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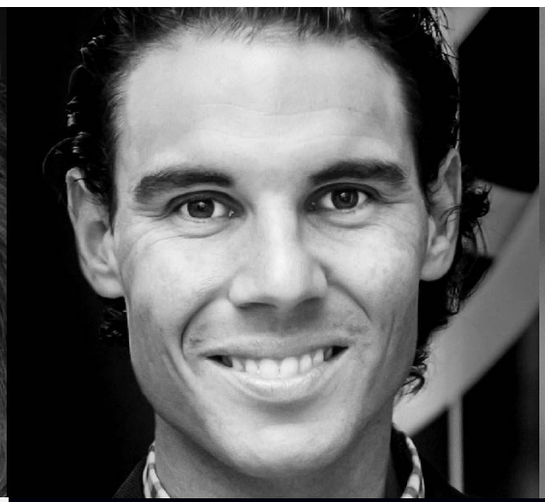
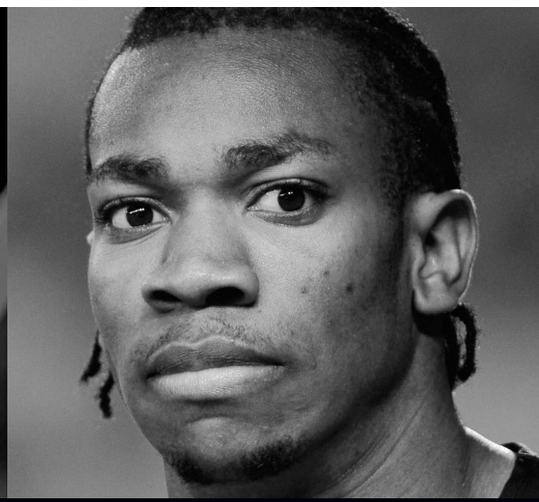
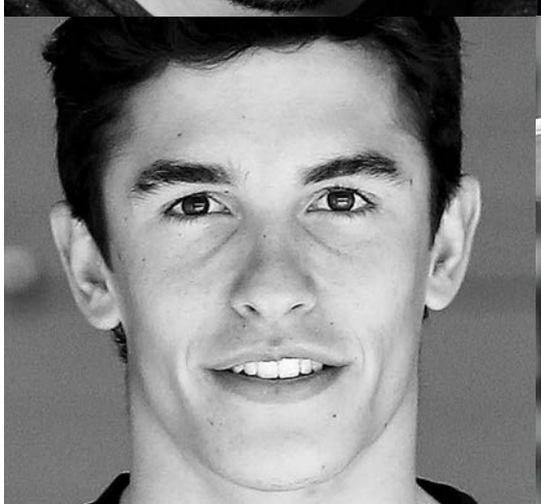
AUTO

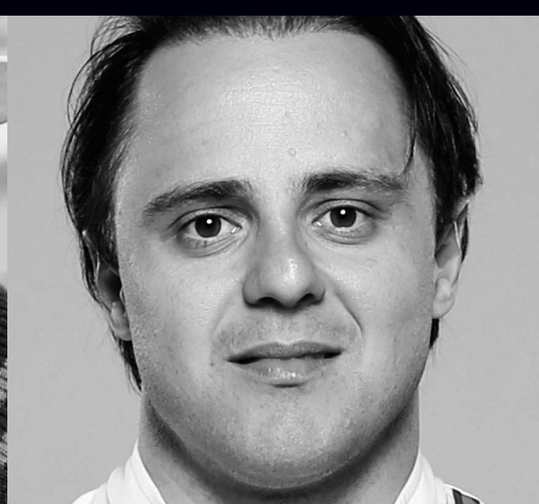





P40

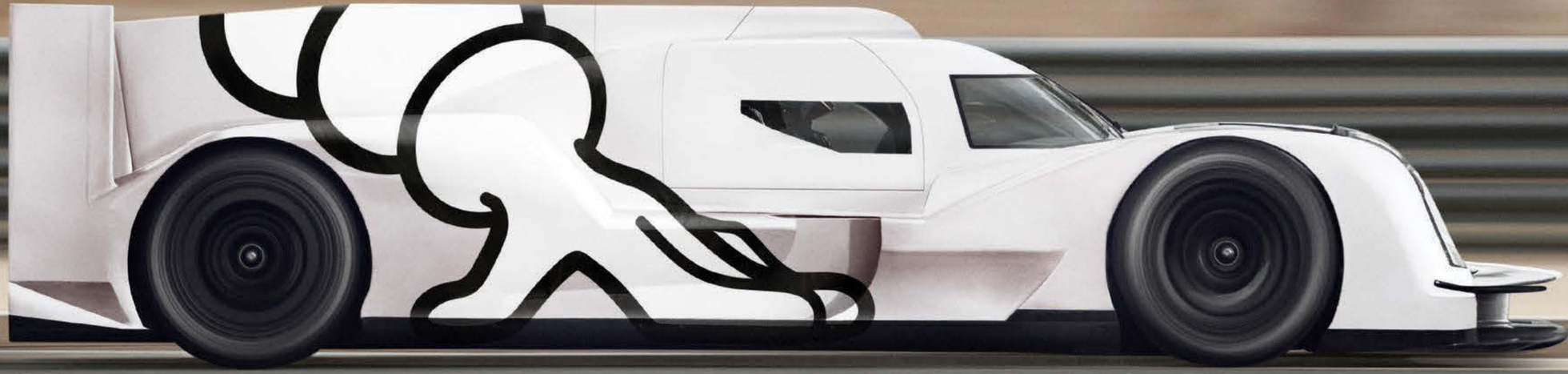
SAFETY STARS

TURNING GLOBAL FAME INTO A
WORLDWIDE FIGHT FOR ROAD SAFETY





ACCELERATE
YOUR SENSATIONS.



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Michelin is engaged in motorsports to keep pushing the boundaries of performance and drive your automotive passion further. It's a thrill we share. It's limitless and contagious, it never stops. We feel it in our guts. It's in our blood. It makes our heart beat faster. Because the more we drive our passion, the more alive we feel.

ISSUE
#16

AUTO

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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 236 national motoring and sporting organisations from over 135 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.

Dear readers,

Road traffic accidents are responsible for a total of 1.25 million deaths per year and 50 million injuries: it is a human, social and economic plague that has to be stopped. The FIA is in the front line of this fight and we have called on seven special ambassadors whose popularity we believe will help spread the word about the FIA's Golden Rules for Safer Motoring.

Fernando Alonso, Yohan Blake, Marc Márquez, Felipe Massa, Rafael Nadal, Pharrell Williams and Michelle Yeoh will all feature in the FIA's first roadside advertising campaign, produced with the help of industry leader JCDecaux. Prior to its imminent launch you can find out more in our cover story.

Elsewhere in this edition we also look at another major social issue - urban mobility. The future of city living will be discussed next month in Quito at Habitat III, the Conference on Human Settlements, organised by the United Nations. For the first time, the FIA will be present with its own stand.

This issue also celebrates some of motor sport's most unforgettable personalities, events and machines, at the Le Mans Classic, in an exclusive interview with racing legend Jacky Ickx and with a look back at the history of one of motor racing's most challenging events - the Macau Grand Prix. I hope you enjoy this edition.

Jean Todt,
FIA President

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ADAPTIVE PE RFORMANCE.

The Pirelli tyre for every season.

Cinturato™ ALL SEASON | SEAL INSIDE™ The total mob ility tyre, puncture resistant.

PIRELLI

POWER IS NOTHING WITHOUT CONTROL

UP FRONT

Rally Raid

SILK AND SAND

Over the past seven years the Silk Way Rally has established itself as one of the world's toughest cross country events. And this year the rally's organisers plotted one of the longest and most challenging routes in its history – a 10,000km trek from underneath the spires of Moscow's St Basil's cathedral, through Kazakhstan, into China, Mongolia and across the huge expanse of the Gobi before eventually finishing in the centre of the Chinese capital Beijing.

"It will be an uncompromising battle through little-known territories, deserts, mountains and steppes with ruins of ancient cities and incredible landscapes," said Rally Director Vladimir Chagin of the event, which is held under the aegis of the FIA and its member clubs the Russian Automobile Federation (RAF) and the Chinese Motorsports Federation (FASC).

