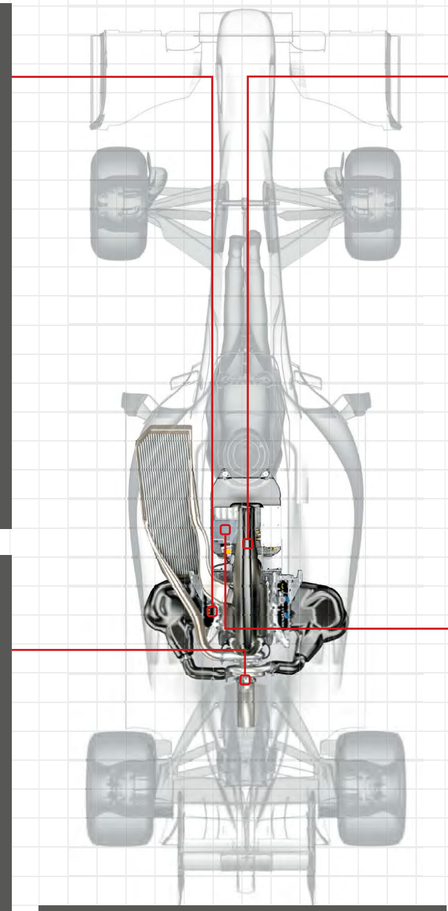
The 2014 F1 season sees the introduction of a new 'power unit' to replace the outgoing V8 engine. The choice of terminology is significant: while internal combustion remains at the heart of the F1 car, associated energy recovery systems will take on a much more significant role next year.

Each car will have an allowance of five complete power units for the duration of the season. However, the individual components of each unit can be mixed and matched freely and used in any combination.

The cars for the 2014 championship are expected to produce more power than the current models and this will balance out the increased minimum weight limits that will be introduced next season. As such, there is not expected to be any great change to the lap times achieved currently.

MGU-K

The MGU-K is an up-rated versions of the existing Kinetic Energy Recovery System (KERS). It acts as a generator during braking, converting kinetic energy into electrical energy (rather than it being dissipated as heat), which then charges the energy store. It acts as a motor under acceleration, returning energy from the energy store into the drivetrain. The MGU-K is roughly ten times as potent as the system it replaces and it will be in operation either recovering or releasing energy for most of any lap.



MGU-H

Perhaps the most innovative element of the 2014-spec power unit, the MGU-H adds a second energy recovery unit to the F1 car. It is connected to the turbocharger, harvesting heat energy from exhaust gases via a mechanical connection to the turbine shaft. Electrical energy from the MGU-H can be routed either to the drivetrain via the MGU-K or stored for later use. Unlike the MGU-K, there is no limit placed on the amount of energy that can be recovered or returned via the MGU-H.

TURBOCHARGER

The turbocharger is returning to F1 after a quarter of a century. Residual heat energy from the flow of exhaust gases is converted into kinetic energy, with the spinning turbine driving a compressor that forces more air into the cylinders, creating the conditions for a more powerful and efficient combustion cycle. The turbine will also be connected to the MGU-H, which will have a secondary function of regulating the speed of the turbo, speeding it up to compensate for turbo-lag, or slowing it down in place of a wastegate.

V6 ENGINE

The gasoline-burning V6 is the ultimate source of power – the energy recovery systems (ERS) simply make the process more efficient. Unlike the current 2.4l V8, the 1.6l V6 will be turbocharged and feature direct injection. Injecting fuel directly into the cylinders allows for more precise combustion. The V6 should give 600hp, with ERS making up the shortfall to today's 750hp.

ENERGY STORE

Batteries have been the preferred energy storage medium for F1 since KERS was introduced in 2009 and will remain the preferred option for the new power units. The MGU-K can charge the energy store with a maximum of 2MJ per lap, while the MGU-H is not limited. A maximum of 4MJ per lap can be returned to the MGU-K and from there into the driveline.

PHOTOS: JEAN MICHEL LE MEUR / DPPI / RENAULT

FIA Institute Safety Consultants Peter Wright (left) and Andy Mellor, who are lending expertise honed across the world's top racing serises to the project

Land speed record

SUPER SONIC SAFETY

How do you make a 1,000 mph jet-propelled rocket on wheels as safe as possible? As with everything associated with the Bloodhound land speed project - you bring in the experts >

BY TONY THOMAS

Sometime in 2015, the Bloodhound SSC land speed record (LSR) project will attempt to achieve 1,000mph on land. It's a breathtaking target and one not easily encompassed in a few words. Andy Green, current fastest man on land and Bloodhound SSC driver calls it "a once-in-a-lifetime chance to be part of a global engineering and education programme." The project's chief engineer Mark Chapman, views it as "part-racing car, part-jet fighter, part-spaceship", while Peter Wright, President of the FIA Safety Commission shrugs and says, "fundamentally, it's a bomb."

There can be no single, definitive perspective on a vehicle and project so daring of intent, so boundary-breaking in ambition – hence the disparate perspectives of those most closely involved. Yet a common theme emerges when speaking to any of them about the mission to raise the LSR by a third from its current 763.468 mph mark: safety is paramount. The days of Donald Campbell screwing himself into a knot of anxiety on Lake Eyre as he powered Bluebird through 400mph in 1964, facing down demons, yard after yard, are no more than a speck in the rear-view mirror of the meticulous technocracy overseeing Bloodhound.

This is why FIA Institute safety experts Andy Mellor and Peter Wright have been asked to join the project. Their job is to bring the latest thinking and best practice in safety to the Bloodhound cockpit and its occupant Andy Green.

"If I didn't feel comfortable with every aspect of the project I would not be involved," observes Green, an RAF wing commander who speaks in clipped tones and these days "flies a desk" by day, while remaining the focal point of Bloodhound. (He is also, as mentioned, the current LSR holder, set in the Black Rock Desert, Nevada, USA in 1997 and a 'fast-jet' vet of Phantoms, Tornadoes and Harrier jump jets.)

The project is taking a three-fold approach to safety: primary, avoiding an accident; secondary, protecting the driver in the event of an accident; tertiary, rescue and recovery after an accident has happened. In each aspect, the Bloodhound team is working in microscopic detail to ensure the welfare of all involved – not just the man at the 1,000mph sharp end.

Green himself gives the example of how the surface of the desert region selected for Bloodhound – Hakskeen Pan in South Africa's Northern Cape region – has been immaculately groomed over the past three years to create a perfect surface on which to cover a 1,000mph measured mile. The main track, measuring 19km by 500m, has been hand-cleared by several hundred local volunteers, each of them removing even the smallest stone from the surface to create the smoothest runway possible. As Green describes it, this is the equivalent of sweeping a road from London to Moscow, then repeating the task back to London, to create a 300m-wide safety zone either side of the main drag.

Chief engineer Mark Chapman previously worked on the Lockheed Martin F-35 Lightning II fighter jet

"It's just astonishing," says Green, before going on to explain that the hand-clearing of 9.5 million square metres of desert hasn't been undertaken simply as an extreme exercise in abstract perfectionism: it's the most fundamental element of Bloodhound's primary safety objective. Without the clearest, smoothest track on which to run, Bloodhound's safety would be compromised even before it turns one of its mighty, solid aluminium-alloy wheels. "It's all about keeping them on the ground," notes Green, with the kind of matter-of-fact understatement only individuals with the 'right stuff' can deliver.

Those wheels are among the most remarkable components on a machine assembled throughout from objects of wonder, such as the Cosworth Formula One engine being used solely as a fuel pump; the Rolls-Royce EJ200 jet engine, developed for the Eurofighter Typhoon; or the Falcon hybrid rocket motor capable of pushing Bloodhound through the 'K'.

The wheels will be subjected to forces none other has had to withstand before and accordingly, they have had to be designed, developed and engineered to a Bloodhound-specific spec. For starters, the aluminium-zinc alloy from which they are constructed, codename 70-37, is a development of an aerospace-grade metal that has been further toughened for use on Bloodhound.

Extreme strength, fatigue and impact resistance are all vital, as they will be subject to intense forces. At 10,500 rpm (their spinning speed at 1,000mph) the 100kg discs will generate 55,000 radial 'G' – more than enough to make any ordinary wheel distort ›

'IT'S PART-RACING CAR, PART-JET FIGHTER, AND PART-SPACESHIP'

MARK CHAPMAN, BLOODHOUND

The ribbed upper chassis, made of Titanium, will house the Eurojet EJ200, a turbofan normally found in the engine bay of a Eurojet Typhoon fighter

The need for ultimate speed

When, on 29 April 1899, Camille Jenatzy opened the throttle on his electric car La Jamais Contente (Never Satisfied) and pushed through the 62mph (100km/h) barrier to break the 57.6 mph record set a few months earlier by Gaston Chasseloup-Laubat, the Belgian racer began a story that finds its latest expression in the 1,000mph goal of Bloodhound.

La Jamais Contente was the word's first real purpose-designed land speed car and set in train a tradition of the pursuit of speed for its own sake, a goal that has ever since been defined by bravery, determination and visionary engineering.

Bloodhound itself was born in late 2008. Then it had already been a decade since Briton Richard Noble's Thrust SSC had, in the hands of pilot Andy Green, broken the sound barrier with a new record of 763mph. With little sign of the benchmark being broken it was left to the same team to envisage the next great speed barrier – passing the 1000mph mark.

Launching the project, then British Minister for State for Science and Innovation and now a land speed competitor Paul Drayson said: "Breaking land speed records is no longer about strapping an engine to a buggy and pointing it at the horizon. Today, the application of new science and technology is the only way to achieve such results."

But while Bloodhound's goal requires the very latest in computer-aided tech, record attempts have always been about finding technologies capable of transforming powered buggies into something just a little bit more special.

In the decades that followed Jenatzy's attempts, the chase for ultimate speed entered a golden age, centred around the efforts of men such as Henry Segrave, the first to break the 200mph barrier, and Malcolm Campbell, whose Bluebird cars gave him a succession of records and eventually, with Bluebird V, made him the first man past 300mph in 1935.

By the 1960s the record attempt had entered the jet age and the great battles between Americans Craig Breedlove and Art Arfons, with Breedlove's Spirit of America setting a turbojet-powered benchmark of 600.60mph in 1965 .

In October 1970, however, Gary Gabelich's rocket-powered Blue Flame captivated the world and captured the record with a speed of 622.407 mph. It would stand for 13 years until Noble's Thrust2 took the record at 633.5 mph. And there things settled until Noble's Thrust SSC, driven by Andy Green, reached 714.14 mph in September 1997.

A month later, Green became the first man ever to exceed the speed of sound at ground level, at 763.04 mph.

The car is a hybrid construction with the forward half made of carbon fibre and the rear section a metallic fabrication. To push Bloodhound through the 'K', the team may opt for a Jet over Rocket configuration

catastrophically from self-generated forces. Any such possibility must therefore be eliminated for Bloodhound.

The companies chosen for the wheels' manufacture are German master forgers Otto Fuchs and the UK's Castle precision engineering. Fuchs are well known as makers of the most high-end road and racing wheels, as well as aerospace components. Castle's expertise is in machining components to the most exacting requirements of the aerospace, defence, automotive and petrochemical industries.

The one-metre diameter by 15-centimetre width masterpieces they've created for Bloodhound are the product of advanced metallurgy meets time-honoured superheating-compression-cooling cycles. They're as perfect and as perfectly strong as any wheel can be for the unique challenge ahead.

"At the speeds Bloodhound will reach," says chief engineer Mark Chapman, "a small stone would impact the wheel like a bullet. We've had to test them to ensure they'll withstand that kind of treatment. And they do."

This kind of disaster-proofing runs throughout Bloodhound. Take, for instance, its deceleration capabilities. The stopping distance from 1,000mph of the 7.5-tonne, 133,000hp leviathan is a supertanker-esque 5.5 miles (8.85km), achieved in three stages. Firstly, air brakes are deployed into their default, fail-safe 'out' position (i.e. in the reverse of a conventional braking arrangement, their automatic position is 'engaged'; they have to be controlled to disengage). After that comes the primary parachute, followed in due course by a second.

"So there is layer upon layer of deceleration safety built in," says Green, who is familiar with this approach from his decades of military flying. "I feel safe flying an aeroplane," Green adds. "Why wouldn't I feel safe in Bloodhound, where everything is being built to the same standard?"

He can take further reassurance from the very nature of the project: land speed records are never set on race tracks, where obstacles such as elevation change, corners, Armco barriers and spectator grandstands all constitute known hazards that must be successfully negotiated both by competitor and event organiser. "In the desert, there's nothing to hit," Green observes.

In fact, the only impact surface is the desert floor itself, and any collision between Bloodhound and the desiccated mud crust of Hakskeen Pan could only happen in the event of an unforeseen technical failure, or another unscripted event.

And that, says Andy Mellor, FIA Institute research consultant, presents all participants with "a little bit of an unknown".

"Failure mode analysis of a vehicle such as Bloodhound cannot be based on analysis of a similar vehicle, because a similar vehicle doesn't exist," he says. "So we can only assume the environment that it would be subjected to and do the best we can."

To paraphrase, no-one truly knows what would happen in the event of a high-speed accident, but Mellor and colleague Peter Wright are uniquely positioned to advise on industry best practice, garnered from extensive and ongoing research into accidents across all motor sport categories.

Indeed, their counsel has been welcomed by the Bloodhound team after an approach came from Dennis Dean, president of the FIA Land Speed Commission, enquiring as to what kind of expertise the federation and the FIA Institute might be able to lend this most extreme of LSR efforts.

And while land speed record attempts do not have to be run to FIA regulations in the manner of an FIA race series, such as Formula One or the World Rally Championship, the governing body is nevertheless the most authoritative reference for best practice with regard to in-cockpit and tertiary safety.