And the challenge attracted some of rallying's most famous names with nine-time World Rally Champion Sébastien Loeb, multiple Dakar bike and car winner Stéphane Peterhansel (pictured), five-time motorcycle Dakar winner Cyril Despres and 2015 Dakar-winning truck driver Ayrat Mardeev all taking part.

At the end of the marathon 15-leg rally, it was bike specialist Despres and co-driver David Castera who took the honours in the car category, with Mardeev triumphant in the trucks section. "Winning is an incredible, fantastic feeling and it still hasn't really sunk in," said Despres. "It's the first time I've won a rally with David. We have learned so much since the start in Moscow."

DESERT CHALLENGE

Stéphane Peterhansel and co-driver Jean-Paul Cottret tackle the Gobi desert in their Peugeot 2008 DKR during stage 13 of this year's Silk Way Rally, from Alashan to Wuhai in Inner Mongolia. The pair finished 15th overall in the car section.

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Concept car

FORWARD ROLLS

Rolls-Royce has created an ultra-futuristic concept car, housing ideas for what it believes we will be driving in 2040.

The Vision Next 100 is an autonomous Rolls-Royce with a hand-built chassis powered by a zero emissions powertrain and advanced suspension that would see the vehicle almost skim across the road surface.

Imbued with its own artificial intelligence, it will work intuitively to advise its owners on itineraries, schedules and options before they leave their residence, reminding them about appointments and tasks and making suggestions to ease any anticipated impediments.

The car will bring itself around when passengers are ready to travel and safely deliver them to their destination, having already predicted the situation and surroundings that await them.

The internal environment is crafted from the most precious and contemporary of materials – fine-line Macassar wood panelling sweeping across the interior from the coach door, continuing around behind a generous OLED screen and up beside the second passenger to the side of a silk sofa, which forms the centrepiece of the cabin.

The passengers' view from their seats is uninterrupted by a cockpit or steering wheel, which are now superfluous. Where an engine would once have occupied the entire under-bonnet area of the car, a luggage compartment is positioned just aft of the front wheels.

The 28-inch tall but narrow wheels upon which the car glides are each hand-built from 65 individual pieces of aluminium, and enclosed to deliver the impression of a futuristic catamaran.

But don't expect this Rolls-Royce to be gliding along our roads any time soon...

VISION OF THE FUTURE?

Unveiled at London's Roundhouse, Rolls-Royce's autonomous Vision Next 100 is designed to provide a glimpse of the future of luxury mobility.

UP FRONT

AUTO NEWS

Car development frozen and prize fund introduced to F3 European series; F1 set to introduce head protection system for 2018 season; Formula E unveils futuristic front wing, new race venues and teams

The freeze on car development in F3 Euro is designed to save money and boost competition.

MORE MONEY, FEWER COSTS FOR EURO F3

The FIA Formula 3 European Championship has extended its current chassis rules until the end of 2019, resulting in cost savings for teams as they will be able to use the same cars over the next three years.

In addition, no changes on existing parts can be made and no extra parts can be added to the car to create an aerodynamic advantage, hence costly wind-tunnel testing will become unnecessary. The same regulations apply to the development of brake ducts, meaning changes are not allowed and only parts available from the chassis manufacturer may be used.

This is aimed at creating a more even playing field for all the teams with regards to aerodynamic development, as any advantage for financially stronger teams will be significantly reduced.

"All teams will start the upcoming season from the same baseline; the trend we have seen in the championship this year, that any team can win races, should continue," said Stefano Domenicali, President of the FIA Single-Seater Commission. "We want to maintain the high level and professionalism of existing teams, but also open the door for new teams to join the series. It should not make a difference for which team a driver competes, everyone should have a chance to win races and compete for the title."

The FIA has also announced a new prize money incentive for rookie drivers. It will award the top three rookies in the series with a substantial monetary prize to be used on a second season in the category. This year, the total prize money provided by the FIA will be €200,000. The driver who wins the rookie title will receive €100,000, with €50,000 each for the drivers finishing second and third.

This money will be paid provided the drivers return to the European championship the following season. It is also the FIA's intention to further increase the prize fund.

"The FIA considers the F3 European Championship as the most suitable platform for drivers learning their way at this stage of the single-seater ladder," added Domenicali. "To prepare drivers for the next step on the ladder, we think it is best for them to remain in the series for at least two seasons."

A new proposed safety kit upgrade has also been approved, adding a new front impact structure, additional Zylon panels and new wheel tethers to the cars.

Daimler's electric truck, which has a range of up to 200km, will go into production in 2020.

DAIMLER REVEALS WORLD'S FIRST HEAVY DUTY ELECTRIC TRUCK

Daimler is to launch the world's first fully electric truck with an admissible total weight of up to 26 tonnes.

Production models will be available in 2020 with the aim that heavy trucks will be able to take part in urban distribution operations with zero local emissions and minimal sound.

"Electric drive systems previously only saw limited use in trucks," said Dr Wolfgang Bernhard of the Board of Management at Daimler Trucks & Buses. "Nowadays costs, performance and charging times have developed so rapidly that there is a trend reversal in the distribution sector: the time is ripe for the electric truck.

To achieve their goal developers at Daimler Trucks have totally revised the drive concept: the entire conventional drivetrain being replaced by a new electrically-driven rear axle with electric motors directly adjacent to the wheel hubs.

Power is supplied by a battery pack featuring three lithium-ion battery modules. This will result in a range of up to 200km – enough for a typical daily delivery tour. Thanks to the integrated concept with motors adjacent to the wheel hubs, the batteries are housed in a crash-proof location inside the frame.

VOLVO, UBER PARTNER ON DRIVERLESS CARS

Volvo Cars and ride-sharing giant Uber are to join forces to develop the next generation of autonomous driving cars.

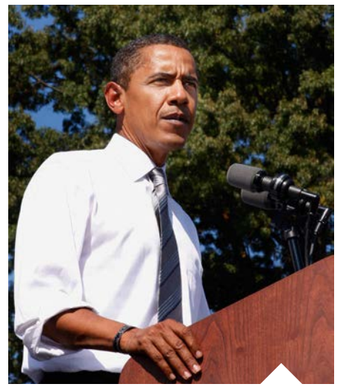
The companies have signed an agreement to establish a joint project that will develop new base vehicles designed to incorporate the latest developments in autonomous driving technologies, up to and including fully autonomous driverless cars.

The base vehicles will be built by Volvo and then purchased by Uber. The companies are contributing a combined USD$300M to the project.

Volvo's President and CEO Håkan Samuelsson said: "This alliance places Volvo at the heart of the current technological revolution in the automotive industry."

Uber CEO Travis Kalanick added: "Over one million people die in car accidents every year. These are tragedies self-driving technology can help solve, but we can't do this alone. By combining the capabilities of Uber and Volvo we will get to the future faster."

OBAMA OFFICE TO ACCELERATE ELECTRIC VEHICLE INFRASTRUCTURE



US President Barack Obama's administration has announced a new public-private initiative aimed at boosting the uptake of electric vehicles in the United States.

The plan, based on a set of 'Guiding Principles to Promote Electric Vehicles and Charging Infrastructure', includes up to $4.5 billion in loan guarantees for charging infrastructure, a call on states and municipal governments to procure electric fleets, the launch of a process to designate 'Alternative Fuel Corridors' and the publication of a guide for financing EVs and charging stations.

Developed by the White House in partnership with US Departments of Energy and Transportation as well as the Environmental Protection Agency, the initiative has received the commitment of more than 50 vehicle manufacturers, utility companies and US states. Among the manufacturers signing up to the scheme are BMW, Ford, General Motors, Mercedes-Benz, Nissan and Tesla.

According to a US Government statement, the principles at the core of the initiative will "drive the market transformation to electric vehicles by making it easy for consumers to charge their vehicles with grid-connected infrastructure that is accessible, affordable, available and reliable, and interconnected with other low-carbon transportation options where feasible."

The statement added that the plan will "promote electric vehicle adoption by increasing access to charging infrastructure and supporting the development of plug-in electric vehicles."

F1 POISED TO ADOPT HEAD PROTECTION FOR 2018 SEASON

Formula One's Strategy Group has agreed to introduce frontal cockpit protection to the championship starting in 2018.