On this last point, Wright notes that Bloodhound presents them with unique challenges.

"Whereas in a circuit accident – the kind we're quite used to dealing with in an FIA championship – it would be normal to provide medical assistance to a driver who is still in the cockpit," he says. "With Bloodhound, the primary concern in the event of an accident would be to get Andy and any rescue crew well clear of the vehicle as it's potentially highly combustible."

The FIA will also have a key role to play in timing the record run, for while neither the Bloodhound's technical nor operational aspects fall under FIA auspices, an LSR is only deemed verifiable if timed by an FIA-affiliated member club, in this case MotorSport South Africa (MSA).

Richard Noble, ex-land speed record holder and Bloodhound project director, the man ultimately responsible for the success or failure of the 1,000mph attempt, says that believability underpins its credibility.

"People must believe that it happened," he says, "because when it's over and it's all finished, what's the proof that it actually succeeded? Well, as long as we have an FIA certificate to say that we reached 1,000mph, signed by the FIA timekeepers with us in the desert, that'll be all the proof anyone will ever need."□

PHOTOGRAPHY: THOMAS BUTLER

‘AS LONG AS WE HAVE AN FIA CERTIFICATE, THAT’S ALL THE PROOF ANYONE WILL EVER NEED.’

RICHARD NOBLE, BLOODHOUND

RECORD BREAKERS

This list of FIA Absolute World Records shows the top average speed achieved over each distance from either a flying start or a standing start. The Thrust SSC achieved a top speed of 763 mph over one mile in 1997, but it is arguably just as impressive that the Volkswagen W12 achieved an average of 200mph over 5,000 miles on the Nardo Ring.

There are hundreds of speed records that are currently approved by the FIA, and they cover an immense variety of distances and categories of four-wheel vehicles, from production cars and drag racers to purpose-built race cars and electric vehicles.

Overseeing each one is the FIA Land Speed Record Commission, which takes its responsibilities very seriously. Commission President Dennis Dean says: "We are very mindful of the decades of history that have preceded us and we make every attempt to ensure that the achievements of previous competitors are only surpassed by attempts that do justice to those previous holders."

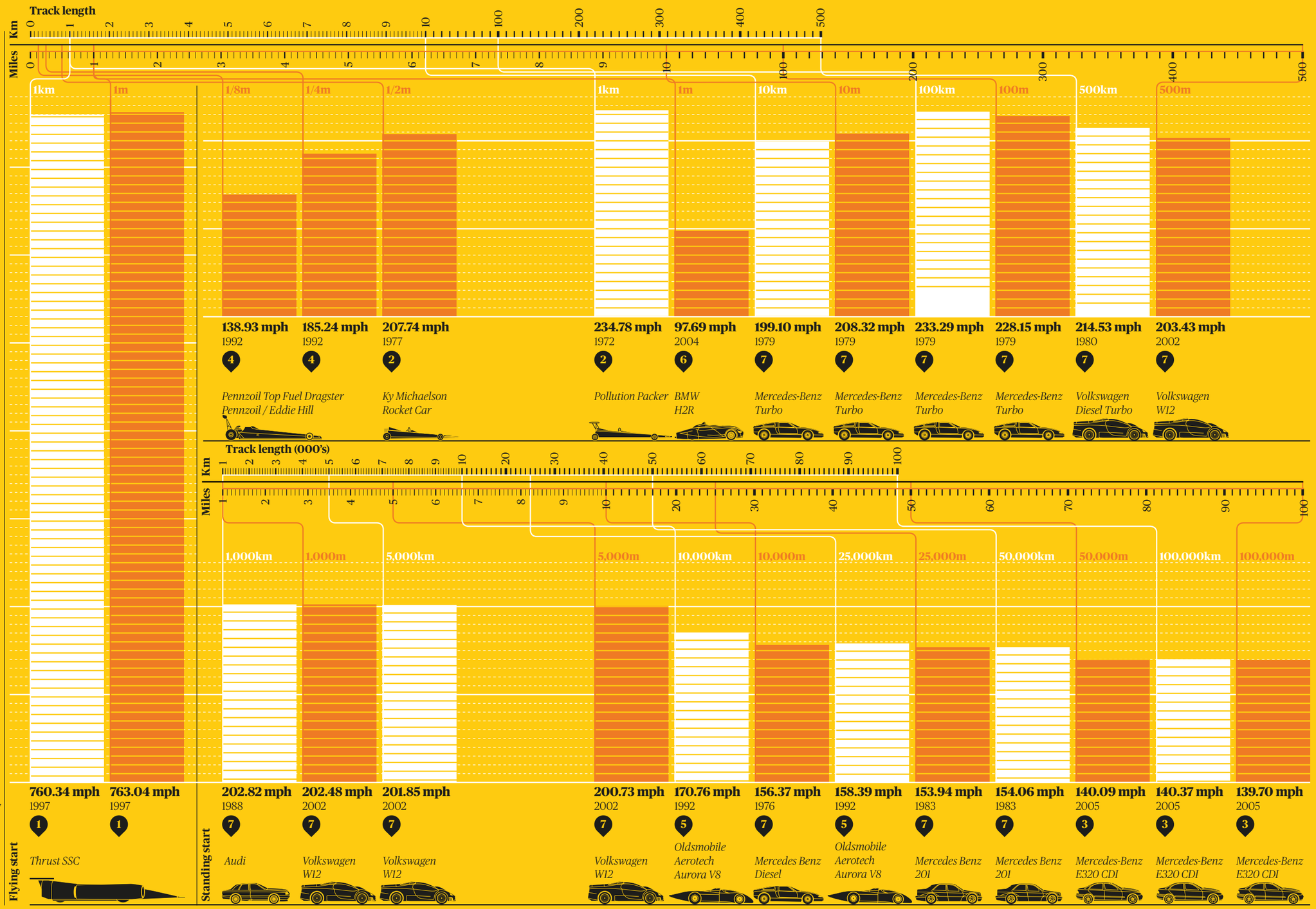
The jewel in the crown of the Commission is the FIA Outright World Land Speed Record, and Dean is thrilled at the possibility that it might be broken by the Bloodhound team.

"Although there are several teams with announced goals of breaking the current FIA Record of 763.035 mph, it's fair to say that the Bloodhound team, headed by Richard Noble, with Andy Green driving, is the frontrunner for a crack at that record," says Dean. "Given their proven history (they hold the current record), I have every confidence that they have the capability to break the record and achieve their goal of 1,000 mph on land."

Location of set record

1. Black Rock Desert, USA
2. Bonneville, USA
3. Laredo (ATP), USA
4. Indianapolis Raceway, USA
5. Firestone Test Cen., USA
6. Miramas, FRANCE
7. Nardo, ITALY

FIA ABSOLUTE WORLD RECORDS



INFOGRAPHIC: FRASER LYNESS

Nissan's Tsuru received no stars for either adult or child safety in Latin NCAP's latest round of tests

Global NCAP

THE ZERO ZONE

In some regions of the world major car manufacturers are still building new models with a zero safety rating. The Global New Car Assessment Programme is aiming to put a stop to that ›

BY JOHN BENNETT

Buying a car in Europe or the US is a relatively straightforward experience. There are certain features that are included in the price without question. Crash-protection technology, the systems that save your life in an accident, are standard in almost all new cars produced by the likes of Renault and Nissan: airbags, seat-belt pre-tensioners and the like are assumed, as are crash-avoidance technologies such as the Advanced Braking System (ABS) and Electronic Stability Control (ESC). They've become so ubiquitous as to pass out of public consciousness, buttons are never pressed and dashboard warnings are rarely seen.

These safety systems are taken as a given, leaving the consumer with other less pressing considerations such as whether to have the latest music system or satellite navigation system.

So why do the same manufacturers leave these essential safety features out of the cars they sell in other regions? Why does a Renault Clio from Europe get five-stars in crash tests but a Renault Clio from South America get zero stars for the same test?

It seems that in order to be safe you need to be lucky. At least, lucky enough to be buying a car in that select band of countries high on the UN's Human Development Index. Safety as standard is very much the preserve of the mature car markets in countries previously referred to as the 'developed world'. While that terminology has passed out of currency its legacy remains for the automotive industry: car manufacturers seem more intent on providing the best for their most established markets than they are on building safer vehicles for the rest of the world.

'THESE CARS WOULD BE ILLEGAL IN EUROPE'

DAVID WARD, GLOBAL NCAP

This is the most reasonable conclusion that can be drawn from studying crash-test data from various comparable New Car Assessment Programmes (NCAPs). Looking specifically at Central and South America, the hard facts are there for all to see. Using the same German laboratories and testing criteria as Euro NCAP, Latin NCAP's results show conclusively that manufacturers with the design, materials and manufacturing capabilities to build five-star cars for European consumption, are unwilling to do the same for those sold in Latin America.

But it is not all bad news. The latest round of results include Latin NCAP's first five-star car in the new SEAT Leon and, perhaps of greater significance, four stars awarded to the tiny Suzuki Celerio. However, while these results suggest a definite improvement in safety standards, they also serve to highlight huge inequalities in the marketplace. The other cars in this fourth round of testing were all awarded zero stars for their adult occupant safety rating.

These are not models produced by obscure automotive brands from economies new to vehicle production, they are cars sold by Nissan (Tsuru), Chevrolet (Agile), Renault (Clio Mio) and Suzuki (Alto K10).

"It's a real story of good and not-so good news," says FIA Foundation director-general and global NCAP secretary-general David Ward. "Great news that we have the first five-star car in the region. That's quite a milestone for automotive safety and you can only praise SEAT for being the first to get there.

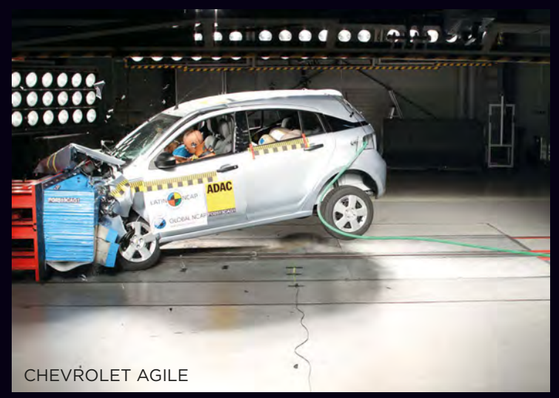
"Less happy is that three years into testing, we're still seeing some very poor results. To still see cars getting zero stars is very disappointing. At that level of performance, they fail to meet even the minimum UN regulatory standards for frontal impact.

"These cars would be illegal in Europe and other places that demand regulations ›

SUZUKI ALTO K10

RENAULT CLIO MIO

NISSAN TSURU



CHEVROLET AGILE

Taking the Latin test

Suzuki Celerio WITH DOUBLE AIRBAG
Adult occupant: ★★★★
Child occupant: ★★

Suzuki Alto K10 WITHOUT AIRBAG
Adult occupant: Zero
Child occupant: ★★★

Seat Leon + 6 AIRBAGS
Adult occupant: ★★★★★
Child occupant: ★★★★

Renault Clio Mio WITHOUT AIRBAG
Adult occupant: Zero
Child occupant: ★

Nissan Tsuru / Sentra B13 WITHOUT AIRBAG
Adult occupant: Zero
Child occupant: Zero

Chevrolet Agile WITHOUT AIRBAG
Adult occupant: Zero
Child occupant: ★★

NCAP frontal impact crash tests use a four-dummy family for testing, with two adults in the front seats and two children in the rear compartment.

An NCAP technician makes final checks on a car prior to testing

be met. By highlighting the disparities between these cars – which we would call substandard – and the four- and five-star cars in the same testing group, Latin NCAP demonstrates its value: it shows consumers they genuinely have choice."

Over the past few years and the three previous rounds of testing, several arguments have sprung up excusing carmakers offering less than their best in Latin America. Suzuki's four-star Celerio is a noteworthy development in that it challenges some of these theories – while the inclusion of Suzuki's zero-star Alto in the same round of testing serves to reinforce the idea that manufacturers are capable of more than they produce.

"The Suzuki Celerio is the smallest car tested by Latin NCAP and the four-star safety rating it received for adult occupants is hugely significant," says Global NCAP technical director Alejandro Furas. "It demonstrates that you don't need to have a large car, a heavy car or an expensive car to have a good level of safety: the Celerio is absolute proof of this.

"Manufacturers know how to produce very affordable vehicles with very good safety performance – but it is a question of demanding it. Looking at Suzuki, if there was a regulation demanding a higher level of safety for the Alto, it would probably score similar to the Celerio. Both vehicles are of similar size and in the same segment, even if one is a little bit more expensive.

"The Alto wasn't developed just for South America, and elsewhere in the world it may come equipped with double airbags or a reinforced front crash structure – but here in this region those are not required by government regulations."

The distinction between regulatory and NCAP testing is an important one. Regulatory testing is a supply-side activity, while NCAPs – even partially or wholly state funded examples – target the demand-side of the car industry, seeking to inform and influence the buying decisions of consumers. Neither exists in isolation, however.

"Latin NCAP is not a regulatory body, it's a consumer information programme trying to influence the demand for safer vehicles," says Ward. "Nevertheless, we think the major vehicle-producing countries in Latin America should move faster to apply the most important UN regulations – because Latin NCAP demonstrates the need for that.

"Car manufacturers are in a competitive marketplace and if the regulations aren't there, they end up competing without a floor of minimum standards. Combined, perhaps, with a lack of consumer awareness you get the situation as it presently exists in Latin America where vehicles with very low safety standards are available.

"You cannot wholly blame the industry for that – though I think in the context of the UN Decade of Action for Road Safety, and the clear benefits we've seen around the world from safer vehicles, that the manufacturers really ought to be moving to voluntarily say they will not build passenger vehicles below the main UN Regulation 94/95 for frontal and side impact.