Following a meeting at Geneva held in advance of the German Grand Prix, the body issued a statement saying that due to the "relatively short timeframe until the commencement of the 2017 Formula One season it would be prudent to use the remainder of this year and early next year to further evaluate the full potential of all options before final confirmation."

Research into frontal cockpit protection has so far centred on two concepts: the 'Halo' system, developed by the FIA Institute and Mercedes, and the 'Aeroscreen' from Red Bull Racing. While static tests of the Aeroscreen have been undertaken and Red Bull Racing driver Daniel Ricciardo ran with the system in place for one lap in practice for the Russian Grand Prix, it is the Halo device (right) that has been most frequently cited as the likely solution.

The system has undergone in-depth static testing by the FIA and the decision to defer implementation until 2018 is predicated on the desire to undertake more exhaustive tests on F1 cars during track sessions.

"Only few drivers have tried it and they have only done a few laps," explained F1 Race Director Charlie Whiting. "What we are looking to do is make it clear that every driver has to try it for a whole free practice session during this year. That would give us a proper way of going forward.

The decision to introduce frontal cockpit protection in 2018 has been broadly welcomed by Formula One's drivers.

Ferrari's Sebastian Vettel, speaking at the German Grand Prix, said that while some drivers were not enthusiastic about the aesthetics of the Halo, the need for frontal cockpit protection could not be denied.

"We don't like the look of it but I don't think there's anything really that justifies death," he said. "We've always learned from incidents that happened on track, and we've always tried to improve."

The system was tested again at the recent Belgian Grand Prix with Mercedes' Nico Rosberg setting the quickest lap of the first free practice session with the device in place, the first time a timed lap had been recorded running with Halo fitted.

"They've done a great job with it because it doesn't disturb me at all when I'm driving and increases the safety a lot," Rosberg said. "It doesn't make the cars prettier but if it's such a big step in safety then it's a good thing."

While the Halo system will be subject to greater visual testing, the F1 Strategy Group hinted that other head protection systems might be considered for implementation, saying: "The Halo is the preferred option, as it provides the broadest solution to date, but the consensus among the Strategy Group was that another year of development could result in an even more complete solution."

While the Strategy Group has agreed the adoption of a cockpit protection system it still required ratification by the FIA World Motor Sport Council as AUTO went to press.

FIA AGREES TWO NEW SUPPLIER DEALS

The FIA has agreed new supplier deals for medical products and racewear across the whole of motor sport.

MDD Europe has been appointed as Official Supplier for Medical Products and will provide state-of-the-art medical equipment and services. MDD already supplies equipment and personnel to the FIA Formula E Championship, where it has been involved in extensive research and development of electrical safety practices and extrication.

Laurent Mekiès, FIA Safety Director, said: "The FIA is pleased to extend its partnership with MDD in several FIA championships. We look forward to developing further medical technologies with them."

The FIA has also renewed its deal with OMP as Official Supplier of Racewear. It will be supplying technical racing clothing to FIA Officials and Safety Car Drivers (right) across the Federation's championships. This will include fireproof overalls, shoes, helmets, gloves and underwear.

HARMAN RESPONDS TO CONNECTED CARS SECURITY THREAT

As connectivity in cars grows, so to do concerns about the security of the systems. To combat possible cyber attacks automotive electronics firm Harman has devised a new security framework that protects the car's infotainment head unit from being compromised and used as a portal into the in-vehicle network.

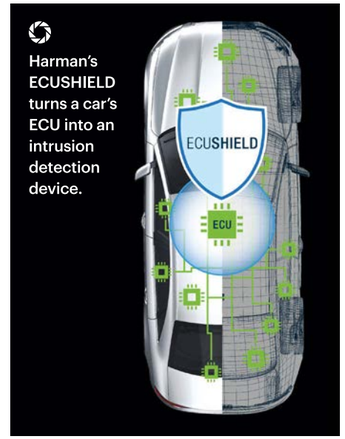
The company's new system features five layers of security, starting with a secure hardware platform.

Then, safety-critical functions are isolated from the infotainment system using a concept originally developed for supercomputers that allows two separate operating systems to run simultaneously. This makes it difficult for infection on one side of the system to spread to the other.

The next level controls access to the memory and peripherals. If, for instance, your CD player suddenly wants to control the brakes it's a good indication that something is wrong. Next comes a 'sandbox' function. This keeps new applications separate from the core system so they can be disabled if found to be harmful.

The fifth level is network protection system. ECUSHIELD turns the vehicle's ECU into an Intrusion Detection and Prevention system to protect critical communications within the car. It continuously monitors the vehicle and prevents intrusion into the vehicle's critical systems.

"Ultimately, it's about eliminating the risk of intrusion," says Asaf Atzmon of Harman's Cyber Secutity division. "By 2020 it's expected there will be nearly a quarter of a billion [connected cars] on the world's roads. This number will continue to grow but only if the car industry can provide the protection that consumers have to come to expect from their other electronic devices."



Harman's ECUSHIELD turns a car's ECU into an intrusion detection device.

Nissan's BladeGlider has a top speed in excess of 190km/h.

NISSAN UNVEILS ELECTRIC CAR WITH WILLIAMS RACING TECHNOLOGY

Ahead of the Rio Olympic Games, Nissan unveiled its new BladeGlider prototype in the Brazilian city, with Formula One and Formula E technology provided by Williams Advanced Engineering at the heart of the radical-looking machine.

First seen as a concept car at the 2013 Tokyo Motor Show, Nissan utilised Williams Advanced Engineering's expertise in electric powertrains – most notably seen in its development of batteries for the Formula E Championship – aerodynamics and chassis dynamics to build two prototypes at the racing team's factory in the UK. One example was placed on static display at Rio's Olympic Park, while the second was used in the city for rides for select media and VIPs.

The fully electric concept, which was designed as a glimpse into the future of electric vehicles (EVs), features a powerful performance delivered by Williams Advanced Engineering's battery and motor technology, with a top speed in excess of 190km/h and 0-100km/h taking less than five seconds.

Commenting on the development of the vehicle, Williams Advanced Engineering Managing Director Craig Wilson said: "We like to use our expertise in automotive engineering to help customers push the boundaries with new products. This is exactly what Nissan is doing with BladeGlider, a real-life study that shows the potential of EV cars in terms of styling and performance."

NEW LOOK AND NEW VENUES FOR FORMULA E

The FIA Formula E Championship has revealed a new look for the 2016/17 season, with the introduction of a bold two-tier front wing for the cars.

The development has been praised by teams and drivers, with reigning Formula E champion Sébastien Buemi saying: "It looks a little bit more futuristic and from inside the car you can see the top part of the wing, so visually for the driver there is also a small change. We want Formula E to look different and be different, and the new wing is a good way of showing that.

FIA President Jean Todt added: "The FIA Formula E Championship is not just a great environment in which to develop a completely electric powertrain with new battery technologies, but it is also a platform for experimenting with innovative solutions when it comes to designing single-seater racing cars."

The championship has also expanded its calendar with 12 rounds and 14 races across the globe. The series will take competitors from Hong Kong to New York via venues including Marrakech, Buenos Aires, Mexico City, Paris, Berlin and Montréal.

In addition, the championship will see the return to motor sport of Jaguar after an absence of more than a decade (see Final Lap, page 82) as well as the debut of the Chinese Techeetah team, which took over Team Aguri's entry and is owned by China Media Capital, a public equity and venture capital firm based in Shanghai. Another new name is that of Faraday Future, an advanced mobility company with headquarters in Silicon Valley and Southern California (USA), which has entered into a new technical partnership with Dragon Racing.

The 10 teams that will take part in the 2016/2017 championship are: ABT Schaeffler Audi Sport, Andretti Formula E, Faraday Future Dragon Racing, DS Virgin Racing, Jaguar Racing, Mahindra Racing, NextEV NIO, Renault e.Dams, Techeetah and Venturi Formula E.

Next season's Formula E car has been given a futuristic look with a bold new front wing.

FIA GIVES BACKING TO DRIFT EVENT

The FIA Drifting Working Group, which was formed last year, has agreed to create the first ever FIA-sanctioned international drifting event.