"I think they should make that a voluntary commitment – and indeed Global NCAP chairman Max Mosley has written to the manufacturers suggesting such. Not to do this is not responding appropriately to the requirements of the UN Decade of Action."

Global NCAP is still in its infancy. Launched in 2011 it brings together various NCAP programmes from around the world at a voluntary level, with the aim of having the programmes advance best practice and also reach more consumers.

"We're trying to encourage technical support and dialogue between the different NCAPs to strengthen their co-operation, avoid unnecessary duplication and build on each other's experiences," explains Ward.

'MANUFACTURERS KNOW HOW TO PRODUCE AFFORDABLE CARS WITH GOOD SAFETY. IT IS A QUESTION OF DEMANDING IT.'

ALEJANDRO FURAS, GLOBAL NCAP

"It's not necessarily about promoting full harmonisation of test programmes because that's not always desirable: it's good that the manufacturers face slightly different test configurations in different regions."

In many ways Latin NCAP is an excellent pilot programme for the work Global NCAP would like to see done, drawing on the experiences of Euro NCAP in the 1990s and promoting vehicle safety awareness to a market previously immature in such matters. Already, the ASEAN NCAP programme, based in Malaysia, is up and running on a similar basis to Latin NCAP and more programmes will follow.

As was the case in Europe, success for Latin NCAP will be defined by the level to which it can raise consumer awareness and, as a consequence, its capacity to influence car design. This fourth series of results marks the end of the Latin NCAP pilot programme. In its three years of operation it has produced some startling – mostly damning – assessments but, according to Furas, Latin NCAP is starting to have the desired effect, by beginning to influence the development of the car market in South and Central America.

"We've certainly started to notice that some manufacturers are leading the process of improving vehicles," says Furas. "They are approaching Latin NCAP rather than governments to ask what comes next. It's a signal they're taking the programme as a reference. To me this is interesting because Latin NCAP is always going to have standards above those mandated by government regulation.

"We've had manufacturers such as Toyota taking information from us, wanting to incorporate it into their designs and ensure that they build a car that gets at least four stars. We're not talking about high-end vehicles but everyday B-segment and city cars. It demonstrates that we're really making progress."

In contrast to the cutting-edge safety technologies that dominate the motor shows in Geneva and Tokyo, success for Latin NCAP would be represented by more modest gains: more airbags as standard, structural reinforcements retained, ISOfix anchors. These are the real technologies that will have the greatest impact on reducing death and serious injury on the road. Widening their use will do more for road safety than most new technologies being developed. □

Latin NCAP awarded its first five-star rating to SEAT's new Leon, which features six airbagsw

THE INFORMATION SUPER HIGHWAY

Vehicles that talk to street signs and stave off accidents are already with us, but as auto manufacturers and telecoms firms continue to push the boundaries, the possibilities for the connected car are immense >

BY JUSTIN HYNES

Until recently, the thought that you might one day be buying a car that could interact with its surroundings to avoid collisions, or that could be commanded, via your mobile phone, to download all of your infotainment from the Cloud, was the stuff of science fiction. After all, it was only two years ago that the New York Times reported that Lexus was the final car company to abandon that staple of old tech in-car entertainment – the cassette. Truth be told, the analogue tape deck has long been superseded by compact discs, flash drives and hard drives. And in-car computers are a standard feature of today's cars. But that's all child's play compared to the new era of intelligent motoring that is upon us. Welcome to the age of the connected car.

Motor manufacturers are already trumpeting the connectivity of their vehicles, whether it's their ability to plot fuel-efficient routes, warn you if you stray across motorway lanes, or integrate your mobile phone with the dashboard system so you can call the office to bring forward your next meeting.

Car advertising is now less about what's on the outside of a vehicle and more about what's under the skin. In magazines and sales brochures there's a growing shift away from vanity photographs of new cars to glossy shots of centre consoles brimming with touch screens, visual aids and user-friendly apps. They guarantee your always-on lifestyle extends beyond your tablet and smartphone to your daily commute.

It's a quantum leap forward from fumbling around in the glove compartment for a John Grisham audiobook to slot into your car's tape deck, all while scanning the horizon for road signs that might or might not display relevant traffic information.

However, because mobile technology has progressed at such a rapid pace, the automobile still has some catching up to do before it truly lives up the term connected.

"The changes we are seeing have happened across the industry relatively rapidly," says Elliott Garbus, General Manager of Automotive Solutions at computing giant Intel, which has been involved in connected cars since the mid-2000s. "Remember, the iPhone was launched in 2007, just six years ago, and companies have really rushed to adopt that.

"As a result there's a shift happening in the industry as it moves to accommodate the transition," he adds. "The purchase criteria for the automobile is shifting, and it's shifting from horse-power and handling to the in-car experience and how well their consumer electronics integrate into the vehicle. This transition is not lost on the automotive industry, and it's not surprising to meet people who've got long histories with companies like Motorola, Sony or other consumer electronics companies working in leadership positions at major automotive companies. It's symptomatic of a culture that's saying, 'OK, how do we bring the notion of innovation, how do we bring this forward, because it's so critical?'"

'THE PURCHASE CRITERIA IS SHIFTING FROM HORSE-POWER AND HANDLING TO IN-CAR EXPERIENCE'

ELLIOTT GARBUS, INTEL

And it is critical. A recent report commissioned by telecoms giant Telefónica estimates the current value of what it calls 'machine to machine' (M2M) connectivity at around $22 billion annually but forecasts that by 2022 the sector will be worth a staggering $422 billion. It goes on to add that within 10 years there will be 1.8 billion automotive M2M connections, comprising 700 million connected cars and 1.1 billion aftermarket devices for services such as navigation, usage-based insurance, stolen vehicle recovery and infotainment. It concludes by stating that before the end of the decade, 90 per cent of new cars will feature in-built connection devices, compared with less than 10 per cent today.

The result of this dramatic upswing in connectivity has been a ›

Connected cars with improved mapping could lead to the end of heavy traffic congestion (left), while dashboards (top) will process data from the internet as well as from your surroundings

ILLUSTRATION: SEAN RODWELL

Accidentally speaking

One of the chief benefits of connected cars is improved safety. The first calls for help are closer at hand than you might think

One of the first big victories for fully connected cars comes via the European Commission's adoption, in June of this year, of two proposals to ensure that by October 2015 all new models of passenger cars and light duty vehicles will be fitted with eCall systems that will automatically call emergency services in case of a serious crash.

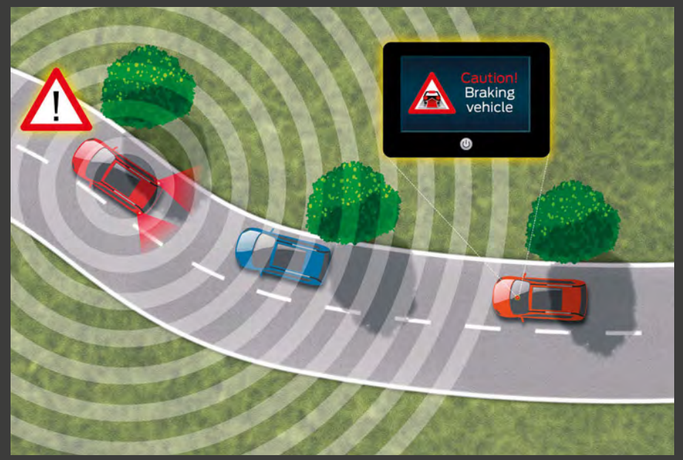
When an accident occurs, in-vehicle sensors trigger the system to dial 112 – Europe's single emergency number. The call is intended in the first instance to allow the vehicle's driver or passengers to relay information about the accident to emergency services. However, even if the driver or passenger are unable to make a voice call, the car still sends a minimum set of data (MSD) – including key information about the accident such as time, location and vehicle description.

Research has suggested that getting immediate information about an accident and pinpointing the exact location of a crash site cuts the response time of emergency services by 50 per cent in rural areas and by 40 per cent in urban environments. As a result, eCall is expected to save several hundred lives across the European Union each year, and to reduce many thousands of injuries.

In the arena of accident mitigation, future safety connected technologies are likely to rest with two systems – vehicle-to-vehicle communications (V2V) and vehicle-to-infrastructure signalling (V2I).

According to research conducted in 2012 by the Centre for Automotive Research in Michigan for the state's Department of Transport, which included input from a range of auto manufacturers such as VW and Toyota as well as communications companies such as Sprint and Siemens, the overwhelming industry opinion is that Dedicated Short Range Communications is the leading solution.

Using this technology, vehicles would continuously broadcast a basic safety message that includes information such as vehicle speed, heading and location. This could be received and interpreted by other vehicles in the area, allowing warnings to be provided to drivers should a vehicle in close proximity present a hazard. The vast majority of companies surveyed believe that such systems, embedded in vehicles, will be offered as standard in at least 10 per cent of cars by 2025.



Ford's Electronic Brake Light alerts tailing drivers by wirelessly triggering a signal on their dashboard, even if the car is unsighted.

V2V systems are already filtering through the mainstream. In June of this year Ford tested a brake light that communicates with cars behind it, alerting drivers to a potential hazard even if the braking car is out of sight around a corner or further ahead in traffic.

In emergency braking situations, the Ford Electronic Brake Light transmits a wireless signal that triggers a dashboard light in cars following behind. The study found the technology could enable drivers to brake earlier and potentially mitigate or avoid a collision.

Intel's General Manager of Automotive Solutions, Elliot Garbus, believes this kind of system will help save lives on the road.

"There are statistics from the US Department of Transportation that 90 per cent of collisions could be avoided with a one-second warning, and 60 per cent with a half-second warning. Given that 93 per cent of accidents are caused by driver error, the technology presents all sorts of opportunities."

Not everyone is in agreement that greater levels of connectivity will lead to safer roads however. In 2010, Peter Rodger, Chief Examiner with the UK's Institute of Advanced Motorists (IAM) suggest that the more complex car dashboards become, the greater the chance for cognitive impairment.

"Just how much information can a car driver absorb and still drive responsibly? There is a fine line between providing useful extra information and causing a dangerous distraction," he said.

Ton Steenman, Vice President of Intel's Intelligent Systems Group, agrees saying: "A great deal of information is available that in effect never has to actually reach the driver, but today it does. Most of it might be contextually irrelevant, and as a result the critical information gets lost.

"With more information available, it's critical that the industry processes that data intelligently so that drivers are given data that's relevant given their environment. Filtering and context are very important."

On the road, online and on sale

Car manufacturers are already offering a dizzying array of infotainment apps for their cars. Here are just a few of the most recent additions to an ever-growing list of connected driving aids

Connected car developments have largely centred on infotainment systems, with a variety of companies providing information aids or partnering with entertainment companies to enhance the driving experience.

Volvo, for example, recently launched a voice-activated music system for its cars via a partnership with Spotify, the digital music streaming service. The solution is fully integrated into the dashboard through Volvo's Sensus Connected Touch.

The new system allows drivers to stream music through their dashboard with a 3G/4G dongle or via the driver's mobile phone connection. Drivers will be able to play any Spotify track they want just by just saying its name, allowing car owners to remain connected while at the wheel.

The technology is based on the Android platform which means it can be upgraded regularly. Sensus Connected Touch also provides access to Google Maps, TuneIn radio service, iGO navigation and an app store for new functions and updates. Interestingly, the Wi-Fi network can be shared with everyone in the car when using a dongle.

Mini is also providing a similar system through Spotify rival Deezer. A modified app from the streaming music company is downloaded from Apple's iTunes store, and when a smartphone is connected, the service appears in a 'Mini-friendly' version on the car's dashboard display.

Meanwhile, at its recent Worldwide Developers Conference in San Francisco, Apple announced that from next year a dozen car manufacturers will offer its latest mobile operating system, iOS7, in new cars. The greater level of integration with the company's iPhone means that drivers will be allowed to access key functions on their smartphones via the dashboard screen. This includes making phone calls, playing music, displaying Apple Maps and receiving iMessages, either via the car's controls or by voice command to the Siri voice recognition programme. Siri will also act as a personal assistant, reading messages aloud and transcribing dictated responses as part of Apple's Eyes Free feature set. Siri

is already available in a number of cars including Vauxhall's Adam in the UK and Chevrolet's Aveo and Cruze models.

Elsewhere, BMW is making it possible for drivers to update their status on social media sites as they drive. To keep driver distraction to a minimum, the German manufacturer has created template posts that go live at the push of a button. The function pulls data from the car such as the chosen destination, outside temperature and what music is playing during the journey. A text-to-speech function can read back responses from friends while you drive.

In terms of providing helpmeets for everyday driving, Audi is currently trialling technology to make parking easier through a wireless system that connects cars to car parks. The company's 'connect wireless payment' enables the car to raise barriers and pay charges without drivers needing to lift a finger.

The trial phase for the system is currently under way at Audi's HQ in Ingolstadt, Germany and involves some 13,000 test cars. The aim is to bundle the wireless payment system as part of Audi's connect option, which already brings internet-based services such as Google Street View, news and weather information as well as local fuel prices. The fuel price finder consults an online database to list the cheapest filling stations in real time at the prevailing location, at the driver's destination or at a location of his or her choice. It even takes into account the type of fuel required. The driver can sort the overview list by price or by distance, and once a filling station has been selected, one click is all it takes to set the selected filling station as a navigation destination.

Connectivity is also facilitating car tracking. Subscribers to Hyundai's Blue Link can go to a website and set up alerts – via SMS, phone or email – that are triggered when the car is driven over a certain speed or outside a defined geographic area or past a certain time of night. Originally designed to allow parents to monitor the habits of teen drivers, the system is also proving its worth as a way of locating stolen vehicles.

Finally, Chevrolet, in its Volt electric model, has bundled a package of basic

Next-generation in-car infotainment systems like Volvo's Sensus Connected Touch with Spotify streaming (above) and Chevrolet's MyLink (left) with iPhone-style apps are leading the charge.

car commands with the system it uses to tell drivers how much charge is left in the car's batteries.

GM's MyLink system, Volt users can, for example, turn on the heater and heated seats while the car is still plugged in to warm the interior without draining charge. The same can be done with the A/C in summer.

GM has also released a platform that allows certain models to be unlocked and even started remotely via a smartphone app. The company's MyLink system connects with the GM OnStar cell phone embedded in the car to allow owners to do with their smartphone anything they would normally do with their key fob. Users don't have to be anywhere near the car.

These are just the tip of an iceberg-sized array of apps and software bundles being, or about to be, offered by car companies the world over. The range of apps is already hugely complex but as connectivity ramps up and car computing power increases, the possibilities will expand massively.

somewhat muddied playing field where car manufacturers scramble to understand telecommunications while telecoms companies eye a 'next-big-thing' profit centre. As a consequence, several issues have arisen.

The first is the discrepancy between the lead-time involved in car manufacturing and the vastly swifter development of mobile technology. A motor manufacturer bringing a car from concept to market will normally take five or more years, a glacially slow timeframe compared to computing or smartphone companies.

"The smartphone business model depends on regular upgrades, which is a fairly new step for the automotive industry. Plans for how to manage payments for upgrades or recognise this revenue and/or cost in financial models will need to be implemented," states Don Butler, Vice President of Marketing for Cadillac, in the Telefónica's industry report.

Butler's company, which operates in the luxury sector in the US, is at the forefront of connected technology. Its recent XTS model was named 'Connected Car of the Year' by American business technology magazine Connected World. The car's 'centre stack' houses a system the company calls CUE (Cadillac User Experience) featuring an eight-inch touchscreen (the size of an iPad Mini) which can be synched to mobile devices. It also recognises voice and gesture commands, so drivers don't have to remove their hands from the wheel to access relevant information.

Audi, too, has embraced gesture-driven interfaces. Its Connect system, which debuted last year in the US, sees a cell phone modem installed in the car, in a modular system, creating a mobile wi-fi hotspot that allows drivers to access all the information outlets they'd normally access on tablets or phones.

According to Garbus, there's a simple way to overcome lead-time ›

As the march towards ever-better connectivity gathers pace, Audi's A3 model will soon be available with super fast 4G mobile internet in Europe

> CONNECTIVITY IS EXTREMELY MEANINGFUL TO GEN X AND Y. THIS HAS TO BE REFLECTED IN THE VEHICLE
>
> ANUPAM MALHOTRA, AUDI

Smartphone control of cars has been a staple of concept car design for some time, but with increasing integration of mobile operating systems into new automobiles, apps to govern vehicle systems will become more widely available

discrepancy and that is by reaching an agreement between the various industry stakeholders.

"There are expectations in the vehicle industry that are about bringing very high levels of quality and reliability, and that takes time," he says. "So there is a little bit of a beat-rate mismatch, but we see a real opportunity for Intel to bring some of its traditional computing strength to bear on connected cars.

"What is required is a more consistent platform that supports innovation at higher levels alongside the robustness and quality that's required by the automotive industry, and that's really what we're trying to deliver."

To that end, in 2009 Intel co-founded the Genivi consortium, a non-profit industry alliance with BMW, PSA Citroën-Peugeot, GM and supplier Visteon, Delphi and Magneti-Marelli to push for the adoption of an open-source in-vehicle infotainment development platform.

Beyond the installation of the technology is the thorny issue of the connectivity itself – who will provide it and who will pay for it? Automobile manufacturers operate on a global scale and aside from minor specification and branding variations, the same platform cars are shipped to dealers worldwide. That's why they need to partner with phone companies that can offer global reach.

Telecommunications businesses are already beginning to club together, with four groupings assembling to offer the type of large-scale local and roaming coverage at viable price levels. There's the Global M2M Association comprising Orange, Deutsche Telekom, multinational TeliaSonera and Telecom Italia; Vodafone and partners; AT&T and partners; and finally Telefónica, which is clubbing together with NTT DOCOMO, Rogers Communications, SingTel and Telstra, among others.

The question remains how customers will react to the likelihood that their new car will come with a price tag, plus a monthly subscription for their connection to all the apps required to get the most from the high-tech vehicle.

General Motors has suggested that some operators might recognise vehicles as a second device on a customer's data plan to bring down the monthly fee. In Europe, Audi has opted for a 'brought-in' connectivity model, where customers tether their own devices to a car rather than building in connectivity.

However, in the US, where phone users shuttling between mobile companies is less frequent, T-Mobile has been selected as the connectivity partner via a built-in solution. An agreement between the two companies sees Audi customers offered industry-beating tariffs, with extra value offerings, such as no activation fees or roaming charges.

For Garbus, the choice between built-in and brought-in is not that clear-cut, since the apparent simplicity of brought-in technology is offset by usability issues.

"At Intel we have requirements for lifetime expectations of greater than 10 years, of needing equipment to work no matter, for example, how hot it is outside," he says. "I live in the Phoenix area and if I make the mistake of leaving my phone in the car when I go into the grocery store, I'll come out and my phone will tell me it's over temperature and can't operate. My car doesn't do that to me, the system just works. And there's a difference in the consumer expectations around that reliability. But these things change rapidly and there are certainly plenty of examples of things done poorly. As I said, I think it's part of a start-up culture."

Price structures for in-car data use will also need to be revisited by phone companies seeking automotive business. While previous telematics systems have had low data use, future connected cars – in which traffic information is updated in real time and in which wi-fi connectivity sees passengers routinely logged on for long periods – will demand heavy data flows. Indeed, in February of this year Audi revealed that its 50,000 Connect customers had used over 75 terabytes of data since the system's April 2011 launch, four times the contents of the US Library of Congress. The figures are only likely to increase.

Once connectivity is delivered it remains to be seen just what sort of apps are made available. Given that auto makers have in the past been reticent about opening up car systems to external devices for fear of contamination or compromise, it's unlikely that we'll witness the kind of open app ecosystem that exists for smartphones. Instead, it's likely that apps will be restricted to in-house or manufacturer-approved development houses and then subject to rigorous testing before release. It will mean connected cars have access to far fewer apps than a smartphone user.

Whatever the issues the sector faces, though, the march of technology is unstoppable and the next car you buy is sure to have a great deal more computing muscle than the last one you drove away from a garage forecourt. And that, insists Garbus, is a good thing.

"That computing horsepower can be applied in a number of different ways, whether it's analysing in-car systems themselves [in order to ensure better and more cost-effective maintenance], or providing greater feedback to automotive companies on how their cars are performing and what people are doing in their vehicles, or even creating safer vehicles that in various scenarios can actually drive themselves.

"These are cars that will have much greater awareness of the world around them," he concludes. "By fusing together an array of sensor technologies including radar, cameras, and other ultrasonic sensors we will really be able to give the car a situational awareness that will lead to much safer vehicles, and ultimately get us on the path towards autonomous vehicles."

Motorway networks full of self-driving cars may be some years off but the era of cars hooked up to a network of always communicating services and infrastructure is already with us and growing fast, as Anupam Malhotra, Manager of Connected Vehicles at Audi of America, confirms.

"Forty-six per cent of our customers today are from generation 'X' and 'Y.' This figure will grow to 70 per cent in the next few years, and with this generation, a connected lifestyle is a given. The connected car is a game changer and as connectivity remains extremely meaningful to younger groups, this lifestyle has to be reflected in the vehicle as well." □

With more information to be displayed and assimilated, the 'centre stacks' of cars could soon evolve into large touchscreen and voice and gesture-responsive spaces

Driving towards a digital future

From cars so safe they can be made of lighter, more efficient materials to e-models that drive to you with all your personal settings downloaded and installed, motoring could be about to undergo a radical change

"We're entering a very exciting time in automotive overall," says Intel's Elliott Garbus, who as General Manager of Automotive Solutions has a lot resting on it. "People buy vehicles for a wide range of reasons and I'm sure many buy them for recreation as well as commuting. And these technologies have a major role to play in safety, in enhancing the driver experience and even just whimsically providing more information about your drive."

It's in the realm of safety, however, that Garbus sees great potential. "Some 93 per cent of accidents are caused by driver error," he says. "If we didn't do that, if the cars actually prevented us crashing, or kept us dramatically safer, it could have far reaching effects across industry. For example, instead of having to design a car out of steel, aluminium and all of this heavy infrastructure, to crumple up and really keep us safe when we collide at relatively high speed, we could see much lighter vehicles.

"We could see different kinds of materials being used and that would go a long way to again boosting efficiency and economy, transforming the auto insurance industry. That's certainly a far-reaching, perhaps almost a utopian view, but I think that's the kind of thing that the computing advances that are still in front of us can enable."

Ian Pearson a futurologist at trend forecaster Futurizon goes even further, telling Telefónica's connected car report that advances in technology will see motorists develop a completely new relationship with the automobile.

"I see this space [the car] developing into a fully personalised, virtual environment with intelligent automation, creating a totally new relationship between the vehicle, the driver, and the passenger," he says. "Cars used to be solitary machines. Not so anymore – some can now detect other vehicles around them and even 'talk' to them. When cars are able to connect to each other in this way, things can get truly exciting. We could see a single stretch of road accommodating more cars safely, automatic management of lane changes, and even more efficient use of roundabouts.

Greater connectivity could see a decrease in road accidents leading to the use of lighter materials in radical future car designs

'CONNECTIVITY WILL UNLEASH A NEW ERA OF CREATIVITY JUST AS IT HAS WITH SMARTPHONES'

MARY CHAN, GM

"If safety and maintenance could be taken for granted, we as the passengers would be more willing to carpool and share them. Could every car feel like 'your' car? Further in the future, cars will come to you. They will take you where you want, and then you can just abandon them to go off to serve someone else. They will in effect offer a comfortable and socially inclusive form of public transport. This could even lead to buses disappearing from our city streets entirely."

This type of service could be with us in the not too distant future. Google has had success in trials of its self-driving car, but while the technology is approaching maturity, a consistent set of real world applications has yet to materialise. However, in recent months Google has begun exploring the possibility of using its autonomous vehicles in a 'robo-taxi' capacity.

The company recently led an investment of $258 million in Uber, a taxi-hailing app. Uber began by offering customers the chance to order vehicles from their mobiles, but the service has proved so popular that a number of competitors have emerged. Google's investment in the app developer could lead to taxi companies employing fleets of driverless vehicles that would be called via the app. The vehicles would collect passengers, ferry them to the required destination and then travel to a new client, all co-ordinated via the car's link to the app.

Mary Chan, GM's President of Global Connected Consumer, meanwhile, says that there are a number of apps she'd like to see in the future. "I wish my car could notify my family of my estimated time of arrival as I am driving to pick up my kids," she says.

"I also would love my car to sync with my calendar when I am away from my vehicle," she adds. "Scheduled trips from my calendar combined with my personalised driving patterns could be used to predict when I need to fill my gas or charge my vehicle.

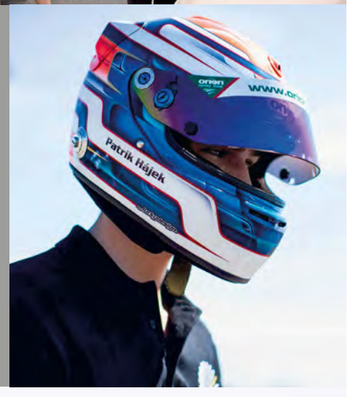
"These are just a few of the possibilities," she concludes. "One thing I am sure of is that connectivity in the vehicle will unleash a new era of creativity just as it has with smartphones, tablets and PCs."

FIA Institute Academy

IN SEARCH OF EXCELLENCE

Twenty-five young drivers from across Europe, each the number one pick of their country, headed to Austria to train and compete for a place in the FIA Institute Young Driver Excellence Academy. Ex-F1 driver Alex Wurz and his team were there to choose the best of the best ›

BY DAVID EVANS



In Teesdorf, Austria, for the FIA Institute Young Driver Excellence Academy 2013 Euro Selection Event. World-class trainers and drivers like Alex Wurz (top) give masterclasses and gruelling workouts to young hopefuls like Patrik Hajek (right), Spaniard Alex Riberas, Swede Erik Johansson, Michelle Gatting from Denmark and Britain's Jake Dennis.

The pain is writ large on Kevin Demaerschalk's face. His legs and arms are shaking. But he's not done. Not yet. All around him, drivers are going through the same thing. Their bodies are being asked questions they're not sure they can answer, plumbing depths they didn't know existed.

In the end, they all submit. And take a moment, lying on the mat. Is this it? Is this really what it takes to compete in world-class motor sport? Former McLaren Formula One driver Alex Wurz is on hand to confirm that… yes, it is. And it gets longer, harder and tougher from here on in. They each get up, ready for more punishment.

Twenty-five into one doesn't go. But today it must. Today is judgment day for a single place on the FIA Institute Young Driver Excellence Academy.

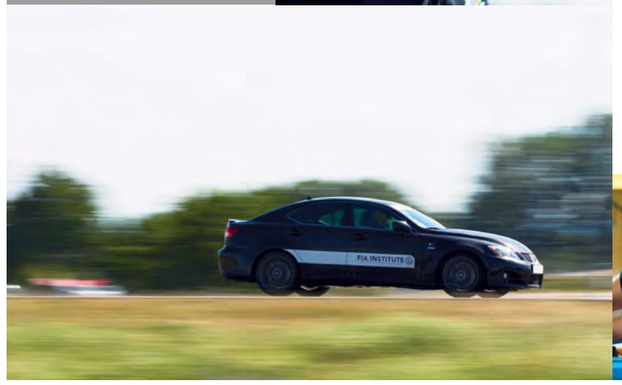
In an attempt to make the process of getting down to one driver easier, there's will be a selection of five finalists who will go forward to an interview and a one-shot hot lap. Pressure doesn't come near to describing it. This is beyond anything these young drivers have experienced.