This is the first time a drifting competition will be governed by the FIA. Drifting is a relatively new discipline to motor sport but major competitions are already held worldwide. Rather than drivers competing to see who is fastest, drifting contests are judged according to the angle, showmanship and line taken through a corner or set of corners, as well as speed.

The show factor is based on multiple areas, such as the amount of smoke, how close the car is to the wall or designated clipping point and the crowd's reaction.

Usually, drift cars are light to moderate weight rear-wheel drive or four-wheel drive and can utilise a variety of powerplants. The first FIA event is set to run in 2017.

The first FIA-backed drifting competition is set to take place next year.

FIA President Jean Todt with the President of Paraguay, Horacio Cartes.

President Todt presents Nicaraguan President Daniel Ortega with an Action for Road Safety helmet.

TODT PRESSES FOR HIGH-LEVEL ROAD SAFETY ACTION ACROSS LATIN AMERICA

FIA President Jean Todt last month took the campaign for high-level action on road safety issues to Latin America during a visit that saw him meet national leaders from across the region as well major figures on the international stage.

On an eight-country tour that took him to Paraguay, Brazil, Antigua and Barbuda, Jamaica, Nicaragua, Honduras, Guatemala and Mexico, the FIA President's first stop was in the Paraguayan capital of Asuncion, host city of the 18th FIA Congress of the Americas for Mobility and Sport.

President Todt praised the road safety efforts of American clubs saying: "Projects such as the Safe Driving Campaign in Guatemala; the post-crash response initiative in Jamaica; the traffic training park in Colombia and the bike safety kit developed in Canada, are just some of the initiatives that have made a significant impact in improving road safety. These are all examples of how practical action by FIA clubs can have an impact."

President Todt also highlighted the region's success in organising major sporting events, with no less than 27 events hosted this year along with the creation of nine new facilities in addition to the 15 already homologated.

The FIA President then moved on to Rio de Janeiro to attend the opening ceremony of the 31st Olympic Games and also to take part in meetings with the President of the IOC, Thomas Bach, a member of the FIA's High Level Panel for Road Safety, and with the President of France, Francois Hollande.

Among a host of leaders engaged during the course of the tour were the President of Nicaragua Daniel Ortega, Honduran President Juan Orlando Hernandez and Paraguay's President Horacio Cartes.

During his meeting with the Honduran President, Mr Hernández signed a commitment to make road safety one of his administration's top priorities.

After the meeting President Todt, the UN Secretary General's Special Envoy for Road Safety, said: "We had a very constructive discussion. I am happy to know that the Honduran government is committed to road safety.

"Like every developing country, Honduras needs to improve education, as well as road infrastructure and law enforcement. All of this has to work together," he added.

The FIA President also urged Nicaragua's President Ortega to make road safety a priority of his government. "It is important to engage with President Ortega on issues of road safety because real positive change can only come about with the backing of the state. We also encourage the continued work that has been started to develop motor sport in Nicaragua," said Todt.

The Nicaraguan President pledged his support for the United Nations' Save Kids Lives campaign during the visit.

In Asuncion, Paraguay's President Cartes, along with Sports Minister Victor Pecci, also pledged their support for the campaign.

Along with the United Nations Development Programme (UNDP) Goodwill Ambassador Michelle Yeoh and the FIA Vice President for Sport José Abed, President Todt met with many national and local authorities and road safety stakeholders, urging them to get involved in combatting one of the worst plagues currently affecting society, one that kills 3,500 people globally each day. In Mexico he met with officials of FIA member club OMDAI and with Carlos Slim Domit, Member of the FIA Senate. In Paraguay he met the Minister of Interior, Francisco de Vargas and in Guatemala the Mayor of Guatemala City Álvaro Arzú.

FIA Foundation's Natalie Draisin presents advocacy activities of Global Initiative for Child Health and Mobility.

FIA FOUNDATION LEADS UN 'PARTNERSHIP EXCHANGE'

Two initiatives led by the FIA Foundation have been featured at the United Nation's High Level Political Forum (HLPF) for the Sustainable Development Goals (SDGs) in New York.

The HLPF has been set up by the UN for Governments to report on progress towards achieving the SDGs and to highlight partnership work. Of the 2,119 registered partnership exchange initiatives, 26 were chosen to present at the forum, two of which were led by the FIA Foundation: the Global Initiative for Child Health and Mobility and the Global Fuel Economy Initiative (GFEI).

During the 'Partnerships with a focus on people' side session, the FIA Foundation's US Manager Natalie Draisin presented the initial advocacy activities of the Global Initiative for Child Health and Mobility. This is a partnership initiative convened by the FIA Foundation to advance the Global Goals agenda of providing a safe and health journey to school for every child. The initiative was launched in June and also includes UNICEF, UNEP, Save the Children, the Overseas Development Institute and World Resources Institute.

"We can all agree that children have a right to a safe and healthy route to school," she said. "But in reality, every day more than 3000 young people suffer a road traffic death or serious injury. Millions more face danger on the roads, and breathe dirty air – often on their way to school. Every one of these instances is preventable. We have cost-effective solutions, and we can deliver them with the right partners, funding, and political will."

Another side event titled 'Safe and Sustainable Mobility for Children in the Global Goals', which was hosted by the Government of Georgia and the FIA Foundation, also aimed to advance the agenda set by the Global Initiative for Child Health and Mobility and included a focus on a safe and healthy journey to and from school for every child by 2030 as a priority in the SDGs.

The GFEI was one of eight partnerships featured in a separate (HLPF) session on 'Planet and Prosperity'. Rachel Kyte, CEO of Sustainable Energy for All (SE4All), who was also the moderator of the session, described GFEI as an "extremely dynamic partnership," and she highlighted the key importance of addressing transport as a major end-use" energy sector.

"It's about supporting countries in the transition to a low carbon future," she said. "It's about a revolution to make energy efficiency something that heads of state compete with each other on."

GLOBAL EXPERTS DEBATE EMISSIONS SCANDAL AT FOUNDATION SEMINAR

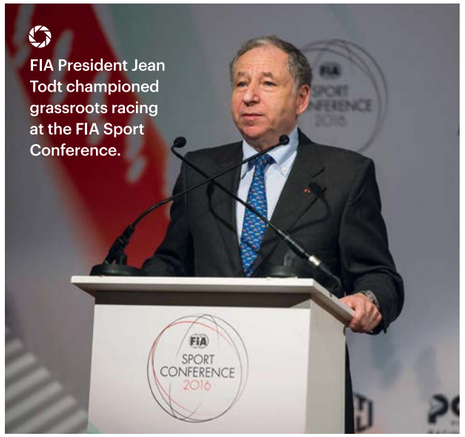
The FIA Foundation recently hosted an event that brought together 30 experts on vehicle emissions testing from around the world at a seminar on the 'Dieselgate' scandal.

The cases of cheating on emissions and fuel economy testing have caused shockwaves throughout the automotive sector and generated headlines across the globe. For organisations involved in designing and producing cars, or regulating and advocating testing in the industry, the revelation that high-profile manufacturers have used such techniques poses a number of fundamental challenges for the future of automotive testing.

Many industry specialists have frequently expressed concerns over the differences between tested and on-road vehicle performance, with recent developments in the EU test cycle, indicating a desire on the part of some regulators to generate improvements. However, as there are many aspects to the issue, the discussion at the seminar, which was held at the FIA Foundation on 8 June, covered a wide range of issues.

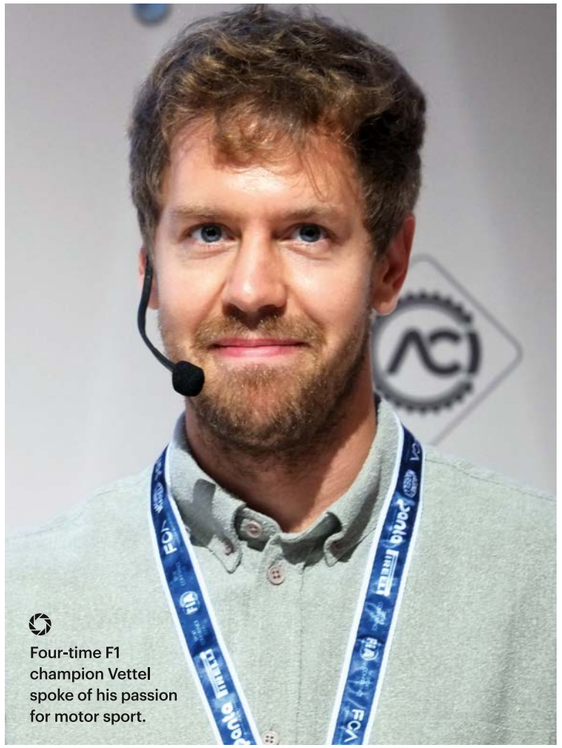
The complex nature of the emissions scandal subject meant topics covered during the seminar included how consumers need reliable information on which to make their choices when it comes to purchasing a car; regulators need to be sure that their rules are being adhered to; and manufacturers need to engage fully.