Fortunately for them, they're well prepared. Having been put forward by their National Sporting Authorities (ASNs) for this selection process, the powers that be in their home countries have decided they're ready. They are the chosen ones. But now, they want to be the chosen 'one'.

Before they get to the final, they've spent time in the company of arguably the world's finest trainers in their fields. On track, Wurz and his company, Test and Training International, oversee all the driving. And in the gym and classroom, World Rally Champion co-driver Robert Reid's Elite Sports Performance (ESP) takes charge of getting the right messages across in terms of psychology, physiology, nutrition, hydration and training.

And then there's team building, career development, sponsorship, media awareness and, of course, the core safety principles of the FIA Institute. In the drivers' flat-out world, the last three days have been as busy as they've ever known.

The sessions are run out of Teesdorf, just south of Vienna, Austria. And it's achingly hot, which only serves to underline the hydration messages coming thick and fast from ESP sweat-measuring guru, Tony Turner.



"It definitely helps to focus the mind," says Turner, "when the conditions get a little bit more extreme." He turns back to the exercise in hand: the beep test. As workouts go, this is as tough as it gets. It starts with a gentle jog, more of a fast walk from one side of the gym to the other. The drivers are required to reach the other side in time with the beep. But then the gap between beeps gets shorter. And shorter. Suddenly, when you're really hurting, you have to dig deeper and run faster. And faster.

The fitness assessment comes early in the process, on the second morning. But it's immediately obvious these 25 are bonding quickly. When somebody falls, the first instinct is to encourage those still running.

But early friendships are soon put to the sword when the drivers are paired off and told to race for the reaction ball. For the uninitiated, a reaction ball looks like something left over from a lesson in nuclear physics. It's six half-balls stuck together, about the size of a tennis ball, but 100 per cent guaranteed never to bounce straight. Paired drivers sit, back to back, and wait patiently. Only when Turner throws the ball hard and high are they allowed to get up and chase it.

"No contact!" shouts Turner as elbows are sharpened. He's wasting his breath. This is a race and any race has winners and losers. Out of nowhere, Europe's 25 brightest young motor racing talents are scampering around a gym in pursuit of a bright red thing.

Victory means everything. These guys know that Reid, Wurz and fellow judge, FIA Institute director of education Gus Glover, are watching their every move.

Selection for the FIA Institute Academy has evolved this year. Gone is the single worldwide selection event where the entire intake was decided in one week. This year is a truly worldwide process, ensuring the best of the best will come to the FIA Institute's fully-funded training table.

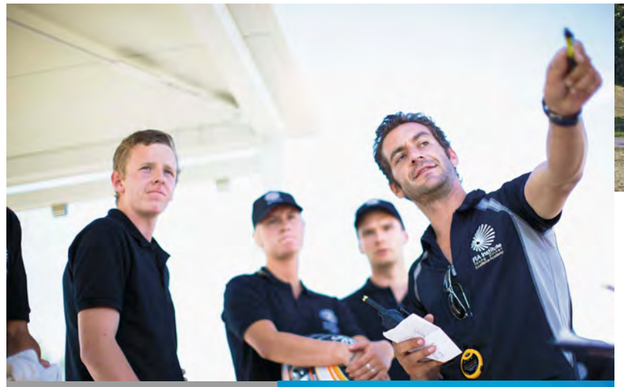
Europe is the first of five qualifying events. Still to come are the Middle East, the Americas, Africa and Asia-Pacific. Those next four events, which will be completed by November, will mirror the process mapped out in Austria over the last three days. Officials from all four regions have been involved in this all-new way of working.

For Glover, it's a real step forward in the way the event works. "We're reaching more drivers than ever by running ›

The students take a 450bhp V8 Lexus road car through a mixed condition wet-dry learning lap (below). The three-day event included assessment and training in the classroom, at the gym and on the race track.

'THEY CAN TAKE WHAT THEY'VE LEARNED BACK TO THEIR ASN, DEBRIEF, AND HELP SPREAD THE MESSAGE'

GUS GLOVER, FIA INSTITUTE



selection in this way," he says. "Before, the selection was just that: an event designed to bring out the best drivers. What we have now is a training and selection event. The drivers here are going through some of the same kind of tutorials and training that the successful candidates went through in the actual Academy workshops in the previous two years. They will all leave here having learned a lot and they can take that back to their ASN, debrief with them and help spread the message – that's really important to us."

And it's really important to the drivers. The last three days has opened their eyes to their responsibilities on and off the track. Such is the entertaining nature of the tutorials that they are only now becoming aware of their understanding of the friction circle and advanced vehicle dynamics and their effects on road safety.

Sweden's Erik Johansson is still trying to take it all in. The 16-year-old Formula Renault driver just stepped out of a V8 Lexus road car, having hammered the 450bhp machine through a mixed condition wet-dry learning lap.

"It was nice," he smiles, nervously. Asked to compare it to what he's driven before, he says: "That's difficult. I'm 16 and not old enough to drive cars on the road yet, so I don't have much to compare it to…"

And yet, such is Johansson's pace and performance, he not only makes it through to a final shortlist – increased to six due to the quality of intake – he comes within a whisker of winning the whole thing.

Johansson's fellow finalists are Kevin Demaerschalk (22, Belgium), Jake Dennis (18, UK), Michelle Gatting (19, Denmark), Ignas Gelzinis (22, Lithuania) and Dennis Olsen (17, Norway).

The group now has an inevitable divide between those with a golden ticket and those without. For those who came close, but not close enough, there is disappointment and frustration. But at the same time, the pressure of the last three days can finally lift. The banter begins.

On the other side of the room are the six who still have the biggest test ahead of them. With their interviews done, it's back to the track one last time. One by one they are called forward. Helmets are pulled on and the drivers eye up the first apex.

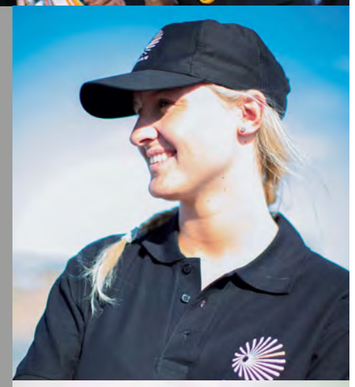
Upcoming Selection Events

MIDDLE EAST AND MEDITERRANEAN
Abu Dhabi,
22-25 September

AFRICA
South Africa,
29 Sept - 2 Oct

AMERICAS
Mexico,
14-17 October

ASIA-PACIFIC
Sydney,
20-23 October



The competition is incredibly close, with Gatting's lap impressing in terms of outright commitment. The Scirocco R-Cup racer has given an exceptional account of herself. She's shown the kind of grit, determination and ability required. But one guy's done it just that little bit better.

Step forward Ignas Gelzinis, a 22-year-old Lithuanian racing Renault Clios in Britain. But he can't step forward. At the announcement, he's rooted to the spot. All he can do is pull his cap down over his eyes in disbelief. Minutes later and the emotion is still too much for him.

"I don't know what to say…" is all he manages. When he finally composes himself and can finish the sentence, it's everything you would expect from a humble winner: "It was amazing just to think I am one of the 25 top young drivers in Europe, but now to win this is incredible. I have to thank everybody at the FIA Institute for this opportunity."

It's not lost on Gelzinis that, as the first Academy 2013 member, he will go on to become a qualified road safety instructor. Each of them takes away a message. It's one of excellence on and off the track. It's a message that could save lives and help educate their fellow road users.

But this is just the start. The FIA Institute Young Driver Excellence Academy is a unique process, which takes a global and wholly independent view on nurturing the best young drivers from the earth's four corners.

Wurz and Reid have enjoyed the process and are content the right decision has been made. "This three-day event has found some real talent," says Reid. "But from the start Ignis has been in the frame. There was big pressure today, but he went out and delivered again. It's tough for the drivers who didn't win, but they are all taking lessons away from here. Undoubtedly, they leave this process as more informed drivers, athletes and individuals."

Wurz reiterates what he's just told 24 distraught drivers. "We shouldn't forget," says the two-time Le Mans winner, "there are eight spaces on this year's programme. We have chosen one. Four more will come from the regional events, but then there are three wildcards – and these drivers have all done enough to be in with a good shot at one of those."

Europe has found its star and possibly stars. Now it's time for the rest of the world. □

PHOTOS: MALCOM GRIFFITHS

'IT WAS AMAZING TO THINK I AM ONE OF THE 25 TOP YOUNG DRIVERS IN EUROPE. BUT NOW TO WIN THIS IS INCREDIBLE'

IGNAS GELZINIS, SELECTION EVENT WINNER

Ignas Gelzinis, the 22-year-old Clio driver (above) is the first confirmed driver at the 2013 FIA Institute Young Driver Excellence Academy. He outshone his five fellow finalists (top) on the final day. The event also included classroom-based road safety and sport science sessions (opposite page, right) giving every young driver plenty to take home with them.

Race safety

MARSHALS MATTER

The safety and success of motor sport depends on trained race marshals. But in countries with little experience of hosting big races, readying hundreds, if not thousands, of volunteers is an immense challenge to solve >

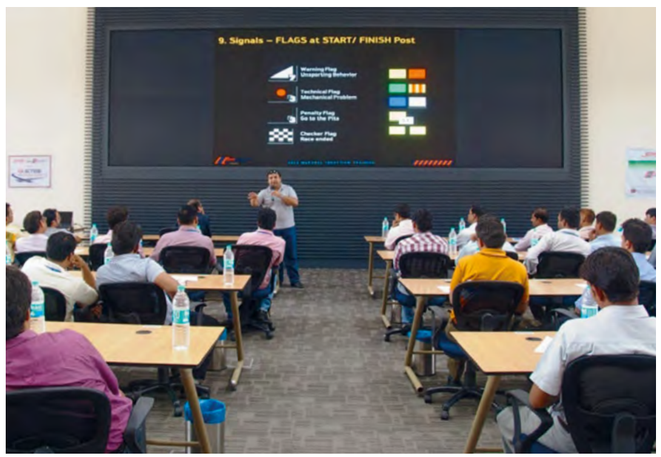
BY MARC CUTLER

Marshals called into action at the 2011 Indian Grand Prix (main pic). In the classroom, trainee marshals are learning about the standard flags (below)

For Rajan Syal, CEO of India's National Sporting Authority, the Federation of Motorsport Clubs of India (FMSCI) it was "like being thrown into the deep end without knowing how to swim." That was how he described the experience of preparing 850 volunteer marshals to help make India's first grand prix happen in 2011. Other new Formula One venues such as Singapore and South Korea have faced similar obstacles in recent years. So how does a country with minimal motor racing experience prepare marshals for the biggest event in the sport?

In recent years it is through a large slice of help from the Motor Sport Safety Development Fund, run by the FIA Foundation and administered by the FIA Institute. That was certainly the case for India, South Korea and Singapore, each of which applied for grants to help train their motor sport officials.

Syal can look back now with satisfaction, as India's first grand prix was such a success, yet the behind-the-scenes marshal recruitment drive it required was mammoth. In response to advertisements for volunteer assistance, more than 3,000 hopefuls came forward. Some were wide-eyed teenagers excited by the prospect of getting so close to Formula One. Others were already working in a motor sport environment in India, either as competitors or as members of their own local motor clubs.



India has a vibrant grass-roots motor sport scene, with thousands of active participants. The challenge for the FMSCI was to identify those most suitable to work at a grand prix and then train them as effectively as possible.

"When we first knew there would be a grand prix in India, we thought that maybe we would have to undertake a huge 'importing' of experienced marshals from other countries, simply to get the event going," explains Syal. "We realised, however, that through our connections with the FIA Institute and other FIA clubs that are Regional Training Providers, training our own marshals would be a possibility."

And that is what began to happen, but only after a rigorous selection process to find the strongest candidates from the original 3,000 applicants. This induction phase was conducted in five cities. It involved interactive multimedia preparatory sessions and had as its main aim the dispelling of common myths about working as an F1 marshal.

It covered the nuts and bolts of a marshal's life – even such basics as the fact that the job would mean standing in high temperatures for long periods without letting attention levels slip. The risk inherent to marshalling at a motor sport event was also emphasised, but in the context of explaining that it is marshals, by and large, who help make racing safe.

'OUR CONNECTIONS WITH THE FIA INSTITUTE MEANT TRAINING OUR OWN MARSHALS WAS A POSSIBLILTY.'

RAJAN SYAL, CEO, FMSCI

"We wanted to explain the job realistically," says Syal, "but also to make our volunteers understand the important role they play."

Hopefuls were given a questionnaire at the end of the induction phase, with questions designed to test their knowledge of F1. They were asked, too, about any special abilities they might have, any experience in motor sport, or any additional information that might prove useful.

"It was a big task," admits Syal, who ruled that only applicants with previous experience in motor sport would be selected for training, bringing the number down to 1,200. These candidates were all invited to attend introductory training workshops. It was at this point that the logistical challenges of training volunteers in a country as big as India soon became apparent.

"We went the length and breadth of the country to find the right people," recalls Syal. The quest was helped immeasurably by a grant from the Fund, which enabled the FMSCI to work with the UK's Motor Sport Association (MSA), which is an FIA Institute-appointed Regional Training Provider.