Speaking about the event, FIA Foundation Deputy Director Sheila Watson, said: "The FIA Foundation was delighted to be host this event, the latest in our seminar programme, which brought together real expertise on an issue which is of vital importance. The context for this issue - poisonous air which is killing millions; $ trillions in wasted fuel; and needless extra gigatonnes of CO2 - is simply huge. We must see improvements in the regime, and as an independent mobility charity with a mantra of 'safe, clean, fair and green' mobility, we are happy to be a part of the solution'."



FIA President Jean Todt championed grassroots racing at the FIA Sport Conference.

FCA CEO Sergio Marchionne hailed motor sport's innovative spirit.



Four-time F1 champion Vettel spoke of his passion for motor sport.

VETTEL AND TODT AMONG KEYNOTE CONFERENCE SPEAKERS

A host of high-profile figures from the world of motor sport, including four-time Formula One champion Sebastian Vettel, FCA and Ferrari CEO Sergio Marchionne and racing legend Jacky Ickx, joined representatives of motor sport organisations from around the world in Turin as the FIA's annual Sport Conference focused on how motor sport can draw on its heritage to define future success.

The star-studded conference at Turin's historic former Fiat factory, Lingotto, was the largest yet held by the Federation and brought together almost 500 delegates from 115 motor sport organisations from across the globe.

Held in association with host national sporting organisation the Automobile Club d'Italia, the event saw current Ferrari driver Vettel insist that for him motor racing's biggest attractions had been speed and the thrill of competition.

"It's that passion – the passion for speed," said Vettel, who took part in a keynote interview on day one of the three-day conference. "From the moment I started racing it was the passion for competition – to measure yourself against others. I think that's what it's all about at the end of the day."

FCA chief Marchionne, meanwhile, pointed to the technological challenge of the sport, and the potential to transfer that technology to road cars, as a key draw for car manufacturers.

"Our organisation has learned an incredible amount from the world of competitive racing, from aerodynamics to materials, from powertrain engineering to safety," he said. "Ferrari is one of the greatest examples of this. The character and potential of Ferrari are constantly tested on the track."

FIA President Jean Todt focused on encouraging the passion for motor sport at local level as a necessity for future success.

"I would like everybody to have access to motor sport, but it starts by developing motor sports at grassroots level," he said. "If we do that people will be aware that you have other categories of motor sport and they will be interested in hearing about it and participating in it."

Elsewhere, the conference explored technological innovation in detail and looked at promoting accessibility in motor sport, a development FIA Deputy President for Sport Graham Stoker later said provided the most revealing outcome of the conference.

"The most important aspect for me was gaining an understanding of just how unique our sport is in terms of social responsibility and social change," he said. "I didn't fully appreciate how unusual we are compared to other sports. That quality is vital in our member organisations engaging with external agencies and governments. You can get the door open as a sport and the perception is of health, of team, of achievement, but it doesn't go further. Motor sport is different and because of that the door stays open. There are educational jobs, there's a sustainability legacy, there are safety lessons and that keeps the door open and you build strong relationships."

The fifth edition of the FIA Sport Conference will be held in Geneva, Switzerland, next summer.

AUTO ASKS

QUESTION:

ARE DRIVERLESS VEHICLES A THREAT OR AN OPPORTUNITY FOR DESIGN HOUSES?

As the automotive industry looks increasingly to a future based on driverless vehicles, AUTO asks three of the greatest Italian car designers how this might affect creativity

GIORGETTO GIUGIARO

CAR DESIGNER OF THE 20th CENTURY; AUTOMOBILE HALL OF FAME MEMBER

I don't believe that there is any essential difference in designing a conventional car and what we might do with autonomous vehicles. The aesthetic is fundamentally the same. This shape must be innovative; the functionality and the aesthetic must be matched. The car must be beautiful, even if the car drives itself.

In fact, I would say that autonomous cars present a great opportunity to designers. You have a huge advantage because the structure can be approached radically. Currently there are many elements of a car that you have to design around the driving position, so there are many restrictions. This new technology means that the design of autonomous cars is really open. We can put a lot more fantasy into the aesthetic.

When you drive a current vehicle there are some design restrictions on visibility for homologation, but that will not be an issue with autonomous vehicles, the structure of them will alter because the rules will change and that's quite exciting.

The one thing you cannot get away from, though, is that man does not change, our physique doesn't change. We are maybe a little bit taller than we used to be, but you have to get in and get out of the car the same way – your feet have to go somewhere! So, in the end, the car will be made more around the person.

It will certainly promote more comfort. People will demand more comfortable environments and I think performance will be less of an issue. After all, what's the meaning of having a sports car in a world of speed limits? You are simply an astronaut in the city. Ego demands that you love the car you drive but in the end you never use much of that car's capability, so this demand may change in a car that you do not drive yourself.

It will change, but I think it will remain a beautiful object, regardless. People will always want beautiful things. We are thinking particularly that this kind of car will be more customisable, so people will be able to personalise their car more. So it may be that the big OEMs will produce a chassis that works and on that coach-builders will fashion something more personalised and bespoke. In some ways it may lead to a return to the old days of coach building.

LEONARDO FIORAVANTI

FAMED FERRARI DESIGNER; CEO, FIORAVANTI SRL

This question reflects an important reality: the car, thought for dead not a long time ago, is still today and for the future a lively topic of design and global manufacturing.

To specify better, it can be said that for some special conditions driverless vehicles will have certain uses, but not all.

As for any innovation, after a necessary period of tuning and tests, these types of vehicles will be able to ensure safety and comfort for the passengers; they will be able to not only enjoy the view better, but also carry out other activities during the trip.

But what kind of vehicle? I think mainly electric cars because of these characteristics: they can have various connection modalities, immediacy of response and input, and especially ease of accuracy in fine adjustments.

As regards the car bodies this type of guide offers, directly and indirectly, new opportunities for the doors-seats system and in general for the passenger compartment. Seats 'vis a vis' and semicircular offer a chance to stretch the legs and change position. The dashboard can be in very different configurations and there are unthinkable ways for optical and sound information.

For these reasons I consider the driverless vehicle a chance for creative minds that have both the fantasy and imagination.

These reflections also create an interesting connection. Do you remember that the first passenger transportation was the horse carriage? The passengers got into the carriage, gave the destination to the coachman and then chatted or... courted a beautiful woman.

Today we will have an electric motor and an electronic coachman! Back to the future.

PAOLO PININFARINA

PININFARINA DESIGN COMPANY MANAGER

Whatever form autonomous vehicles take, they will open up great opportunities for designers, who will be able to influence how they are made. Designers are continuously doing innovative research in the automobile sector, but also in other sectors – in technology, materials. These different experiences are valuable for designers and they can bring this contribution to new automobile technology.

It could be that autonomous vehicles represent a new product – perhaps a system rather than a single product, a people mover. In the same way you drive a train, a driverless car may not be piloted by a human being and may carry many people; it's a service. This is the kind of opportunity that exists and we are open to providing ideas.

The advent of this kind of technology gives you great freedom. The space, the functionality – every aspect of it is a new challenge. It is one we are excited about, to the extent that recently we supported a design competition involving four design schools – the Italian IAAD, the international network IED, the French ISD Rubika and the Swedish UMEA – with each looking at the future of car design.

Also, car designers are not limited to the automotive sector. Indeed, I think Giugiaro started designing other products in the 1970s and Pininfarina did the same, and all of us made design about everything. So why not bring that creativity to the driverless car.

The driverless car will be an interesting sector. I believe it will arise in niche areas first; for example, for older people. The market among people who cannot drive a car any more because they don't see well or their movement is restricted will open up. I believe that Japan will be one of the first markets for this type of vehicle because they have the highest number of wealthy people in old age.

So, for me, it will initially be another niche, as with zero emission or supercars, that develops gradually. I don't see the autonomous car as antithetical to the traditional car. There will be hybrids. Much research is being done on assisted driving and the traditional car will increasingly feature assisted driving technology. So the border between traditional and autonomous cars will be blurred.

But for us, it is an exciting challenge. We are not frightened by change. Innovation is our inspiration and we have no fear.

TECH REPORT

Seatbelt monitoring

SAFE AND SECURE

A new digital device has been developed to ensure racing drivers' seatbelts are always fastened securely, whether they are changing cars in Formula E or replacing a team-mate in sports cars

TEXT: MARC CUTLER PHOTOS: DAN BATHIE

DS Virgin Racing's Sam Bird checks his belts during a pit-stop, which uniquely in Formula E involves a driver changing cars.

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The seatbelt measurement device is housed neatly in a smartphone-size box.

It only lasts for two seconds, but the blue light on the nose of a Formula E car (activated during the pit-stop) has become one of the most important additions to the electric racing championship. It tells the team (and the Race Director) when a driver's seatbelt has been fastened to the perfect amount of tension to keep them safe. This has enabled the championship to reduce pit-stop times and increase the excitement for fans.

The Global Institute for Motor Sport Safety, the research partner of the FIA Institute, has been working with British motor sport and engineering group Prodrive to create this measurement device, which registers when the correct load has been applied to ensure the driver is strapped in properly. It then communicates with the data logger in the car, informing the pit crew and giving the all-clear to race control.

Originally, researchers had been working on this device for other championships, but then Formula E came along with its unique car changes during pit-stops.

"The initial target was actually to address a potential safety issue in the World Endurance Championship," explains Laurent Mekies, the Global Institute's General Manager Research. "When there is a necessity for a driver change during the pit-stop, they try to do that as fast as possible, but we need to ensure it is also as safe as possible.

"In Formula E we had a similar but probably a more pressing need due to the fact that the drivers are actually changing car themselves mid-race. As this is the only thing that they do in the pit box there is therefore a large amount of pressure on the teams and drivers to do that quickly."

This is why the devices were introduced into Formula E first. Each device is housed in a small box the size of a smartphone and two are attached to a driver's shoulder harnesses. When the belts are being pulled tight they push against internal springs, and once the appropriate amount of force has been applied a micro-switch is activated, initiating the blue light on the car's nose.

"It's a simple device that triggers at around 13kgs of force on the shoulder belt tightening strap," says the Global Institute's Senior Research Advisor Peter Wright, who is leading the project. "There is a display in the car to help the drivers and mechanics know that they have triggered it."

The device was engineered and produced by Prodrive's technology department under guidance from Wright and was introduced at the start of the second Formula E season last October.

"The introduction has been remarkably smooth and we didn't have a lot of pushback against them," Wright says. "I think the teams like the fact that they can then go for a fast car change and get their drivers out onto the track again quickly instead of sitting there waiting for the time period to come to an end."

As a result, compulsory pit-stop change times were reduced by around 10 seconds per race in the 2015/16 season. However, it did not lead to the championship scrapping the time limit altogether as concerns remain over teams taking higher risks in their quest for faster stops.

"When we introduced the device, we did not remove the compulsory pit-stop time because we felt it could lead the teams to unnecessary risk-taking not only in the driver change but also in and around it," says Mekies. "But we reduced it so that we kept the competitive aspect of the pit-stop."

Although there have been no reported incidents of a Formula E driver trying to leave their garage before triggering the device since it was introduced, the FIA stewards at every ePrix would be able to apply a penalty if any such attempt was made.

"All the information is logged in real time and is accessible for the stewards," says Mekies. "Therefore if it was felt that someone had done something wrong there would be enough material in the regulations to award a penalty."

The logical progression for this device is to incorporate a system to detect if a driver has loosened their belts before arriving at their garage (to try to gain a time advantage) and a phase two module is in development. "We're implementing a simple alarm that could say whether the adjustments have been changed," explains Wright.

While the second iteration of the belt device is still very much in its infancy, there are plans to introduce it into the categories it was originally conceived for: WEC and sports car racing.

"What the current device doesn't do is record if a driver loosens his belts," says Mekies "But this is a need for Formula E and especially WEC in order to stop drivers there from potentially loosening their belts on an in-lap or in the pitlane."

If technical development for the updated belt device goes well, it could be introduced into Formula E and endurance racing series for the 2017 season. But its applications could be wider still: "If you think about categories like cross-country motor sports," says Mekies, "you want to ensure that the guys who compete there stay tight for the length of the day over long special stages. In that case you need a device which is able to detect if the guys are untying their belts and that's what the phase two device is aiming for." ■

A blue light on the car's nose indicates when the driver's belts have been tightened correctly.

TECH REPORT

F1 technology trail

SUCCESS SIMULATED

McLaren's Dr Caroline Hargrove is utilising the team's simulation expertise to benefit an increasingly wide range of businesses, from healthcare to rail companies

TEXT: JUSTIN HYNES

Since the days of Jaguar's pioneering use of disc brakes at the Le Mans 24 Hour races of the early 1950s the link between motor sport technology and real world applications has been well established, with advances in engineering and safety technology regularly migrating from track to road.

It's only in the past two decades, however, that technology routinely applied at the top level of motor sport – particularly Formula One and top-level endurance racing – has found a home in industries beyond the automotive.

At the forefront of this technological diffusion has been F1 team McLaren. Through its McLaren Applied Technologies (MAT) division the company has taken its racing technology into whole new areas of endeavour. It supplies a range of companies in an increasingly diverse range of spheres with methodologies initially developed to improve race track performance but which now help to increase efficiency in processes as disparate as toothpaste manufacturer and the efficient ebb and flow of aircraft taking off and landing at Heathrow Airport.

At the core of this lies McLaren's simulation expertise. The team began developing simulation tools in the late 1990s to both speed up and hone the development of its Formula One cars and also to model factors influencing a race – strategic thinking to improve its chances of victory.

In the two decades since these tools have become ever more sophisticated and as such increasingly applicable to wider industry, as the woman behind the development of the team's simulators, MAT's Technical Director Dr Caroline Hargrove, explains.

"We followed a curve on computer power," she says. "If I look at simulation and simulators, we happened to follow the curve of gaming, which we really needed. Improved graphics cards and processor power in computers have helped us get better and better. The key to doing these kind of simulations is to be able to run them in real time, in the world of F1 at least.

"What it meant is that we did everything from scratch," she adds of the system's genesis. "We couldn't use a package here or a package there to help with a design. But when you're doing simulation you've just got to get to the essence of it. So we did a lot of things from scratch, which today you probably wouldn't need to do. However, we needed to do it at the time. And by having done that we became really disciplined, so we are now able do so much more because that mind-set was forced upon us. The good news for us when we were designing simulations and simulators was that we were among the first ones."

The result is an expertise in simulation that has led to manifold increases in design efficiency.

"When I started the stats were something like 90 per cent of all the components that we would come up with we would test, but they wouldn't be raced," she says. "We've now flipped that around and now it's probably a case that 90 per cent of the components built are raced. That's all to do with better simulation, better design techniques; that we know a lot more early on. You fail fast and you can do that in a cost-efficient way."

It's a lesson that wider industry has learned, including the world of road cars, which is embracing the methodologies.

"The world of road cars is now catching up," Hargrove says.

> "WHEN WE WERE DESIGNING SIMULATIONS AND SIMULATORS WE WERE AMONG THE FIRST ONES"
>
> DR CAROLINE HARGROVE

"Because they are realising that actually it makes business sense to have your car designed and tested in a simulator before you even do a prototype. It's one of the unique points motor sport has to offer the outside world."

To that end MAT last year signed a technical agreement with MTS Systems Corporation to further the use simulators in the automotive market.

"By us licencing our product to MTS and working in partnership with them, we can integrate all of our systems together and it becomes a better product. It's something that we can't do on our own, they can't do on their own, so together we achieve more.