Working under guidelines established as part of the FIA Institute's Train the Trainer programme, the MSA's Sue Sanders and Ian Watson created a group of 15 qualified trainers in India, who in turn began ›

Medical training in progress during an induction weekend in New Delhi (above); a newly trained marshal at his first race weekend (below)

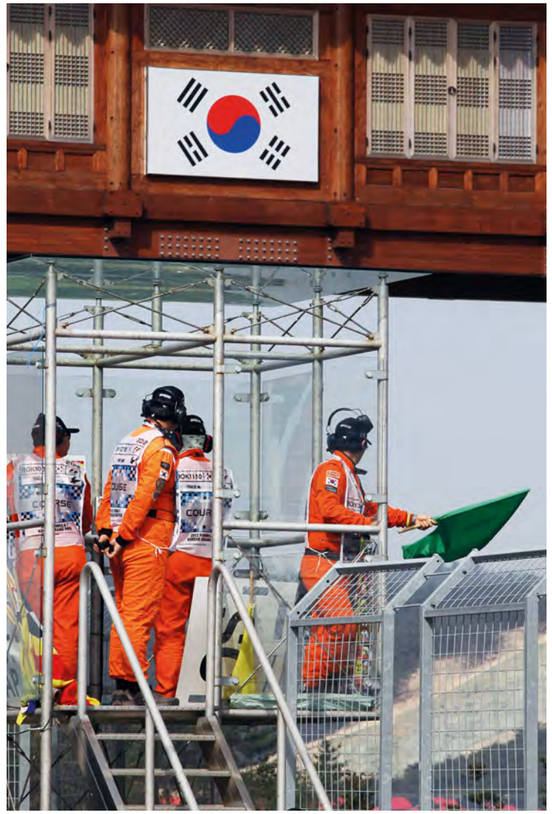
to train volunteers across the country. The programme was divided into five phases: Scrutineering; Pit and Grid; Fire and Rescue; Recovery and Track Clearance and Race Administration. It was conducted in two parts, each two days long, and in two cities, Chennai and New Delhi.

Using lectures and additional printed material, as much relevant information as possible was broken down to ensure that possibilities for misunderstanding were minimised. Experienced trainers from Bahrain provided an extra resource for this stage of the programme.

Practical aspects were as important as theoretical teaching, so role-playing of scenarios likely to be encountered by marshals played a significant part. This included how to approach a stranded driver, how to handle a stranded car and situations such as fire and rescue.

"The training really helped us gain confidence," emphasises Syal. Gradually, leaders from the larger group started to emerge. It was at this point that the 950 were whittled down to a final 850 marshals who would go on to work at the grand prix, with the selection being made on the basis of performance, attitude and commitment. This group went forward to the final training stage in the week running up to the event. The training was intended to replicate the live race weekend experience as much as possible, so local and overseas officials conducted detailed training on the track, as well as working on preparatory exercises and shakedown drills.

By the Thursday morning of the first Indian Grand Prix weekend, 27 October 2011, India's F1 marshalling team was ready. "It was a



'89 PER CENT OF OUR MARSHALS CAME BACK TO VOLUNTEER FOR THE 2012 GRAND PRIX'

RAJAN SYAL, CEO, FMSCI

proud and exciting moment," says Syal. "It was wonderful to see how everything came together – and they must have enjoyed it because 89 per cent of those first 850 came back to volunteer for the 2012 Grand Prix.

"What is equally important is that all those we trained have gone back to their local motor sport and motoring clubs with so much extra knowledge and new skills to pass on. This programme will definitely have helped raise the standard of motor sport safety across the whole of India."

India's case is not unique. There are now more than 40 National Sporting Authorities (ASNs) benefiting from the help and training of an FIA Institute-appointed Regional Training Provider. Grants given out by the Fund's Officials Safety Training Programme have been used for a range of projects, from providing countries with a first taste of officials' training to advanced programmes for senior officials.

Singapore and South Korea worked with Confederation of Australian Motorsport (CAMS) to help prepare them for their first grand prix. Subjects covered included stewarding, fire safety, recovery, flags and communications. In South Korea, the development of an instructor-led and online training curriculum ultimately prepared 1,500 officials for the inaugural Korean Grand Prix and for future events.

Currently, the Russian Automobile Federation (RAF) is availing itself of a grant to run an extensive officials training programme with help from the Automobile and Touring Club of the UAE, in preparation for its first Formula One race in 2014.

But it is not just F1 that has felt the benefit. Training marshals goes all the way down to grass-roots level and is essential for the development of motor sport in any country.

Over the last three years, Tanzania has been given assistance to train its rally officials. Similarly, in Kenya and Madagascar, ASNs have used grants from the Fund to develop and enhance officials training programmes, with the UK's Motor Sport Association as their Regional Training Provider.

Sri Lanka has also successfully recruited and trained new motor sport officials for the last three years with the help of Australia's CAMS. The programme has been so effective that in 2013, the Sri Lankan ASN itself achieved the first level of accreditation in the FIA Institute's Officials Safety Training Programme, otherwise known as Commitment to Excellence.

A marshal gives the all clear after an incident at the Korean Grand Prix (left). Fire drills are just one of the components of the training (opposite page, top) before marshals can work at major events such as the Singapore GP (opposite page, bottom)

A number of countries have used funding to organise seminars for their region, enabling information to be widely disseminated. Examples of this include the annual seminar organised by Spain's Real Federacíon Española de Automovilismo (RFEDA), which usually attracts approximately 400 attendees, and the two-day event run in 2011 by the Türkiye Otomobil Sporları Federasyonu TOSFED, which saw participants attending from 19 other countries.

Since 2010, the Netherlands has used funding to establish a multi-disciplinary training academy for officials and trainers. The aim was to implement a new training infrastructure to improve officials' competency levels across all motor sport disciplines, with the help of a state-of-the-art e-learning platform.

At the other end of the scale, some countries just starting out in motor sport have used the Fund as a chance to introduce formal officials' training into their operational plans for the first time. One example is the Trinidad and Tobago Automobile Sports Association, which, with the help of CAMS launched a programme to train officials as part of their five-year plan to develop motor sport in the Caribbean country.

It all bodes well for the future of motor sport worldwide. For if competition is to continue to develop in a growing number of countries across the world, well trained marshals will be crucial to the organisation and safety of events, from karting and entry-level competitions to rallying and Formula One. As Syal puts it: "They're the backbone of all forms of motor sport."

PHOTOGRAPHY: ACTION IMAGES/LAT/SUTTON IMAGES/REUTERS

Future transport

IF NOT ELECTRIC, WHAT?

Electric cars may not be the panacea for sustainable transport in the 21st century, which is why major manufacturers such as Audi are betting on other technologies with the potential to be as important as the combustion engine

BY PETER WRIGHT

For all the industry optimism and fervour about electric vehicles they still may not provide all the answers to the transport problems of tomorrow. Though EVs deliver emission-free transport, their limited range and high cost are major stumbling blocks that have so far not found satisfactory solutions. This is why car manufacturers are hedging their bets on different technologies and are devoting their time and expertise on a range of future-proofed solutions.

One of the most radical technologies in development at present are carbon-neutral fuels. These synthetic fuels are compatible with current engines, but are not detrimental to the environment. It may sound like something out of a science fiction novel, but one manufacturer is counting on it becoming a reality, and sooner than we think.

German manufacturer Audi has so much confidence in carbon-neutral fuels that it has entered into a joint venture with one company working on the innovation, and is investing significant resources in its success.

Called e-fuel, the products are generated by bio-organisms continuously converting industrial CO_2 and water, in the presence of sunlight, into hydrocarbons, which results in end-products identical to either ethanol or diesel. Audi is hoping it will be able to synthesise a chain of sustainable fuels as early as the end of this year.

If e-fuels can scale commercially, they have the potential to massively reduce the carbon footprint of motoring worldwide, but without abandoning the piston engine.

Reiner Mangold, Audi's Head of Sustainable Product Development, explains: "Our Audi e-fuels are a new generation of renewable fuels, which only need CO_2, water and renewable energy: no biomass is necessary. It is important to note that the e-fuels are drop-in fuels, which means we don't have to change the engine technology. This helps to replace fossil fuels faster and at the same time it makes CO_2-neutral mobility possible, even for older cars." ›

In the New Mexico desert, Audi is helping Joule Fuels to synthesise carbon-neutral fuels using bio-engineered micro-organisms.

‘E-FUELS ARE A NEW GENERATION OF RENEWABLES NEEDING ONLY CO2, WATER AND SUNLIGHT’

REINER MANGOLD, AUDI

Joule’s bioreactor is located at a four-acre plant (top) designed to scale for industrial output. Reiner Mangold, Head of Sustainable Product Development at Audi (above) is partnering with the company to develop e-fuels for the consumer market. Left: One of the micro-organisms used in the fuel’s production. Each measures just 3000th of a millimetre in size.

At a time when governments are calling for solutions to address the joint problems of fossil fuel shortage and climate change, and as emerging markets feed more demand than ever for consumer transport, the need for green technologies to fulfil their potential is more urgent than ever.

E-fuels, if they can deliver on their promise, will offer cost-effective, guilt-free motoring, through biotechnology pioneered by Audi’s partner, Joule, harnessing the sun’s energy. This is not just a scientist’s dream demonstrated at the molecular level in the laboratory. It’s already way beyond that point.

Pilot production is under way in the desert of New Mexico, with commercial production of drop-in, carbon-neutral fuels predicted for the second half of the decade.

On the face of it, this fuel could single-handedly revolutionise the automotive industry, and beyond that transport in many forms.

Mangold is certainly not blind to its potential. “We are sure that e-fuels will help to solve some of the problems we have today, bringing important benefits such as oil and energy independence, CO_2-neutral mobility and cheaper fuel prices,” he says. “It would be wonderful if our e-fuels would line up one day with inventions like the piston engine, quattro all-wheel drive and TDI direct injection diesel engines.”

WORK IN PROGRESS

Joule’s partnership with Audi will accelerate the development and commercialisation of e-fuels. There will be an e-ethanol and an e-diesel, both made using a range of patented, genetically engineered micro-organisms that streamline the process of capturing the sun’s energy and CO_2, directly synthesising and secreting specifically designed hydrocarbon end-products.

Unlike the production of ethanol, no sugars or biomass are used in the production of these e-fuels and as a result they don’t divert land away from food production – one of the criticisms leveled at ethanol. This explains why Joule’s bioreactor can be located at a four-acre site in the deserts of New Mexico.

The primary energy input is sunlight, which is the most plentiful energy source on earth. The other major input is waste CO_2, which is sourced from power, steel and cement plants. The resulting fuel is therefore certified carbon neutral.

The water used in the process does not need to be pure, so there is no competition with human or agricultural demands. There ›

are virtually no waste products either. And the fuels are cost competitive with existing, oil-based fuels. It all sounds too good to be true. Audi doesn't think so.

Some years ago, the company recognised that the eventual electrification of cars would require intensive Research and Development, production facilities, and infrastructure investment. Whether EVs ended up being powered by on-board battery storage or hydrogen fuel-cells, Audi's development of the internal combustion engine and their range of gasoline and diesel engines would become obsolete.

Audi still believes there is a place for electric cars but is also convinced that fuel-based engines are an essential part of the mix. "We need both technologies, because each has advantages and disadvantages," explains Mangold. "Electric cars are emission-free locally and are very efficient, which means you need less energy. But they are also, at least right now, limited in range and it takes a long time to recharge the battery. With our e-fuels on the other hand, you are able to have CO_2-neutral mobility over longer distances and you can also use it in older vehicles. But you are still not emission-free at a local level. The perfect combination would be a plug-in hybrid with e-fuels, so you can drive emission-free in the cities and CO_2-neutral long distance."

Joule's fuels are sulphur-free, and the diesel has a high cetane number, indicating good burning properties. Audi can offer technical support to the fuel development process in the form of know-how and also provide hardware when it comes to fuel and engine testing.

Gaining exclusivity may seem like an astounding achievement, but Audi says that when it approached Joule Unlimited in 2011, there was no sign of interest from the US automotive industry.

Audi is forecasting uptake of e-fuels based around some fairly conservative figures, but the way it plans to promote their development is highly inventive.

Joule's CBO Paul Snaith in the lab with Reiner Mangold, Head of Sustainable Product Development at Audi

PHOTOS: AUDI

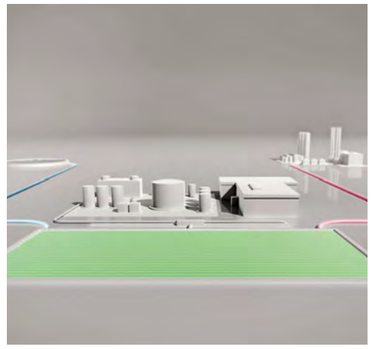
Audi does not want to become a fuel manufacturer or distributor, but it does want to encourage the production of e-fuels at an economically attractive price point, and to see them added to fuel distribution networks around the world. It also wants Audi's customers to continue to be able to buy combustion engine cars that have the lowest life-cycle carbon emissions, at least on a level with electric vehicles.

To achieve that goal, it plans to provide purchasers with an agreement that for each litre of fuel they put in the tank, Audi will put a litre of e-fuel into the network, such that they effectively run on carbon-neutral fuel.

"Audi is not currently planning to become a fuel producer," says Mangold. "Our goal is to draw more attention to other ways of achieving CO_2-neutral mobility, like our e-fuels, and also to pioneer such fuels. That is why we are helping start-up companies like Joule to develop market-ready renewable fuels which can be used within the existing infrastructure and by existing vehicles."

Not many silver bullets actually work, but if Joule and Audi's vision becomes a reality (the economics of production relative to oil-based fuels will ultimately determine this) and if synthetic fuel production can develop an economy of scale, the technology will be a game-changer. It is potentially the most significant innovation for automotive, aviation and shipping since the internal combustion engine. It would be extendable not only to new vehicles and aircraft, but to all existing ones too, potentially solving the transport industry's CO_2 problem at a stroke.

It may take some time to develop to a global scale, but Joule and Audi are together demonstrating that carbon-neutral transport fuel is a workable alternative to fossil fuels. Now it remains for them to prove the financial viability and early signs that it can produce a gallon at $1.28 are very encouraging. In any case, it's a promising start for transport that is future-proofed for the 21st century, and whose commercial exploitation will ramp up from the end of this year. ▫



The race is on

Audi is not the only manufacturer chasing emission-free mobility. Here is a sample of some of the other solutions jockeying for position

HYDROGEN

Hyundai is one of a rising number of manufacturers betting big on emission-free, hydrogen- powered cars. Although Hyundai has had its fuel-cell vehicles in development for more than 15 years, it is only now – with something resembling a viable hydrogen-refuelling network in place – that it can consider putting a fuel-cell car into production.

It recently signed a deal to become an integral part of London's Hydrogen Network Expansion, covering the UK's capital and south-east England. The government-backed project will put hydrogen-fuelled vehicles into daily business use and deliver the refuelling infrastructure necessary for its proper functioning and growth.

General Motors and Honda have also announced a long-term master agreement to co-develop next-generation fuel-cell and hydrogen storage technologies, aiming for a 2020 implementation deadline. The collaboration will share expertise, common sourcing strategies and develop economies of scale.

GM and Honda also plan to work with stakeholders to advance the refuelling infrastructure, which is critical for long-term viability and consumer acceptance of fuel-cell vehicles.

ELECTRIC ROADS

The limitations of electric cars have traditionally been twofold – lack of range and high cost – but Volvo thinks it may have resolved both with one swoop. Consider a future where trucks and buses are continuously supplied with electric power without carrying large batteries. Instead, they draw on power lines built into the surface of the road.

Last year, Volvo built a 400 metre, electrified track at its testing facility in Hällered, outside Gothenburg, and the company has been using the system since last autumn. The method currently being developed and tested by the Volvo Group, together with Alstom, entails two power lines built into the surface of the road along the entire length of the road. A current collector located on the vehicle is in constant contact with the power lines.

The power lines run along the road's entire length. One is a positive pole, the other is used to return the current. The lines are sectioned so that live current is only delivered to a collector mounted underneath or at the rear of the vehicle if an appropriate signal is detected. As an additional safety measure, current only flows when the vehicle exceeds 60 km/h (37 mph).

FIA International Series

STANDARD BEARERS

The FIA's racing remit doesn't start and end with its world championships. The federation also gives its seal of approval to a rapidly growing number of international series, all of which uphold the governing body's exacting safety requirements ›

BY JUSTIN HYNES

PHOTOGRAPHY: PETER-AUTO-RACING.COM

Classic Endurance Racing, which takes place across seven European countries, is just one of 36 series to be newly approved by the FIA for 2013.

Pick up any motor racing weekly from around the world and the chances are that the cover picture will show Sebastian Vettel wagging his index finger in acknowledgement of yet another F1 victory, or a shot of Sébastien Ogier atop his VW Polo celebrating his latest WRC win, or even an image of a triumphant Audi crossing the line at Le Mans.

What it won't show are the many lower level championships that criss-cross national borders each weekend. Turn to the back pages of these same magazines, however, and there they are, series where the competition is just as intense, where the circuits carry the same scent of great racing heritage as grand prix venues, and where assurances about coherent organisation, fairness and safety are just as paramount as at top of the sporting ladder.

It's the FIA's task to put those assurances in place, using its member national sporting authorities (ASNs) and their member clubs to identify international series that have at least one event staged beyond their own national borders. By ensuring that they conform to minimum safety requirements, and with the added appeal of official FIA status, the series become more enticing to spectators, competitors and sponsors alike.

Following a major review last year, the programme has seen huge growth. 35 of the 73 international series now approved by the FIA were newly sanctioned this year. It is, says Gérald Richard, Head of the FIA's Interdisciplinary Activities Department, part of a concerted effort by the federation to bring series into line with the international body's safety standards.

"We became aware that there were many series out there that were not part of the family, that existed under the radar, so to speak," he explains. "It is important for us to collect all these series under our umbrella to ensure safety and to make sure that they all have a coherent and safe set of regulations.

"The key point we want to see is that all of these series run their events on circuits homologated by the FIA. On top of their regulations meeting certain requirements, it also affords competitors a minimum level of safety." ›

In order to get championships sanctioned, ASNs get in contact with international series via their member clubs, and task them with preparing a dossier that is then submitted to the FIA.

It sounds straightforward but according to Richard the procedure can take time. "The dossier consists of a number of items, such as letters of authorisation from the host ASN, the characteristics of eligible cars, a calendar, the level proposed for the series based on the weight/power ratio if it's a circuit series, and also full sporting and technical regulations," he says.

The regulations are required so that the FIA can confirm the series' rules meet the standards set out for minimum safety in article 24 of the federation's International Sporting Code.

"It's an exhaustive process," says Richard. "So what we intend to do is to build a template covering the main points we would like to see addressed, which the promoter can fill in. This is the goal for next year and it should make the process a little less complex."

Once the FIA has reviewed the dossier, comments are sent back, and after the promoter has satisfied the demands of the ASN and the FIA, the series is then put forward for approval at the subsequent meeting of the World Motor Sport Council.

To get to that stage, however, ASNs must first identify suitable series and persuade promoters that the process is worthwhile. According to Cheryl Lynch, Race, Speed and Kart Executive at the Motor Sports Association (MSA), promoters are not always keen.

"As with most registration requirements dictated by a governing body, some organisers tend to see the process as being somewhat bureaucratic, and perhaps a little frustrating," she concedes. "For example the formalities of the process, plus the fees for registration, can sometimes be seen as an issue, as organisers at the lower levels see their role as to facilitate and encourage participation in the sport. However, I believe the need for consistent standards is well recognised, and it is imperative that there is consistency."

When a championship does finally get sanctioned, the FIA seal of approval has its benefits, as Richard and Lynch can confirm.

"Being able to use that FIA label is very important for some series," says Richard. "We are able to help them in a much closer way than in the past. In the future we'll open a page dedicated to each on our website with a direct link to the series' own website. That's something we're working on and is designed to give them as much exposure as possible.

"I think it also helps to attract competitors, who can clearly see that standards have been met," he adds. "To be competing in an FIA competition is of greater significance for competitors, I think, and that may help attract sponsors."

Lynch agrees, saying, "As an example, MotorSport Vision Racing runs three FIA International Series. Two of those believe that their series has become more attractive to competitors and, to an extent, to sponsors as well. All three said that they believed their series had gained greater credibility and one said they hoped it would become easier to obtain track time on high profile events."

Circuit racing series make up the bulk of the approved international series, with 68 featuring formula cars, saloon or sportscars. Within that category, it is historic racing that has seen the biggest growth, with 12 series receiving approval this year alone.

"For many years, organisers of Historic circuit racing were taking their members to overseas domestic events across Europe and were not aware of the requirement to register. Following the FIA review, the MSA contacted those organisers, and a consultation process ensued to ensure that the series became registered where necessary."

Beyond circuit racing, the pickings are slimmer, with just one rally series being sanctioned by the FIA and only three off-road events being approved.

"It is hard to say why," admits Richard. "It could be a cost factor but the simple fact is that the series that were sanctioned this year were associated with a manufacturer or a larger series promoter. In WRC we had a new promoter and more interest, so the series that got approved (Citroën Top Driver) is linked with a manufacturer in that series. It was the same for the rallycross series approved. A new promoter for a major championship saw a secondary series approved."

There has also been a significant rise in the number of Far Eastern series recognised, and while that could create the false impression that previous events were poorly organised, nothing could be further from the truth.

"They play the game very well," he says. "They are very well organised. Actually, the biggest problem is in Europe, where we have discovered a lot of series operating without any sanction from the FIA. It is ultimately the ASNs' responsibility to keep on top of this as many series had slipped through the cracks in the past."

Richards is satisfied that this year's roster of 73 approved series is a major step in the right direction but is equally sure that further gains will be made in the coming years.

"Some ASNs have been reluctant to embrace the idea but once everyone gets that it's to the benefit of everyone, then things progress well," he says.

And some, such as the MSA, have earnestly picked up the gauntlet.

"The MSA works with its member clubs to present series to the FIA, and offers those clubs as much support as possible during that process," says Lynch. "The assistance provided by the FIA is integral to this process and is greatly appreciated. The MSA has also been involved with meetings of the European ASNs, co-ordinated by Germany's DMSB. This has helped the ASNs to understand wider issues and concerns and has improved liaison between those ASNs." □

The Asian Le Mans series is just one of a number of increasingly popular Far Eastern series to receive FIA approval.

Lotus Cup Europe offers enthusiasts the chance to race on some of Europe's classic circuits such as Dijon-Prénois in France.

This page, top left: historic racing series such as the Group C/GTP series for 1980s sportscars represent a major growth area on the FIA International Series calendar. Top right and below: Championships run the gamut from amateur events to top-level series such as ADAC Procar, which attracts ex-F1 drivers such as Christian Klien.

'TO BE COMPETING IN AN FIA SERIES IS OF GREATER SIGNIFICANCE FOR COMPETITORS'

GÉRALD RICHARD, FIA

PHOTOGRAPHY: F1-PHOTO.CO.UK/LOTDRTC.COM/ADAC PROCAR/REWIND MAGAZINE

Stats at the back

INTERNATIONAL BOOM TIME

The FIA's major championships may generate all the news heat but it's at grassroots level that the real temperature of motor sport can be gauged and if the expansion of the FIA's International Series calendar is anything to go by then racing is in rude health. This year 73 cross-border series have been given a stamp of approval, each being judged worthy of the technical and sporting standards the federation sets. Of that total, 35 are new for this year and exist right across the motor sport spectrum from circuit racing to rallying and from off-road to hill climbs. By far the biggest growth area, however, is in historic racing, with 12 new series sanctioned this year alone.

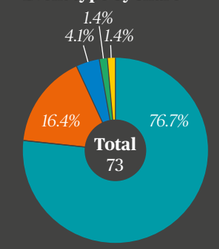
Key

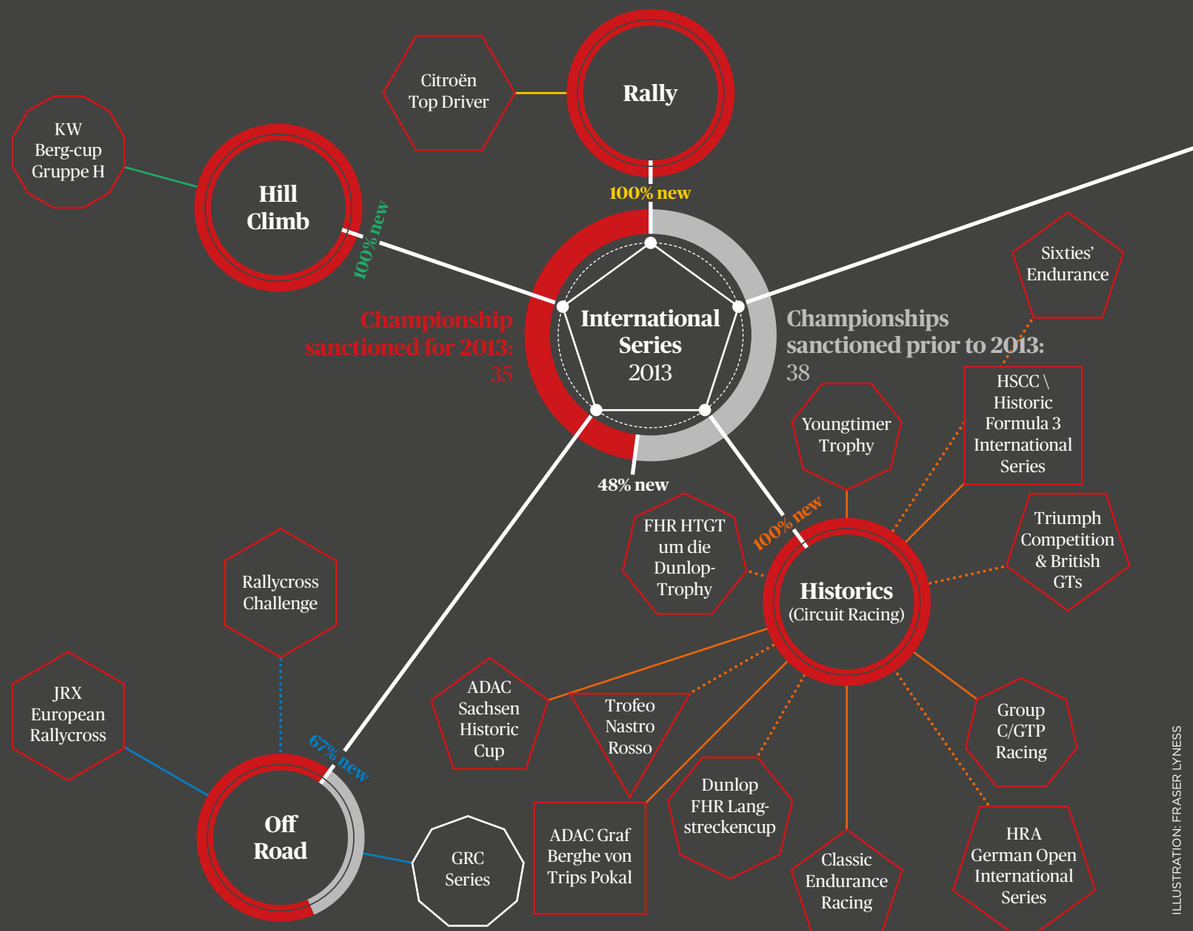
- Circuit Racing
- Circuit Racing, Historics
- Rally
- Hill Climb
- Off Road