"People talk a lot these days about data analytics, big data and so on, but Formula One has been doing it for many years," says Hargrove. "We didn't call it that but you do a lot of simulation, a lot of data analytics and you merge the two. And when you merge the two it's really powerful. This is what opens doors for us when we're going into other markets because people are saying, 'Hang on, we have data but what we do is really complicated'. So, we break it down into what we can model and what is the desired outcome and we do that in a more data analytic black box way. That capability and skill set is really a good fit between motor sport and... well, much more than you might think."

ALL-ROUND BENEFITS

The 'much more' Hargrove refers to includes the provision of simulation in automobile design, techniques McLaren has applied to its own road car programme and which it is also supplying to others.

"The main thing that we do for OEM, and where we target them in the simulation side, is where you're looking at the development process, to help speed up that initial design concept or those testing phases where you can really replicate as much as you can. People have been using simulators now for some years but they mainly use them for comfort, for ergonomics, for noise and vibration. What we're saying is you can use them a lot more for your design phase.

"That adds a lot of value to this. For us, we try to translate what we do into business value when we talk to our customers, or potential customers," she adds. "If it doesn't make business sense for both of us then we're not interested.

"We're not a big company. We're not going to make something in mass market volume; not today," she continues. "What we want to do is help create that value so that the people we work with actually benefit and we piggyback on the benefits. So we tend to work on a shared success basis. One example is bicycle manufacturer Specialized. When they sell a bike that uses technology we've developed, we get a part of that. They get something that pushes their product, but we get something when they're using it."

With the MAT business now established as a profit centre for McLaren, Hargrove believes that the tools developed by the company have even wider applications.

"We've got key areas of interest. Motor sport will always remain, so half of our business is in motor sport, but we are continuing to push. For example, we're working now with rail companies on a number of different things.

"In one case it's communications to the train in and out, both for passengers in, using your Wi-Fi, but also the conditioning of the train and so on. That, and making sure that that coverage is best achieved.

"Another of the projects we're working on is really fascinating, because it isn't being done and you think, why not? Simply, it's that you just don't know how many passengers there are on each train at any one time.

"We've all had that journey on an overcrowded train and it's really unpleasant. And you think 'this is not rocket science'. But it's not happening because of the business model they're following and also because the technology is not there on the trains to tell you that carriage is full, that the company shouldn't sell tickets for that particular train and so on.

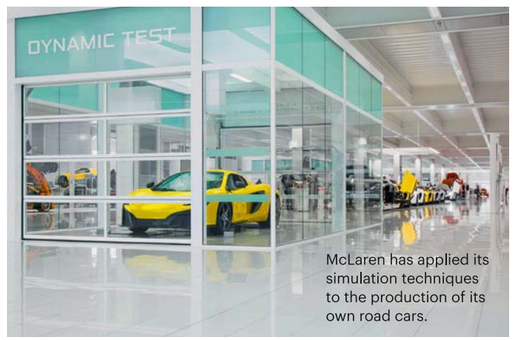
"With these kind of problems, it's just about a different way of thinking that we can bring. A lot of the optimisation is decision support; helping companies make the right decisions. This is something that we do all the time in F1 and that's exactly the kind of thing we're doing elsewhere and we want to do more of. So we're pushing big time in rail, but we're also doing a big push in health. "

MAT's work in the sphere of healthcare has seen it partner with Oxford University in the UK on a number of optimisation projects, including creating programmes that advance surgical training methods and enhance the monitoring of surgical effectiveness, improving patient care processes and the optimisation of resource allocation in hospitals.

For Hargrove, bringing MAT's hard-won racing expertise to other development processes has many possibilities, but she adds that it is often only companies with a keen eye on the future that embrace the idea.

"It's odd, but we thought it would be the organisations who were lagging behind their competitors that would embrace this and they would want to really leapfrog. But actually the people who've come to us most have been people who are almost ahead of their game already and they want to stay there. They're saying, 'What's the next step?'"

In this regard it seems Formula One's increasingly technologically ambitious teams are to have the answer – a world of relentless optimisation, of ever-increasing efficiency and predictable and profitable outcomes, all sourced from the most competitive environment of all – the race track. ■



McLaren has applied its simulation techniques to the production of its own road cars.

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TECH REPORT

Racing with a disability

FEAT OF ENDURANCE

Every year, the Le Mans 24 Hours celebrates innovation by allocating Garage 56 to a pioneering racing endeavour. This year it was home to one of motor sport's most challenging efforts -Frédéric Sausset's attempt to take on the world's most famous endurance event despite being a quadruple amputee

TEXT: ANNE GIUNTINI

July 2012 and what should have been a pleasant family holiday on France's Atlantic coast becomes a waking nightmare as a freak accident irrevocably alters one man's life.

"Four of us went away, only three came home," recalls Frédérique Sausset, wife of businessman Frédéric, who while enjoying quality time with his family sustained a tiny, seemingly harmless scratch on his hand.

In a frighteningly short space of time, however, Sausset was hospitalised with a virulent bacterial infection. He rapidly fell into a coma and later awoke with his arms amputated at the forearms, and his legs cut off just above the knees, operations that been crucial to his survival.

When he eventually came out of the coma, Frédéric Sausset was engulfed in love, but in his head he was alone: alone with his thoughts and alone to choose between slipping away or fighting for another chance.

He chose the latter and in the months that followed the then 43-year-old set himself an incredible goal, to compete in the world's most famous endurance motor sport event – the Le Mans 24 Hours.

"I had just arrived at the rehabilitation centre, near Tours," explains Sausset. "My 'accident' happened at the end of July 2012. It was mid-October and I started to think that I had to find something to grab my attention, or I wouldn't be able to deal with it. Then all of a sudden, the idea of doing the Le Mans 24 Hours came into my head.

"I never stopped working on it up to the end of December 2012: I read thousands of articles – about racing, the teams, their organisation and their work methods. I structured my project, drew up a list of partners that I'd like to have on board, people to contact. Then I thought about how a race car could be adapted to cope with my handicap. On 23rd December, I spoke to my wife Frédérique. She had never shown any sort of interest in motor sport, but she said, 'if it's good for you, go for it. Do it.'"

As his ambition grew, Sausset's crazy dream became a realistic project and an extended family formed around him without which, he says, the realisation of his goal, at this year's event, would never have happened.

RACE PREPARATION

Christophe Tinseau, a veteran of 12 Le Mans attempts, became one of the mainstays of this tribe, coaching Sausset on driving techniques. Le Mans organisers the ACO (the Automobile Club l'Ouest) backed the Frenchman to use Garage 56, the space reserved for 'innovative projects'. And then there was the team of engineers that developed the innovations to allow Sausset to race – any of which were devised by Frédéric himself.

These included the steering wheel in the form of a connecting rod to which he would attach the screw from his artificial carbon arm, and a special seat linked to the accelerator and brake by a crosspiece that brought the pedals up to his leg stumps. There was also a compressed air system to lift his seat so that Sausset could get himself out of the car.

Sausset is lowered into the Morgan, which was specially adapted to allow him to race at Le Mans. Top right: the Frenchman on track.

"My handicap forced me to think, to come up with solutions," he says. "I can't bear coming up against a problem I can't solve. Basically, I'm stubborn. And in fact, nothing could be simpler than the things I 'invented' like extensions for the pedals. I didn't know if it would work, but it seemed the simplest solution to come up with; the 'ejector seat' so that I could get out of the car in an emergency, the connecting rod instead of a steering wheel. The engineers, technicians and mechanics on my crew did everything they could to refine my suggestions and to put my ideas into practice."

And there were more, as David Lecleach, data and systems engineer at one of Sausset's partners, Onroak Automotive, explained to lemans.org earlier this year. "We are the only car to have ABS, which is a massive help when it comes to braking. There is a Master-Vac brake booster that creates a vacuum to provide assistance when the driver presses the pedal. Without it, he wouldn't apply enough pressure to brake himself.

"The steering wheel is unique," he added. "The prosthesis he wears has a tip at the end that he uses to turn the wheel. It has practically the same steering rotation as a standard wheel. It has all the buttons required to start and stop the engine, and to control the automatic gearbox and the power supply. For him to use them, he must be disconnected from the steering wheel so all the buttons have been designed for use only when the car is stationary.