The number of faces on each shape indicates the amount of scheduled events for each championship

Example: 4 8 6

Event type by share





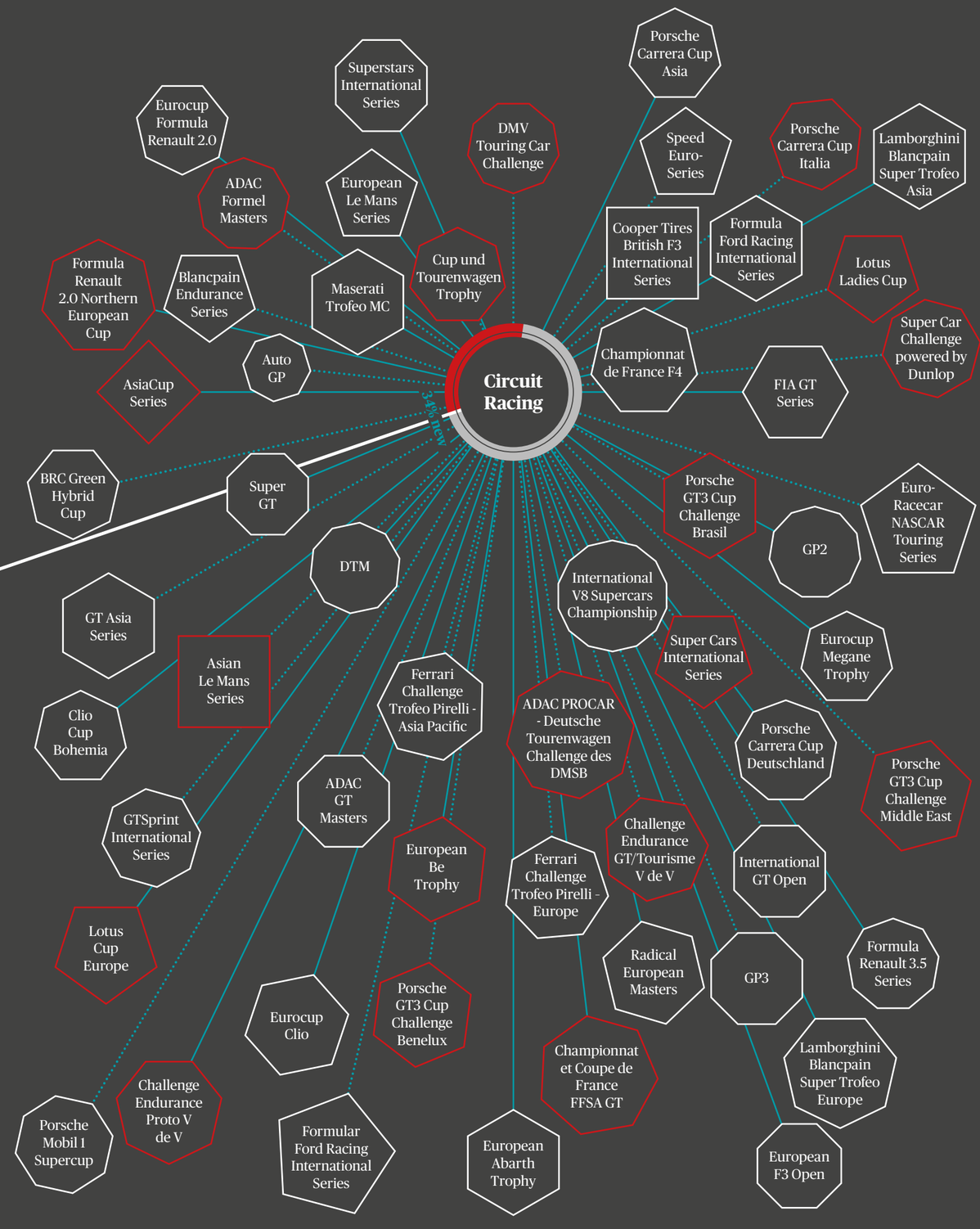


ILLUSTRATION: FRASER LYNESS

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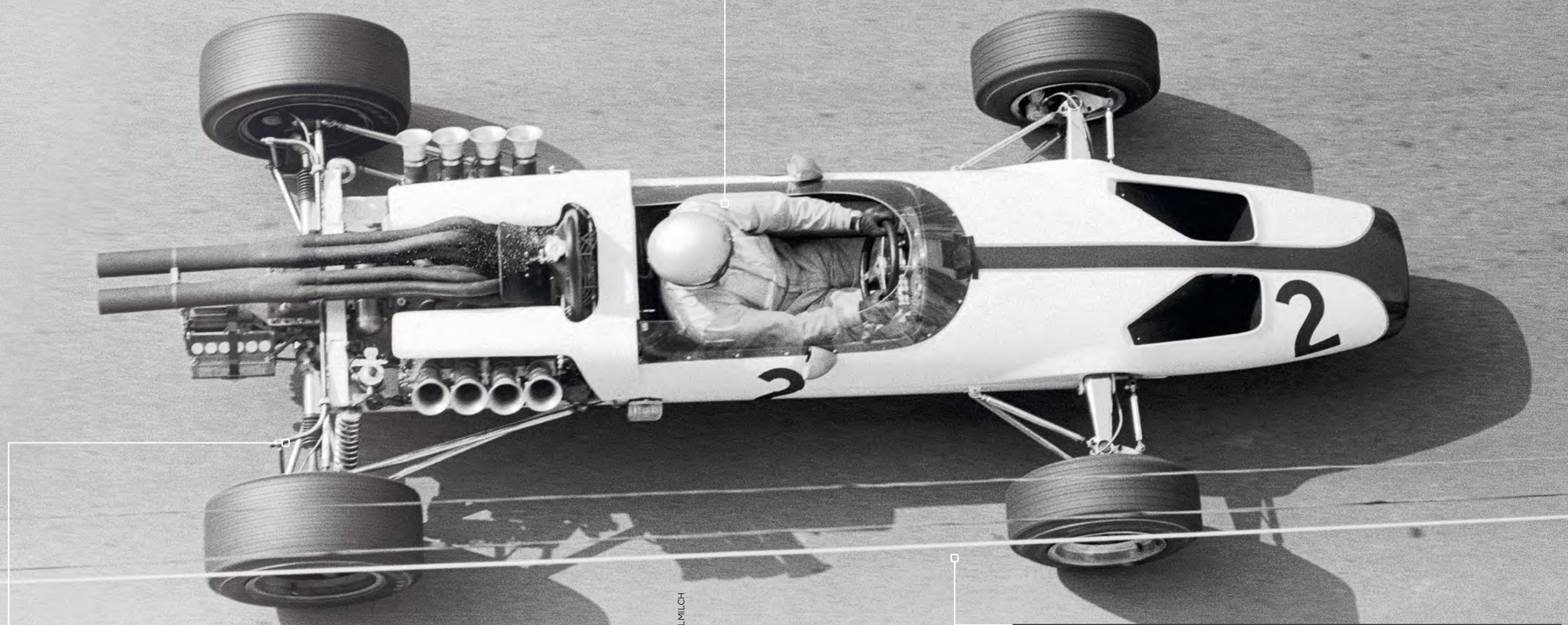
GOLDEN MOMENT

With McLaren celebrating its 50th anniversary in September 2013, we look beyond the team's first efforts in sports cars to its Formula One debut and this iconic image of Bruce McLaren piloting his M2B around Monaco in 1966

Fifty years ago, a restlessly imaginative young F1 driver from New Zealand took the bold step of combining behind-the-wheel adventure with an equally high-risk endeavour – designing and building his own racing cars. Bruce McLaren quickly grew his company from a seat-of-the-pants business operating from a lock-up garage in New Malden, London, into a racing power-house that by the time of his tragic death in 1970 was contesting for Formula One titles and dominating the Can Am sports car series. It was far from the end of the tale, however, and with the torch passed to McLaren's first partner, Teddy Mayer, and then Ron Dennis, the McLaren name became one of the most famous in motor racing. Landing eight team and 12 drivers' F1 titles in the time since the death of its founder, the team's quest for competitive edge and racing innovation remains undiluted half a century later. And while McLaren's glass and steel techno-temple in Woking may be a far cry from that small lock-up garage, the team's spirit is still as strong as ever. Bruce McLaren's immortal words about fallen team-mate Timmy Mayer still sum it up best: "It would be a waste of life to do nothing with one's ability, for I feel that life is measured in achievement, not in years alone." ▫

'I FEEL THAT LIFE IS MEASURED IN ACHIEVEMENT, NOT IN YEARS ALONE.'

BRUCE MCLAREN



PHOTOGRAPHY: GETTY IMAGES/RAINER SCHEGELMILCH

THE MAN: Bruce McLaren

Born in 1937 in Auckland, New Zealand, Bruce McLaren made his F1 debut at the 1958 German Grand Prix in a Cooper-Climax F2 car, finishing fifth. The following year he took his first victory at the US GP at Sebring. At just 22 years and 80 days he became F1's youngest ever winner, a record he would hold for 44 years until Fernando Alonso won the 2003 Hungarian GP. After finishing third in the 1962 championship, McLaren, aged just 27, set up his own racing team in 1963. After participating in the Tasman Series in Australia and New Zealand, the restless McLaren couldn't avoid a tilt at F1 and in 1965 he left Cooper to make his debut as an F1 constructor the following year. He took his fourth career win and his company's first in Belgium in 1968. He continued to enjoy a successful career in sports cars, too, before a tragic accident while testing his M8D at Goodwood Circuit in 1970 claimed his life. He was just 32 years old. The company he founded raced on, however, and since his death has been victorious in 178 grands prix.

THE CAR: McLaren M2B

Featuring a monocoque built out of mallite – a sandwich of balsa and aluminium alloy originally used in the construction of jet airliner panelling – the radical little M2B's chassis was stiff and light. However, any advantage gained was offset by its unwieldy engine, a 3.0l version of a 4.2l Indianapolis 500 spec unit. On its debut, the car lasted just nine laps before succumbing to an oil leak. For its next outing, in Belgium, McLaren changed the engine to a V8 unit from Italian manufacturer Serenissima. The new pairing failed to start at Spa due to damaged bearings, but at its next race, the British GP at Brands Hatch, McLaren brought the car home in sixth place to score the new team's first point.

THE RACE: 1966 Monaco Grand Prix

In qualifying for the opening race of the 1966 season, Jim Clark took pole position for Lotus, ahead of John Surtees in a Ferrari and Jackie Stewart in a BRM. According to Mike Lang's 'Grand Prix! Vol. 2', McLaren was "reasonably happy" to have qualified his M2B in tenth alongside Richie Ginther's Cooper/Maserati. The New Zealander began brightly too, jumping to sixth early on, as ahead, Clark dropped back with gearbox issues and Surtees and Stewart took over at the front. However, despite the good start, things soon began to unravel, as mechanic Howden Ganley recalled: "Bruce seemed to be going quite well. But on lap 10 he suddenly came in with his legs and feet drenched in hot oil. We couldn't rejoin the race because so much oil had been lost, and the rules banned replenishment. It was a shame, but the system just needed a re-think." After Surtees exited with differential failure, it was left to Stewart to take his second career win, with some 40 seconds to spare over second-placed Ferrari driver Lorenzo Bandini. Graham Hill finished third for BRM.

Women in Motor Sport

‘MOVING IN THE RIGHT DIRECTION’

Currently second in the VW Scirocco R-Cup standings and singled out for special mention by the FIA Institute Young Driver Excellence Academy at its recent European selection event, Danish racer **Michelle Gatting** *is proving that the future for female racers is bright, as she explains...*

There are more and more girls coming into the sport all the time. Susie Wolff, Katherine Legge and Danica Patrick have shown that it’s possible to be involved at a very high level, and this is having a hugely positive impact.

Susie’s F1 test was a big thing and I think she really surprised a lot of people. She showed that it’s possible for women to drive at the highest levels. At the end of her test, she was ninth quickest of the 16 drivers that day. She also seems to have the right people behind her, supporting her and helping to develop her talent.

One of the things that’s always brought up in relation to female drivers is that we’re not strong enough. I think Susie showed that this isn’t the case. She did almost two race distances and didn’t have a problem.

Sure, we’re not physically as strong as the guys, but for me that isn’t an issue. I don’t think you have to be super strong to drive a DTM car or even an F1 car. I think it’s more about overall stamina, mental strength and focus and there is no reason why a woman can’t compete on those terms. The lesson from Susie’s test was that if she can do it then the way is open for all of us.

It’s all about results, though. When you’re getting up to saloons and single seater cars, you have to deliver. If you do that then your career will progress.

Having said that, at the level I’m at now, it’s actually a positive to be female. You’re noticed a lot quicker, you’re not just one of the hundreds of guys racing. The media love to do stories about female racers, so it’s a little easier to get a profile, too.

Of course, I don’t want to have a career in motor sport just because I’m a girl. It has to be on merit and by virtue of the hard work I put in. I know that’s the case so far because I’ve been getting good results.

The future looks bright. There are quite a few girls in my generation who are getting really good results and I think we’re getting noticed more and more. I also think the FIA’s Women in Motorsport campaign is doing great things to get more women involved. Things are progressing slowly, but they’re moving in the right direction and that can only be a good thing.

Getting a woman to a Formula One drive will be very tough though. It’s so difficult to reach that point. Susie’s the closest we’ve got, but there’s still quite a long way to go. I think it’s easier to get a girl into DTM.

That’s the next big thing for women, in my opinion. Coincidentally, that’s what I’m aiming for. I’ll do Porsche next year hopefully, and then we’ll take it from there, but DTM is the goal. ▫

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