"There is a paddle that he can control with his right thigh. It is used to control the pit limit [the speed permitted when coming into the pits] and the full course yellow at 80kph. He presses it down as long as necessary and the computer interprets that to adjust the engine strategy [throttle opening and engine management]. Finally, on his left, there is a joystick that controls the indicators and activates the brake lights and flashers."

The FIA, too, was involved, validating the car as competition ready for the world's most famous endurance race. The initial reaction though was cautious, a position Sausset understands.

"The authorities [had to approve] – the ACO and the FIA. If Vincent Beaumesnil [Sporting Director of the ACO] or Pierre Fillon [ACO President] had vetoed it immediately, that would have been the end. I went to see them in April 2013 at which time I had not even tried to drive a road car. I only retook my driving test that July.

"FIA President Jean Todt could not give his approval from the start. Safety is at the top of his agenda. I came from nowhere, I had never raced and on top of that I have this handicap. But he followed the development of the project closely and over the past few months we had quite a few meetings. He came to see me in the pits at the 24 Hours. And he sent me a wonderful letter the day after the event."

The road to Le Mans itself was long, however, and saw Sausset build up to it via driving tests in a Ligier JS 53 EVO CN, prepared by Onroak, and then in the VdeV championship.

> "MY HANDICAP FORCED ME TO THINK, TO COME UP WITH SOLUTIONS, AND THE TEAM REFINED THOSE SUGGESTIONS"
>
> FRÉDÉRIC SAUSSET

"It was another victory, the first time I got in the CN prototype at the little Magny-Cours circuit in March 2015," Sausset says. "My main problem is that I never savour the present, because I'm always looking to the next step."

And eventually Sausset was ready to realise the goal – racing at Le Mans in a prototype Morgan LMP2 car alongside team-mate drivers Tinseau and Jean-Bernard Bouvet.

"Fred doesn't just settle for driving. On track, he thinks, analyses, anticipates. As he did more races, I saw him become a competitor like any other," says Tinseau.

And the result, for Sausset, was as magical as he had always imagined. "The night-time was fabulous! Your field of vision decreases, you arrive at Arnage and notice the bonfires burning in the spectator areas and you can sniff the smell of Merguez sausages cooking," he smiles.

"Then, on the way back to the pit straight, you see the big wheel lit up and you can hear the concert. Magic! I will remember that all my life, as I will the howling Ferraris. I was behind one of them down the Hunaudières and I could no longer hear my own engine, just the Ferrari's..."

LOOKING TO THE FUTURE

There was, though, the inevitable – the finish line. It was a moment Sausset had not prepared for.

"On Sunday, at daybreak. I knew it would soon be over," he says. "During the last hour, before my final stint, I couldn't stop crying. For the past two years, I'd imagined what it would be like to cross the finish line. In fact, I cried before. But when the flag was waved in front of me, I was already looking to the future."

And it's a future he is working on with the same commitment shown in tackling Le Mans.

"Afterwards, I got back to work as soon as possible, getting on with running my business and I also began to organise my motor sport future," he says. "It was too thrilling an experience to stop there. I'm currently looking at various options, but I'd rather wait until they come to fruition before talking about them.

"I feel I owe a debt to motor sport, which accepted me as I am and allowed me to go through with this challenge," Sausset concludes. "I wanted to do everything when it came to the Le Mans project, to control everything from A to Z: looking for technical partners and sponsors, building relations with corporations, with the constructors; the dialogue with the engineers, organising the local agencies. I was risking exhaustion, but it was vital for me to understand everything. I wouldn't want to be seen as pretentious by saying that I can bring something to motor sport today, but I do believe that I can." ■

AUTO FOCUS

Goodwood and the FIA

UP TO SPEED

This year's Goodwood Festival of Speed saw some 200,000 motoring enthusiasts gather to celebrate everything powerfully automotive and for the first time the FIA was present in an official capacity. AUTO looks back on some of the weekend's highlights...

TEXT: TOM WOOD

ON THE HUNT
In this 40th anniversary year of James Hunt's Formula One World Championship win, there were many incredible cars at Goodwood to celebrate the milestone. Among the flame-spitting tributes was the #44 Molyslip Lotus Racing Lotus 59, raced to several Formula 2 victories by Hunt in 1970.

◀ HISTORY IN MOTION
Each year, the Festival of Speed brings something unique to the hundreds of thousands of fans that flock to West Sussex in England. One of the standout moments of this year's event was the running of the 2009 Formula One World Championship-winning car – the Brawn GP BGP 001. Entered into the event by the team's former boss Ross Brawn, the car, which earned Jenson Button the '09 Drivers' Championship crown, was on this occasion driven by former F1 driver and now TV pundit Martin Brundle. Speaking about the car and the short-lived team that raced only in 2009 before becoming the Mercedes F1 outfit, Brundle said it "represents a little moment in time in Formula One history," a moment that captured imaginations and was gone almost as soon as it had appeared.

"WE'VE ALWAYS FELT THE FESTIVAL SHOULD CELEBRATE THE CAR IN ALL ITS FORMS"

LORD MARCH

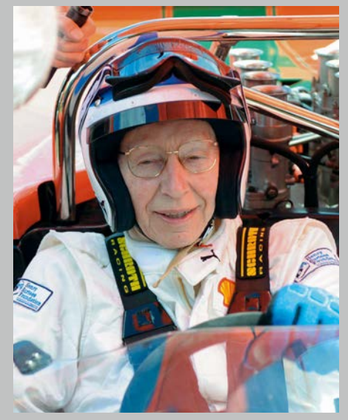
FEDERATION STATION ▲
For the first time an FIA stand took pride of place at the heart of the Festival of Speed. The main display focused on the single-seater pyramid, with each level represented from karts, to Formula 4, Formula 3 and all the way to a Scuderia Toro Rosso Formula One car. The path set out by the FIA was further demonstrated when British F4 rookie Ayrton Simmons and Red Bull Racing F1 reserve driver Pierre Gasly met on the stand. Also on show was the prototype of the 'Halo' head protection device, which is a frontrunner for introduction to F1 in 2018. The stand displayed details of the FIA Action for Road Safety including the Federation's Golden Rules for Safer Motoring.

▲ FRIENDS REUNITED
The FIA has visited Goodwood House previously, for the Federation's inaugural Sport Conference in 2013, so this year's official presence was an opportunity for Festival organiser and Goodwood owner Lord March (above left) to renew acquaintances with FIA President Jean Todt. Across the weekend the FIA stand played host to some key motor sport figures, with former Mercedes Formula One technical director and Brawn GP team principal Ross Brawn and former Ferrari team principal and now Lamborghini President and CEO Stefano Domenicali among the senior motor racing figures to drop by. ▶

HEAVENLY STRATOS ▼
The 1976 Lancia Stratos Rallycross car occupies a special place in FIA history as it won the inaugural FIA European Rallycross Championship that year. Then driven by Franz Wurz, the car is now owned and run by his two-time Le Mans-winning son Alex, who had the pleasure of driving the car in front of the thousands of fans gathered at the Goodwood Estate. While the Stratos is perhaps best known for its World Rally Championship prowess, the car proved its quality in rallycross, going on to win the European title a second time in 1978.

◀ NICO TIME
One of the highlights of this year's Festival of Speed was the appearance of current Formula One Drivers' Championship title contender Nico Rosberg. As well as meeting his many fans at the course edge, the Mercedes driver powered the manufacturer's W05 Hybrid car up the famous hill. One of the most dominant cars in F1 history, the W05 was raced to victory in 16 of the 19 grands prix on the 2014 calendar, with Rosberg taking five wins along the way to help Mercedes claim that year's Formula One Constructors' Championship.

◀ BLACK JACK'S BEAUTY
The Brabham BT24 was one of the many grand prix cars at Goodwood with a fascinating history. Going toe-to-toe with the Lotus 49 during the 1969 Formula One season, the car took three wins in the hands of Jack Brabham and Denny Hulme. The car's strong reliability and pace helped to secure the Constructors' Championship, while Hulme went on to pip Brabham to the Drivers' Championship title by just five points. Fittingly, the car was driven up the fabled hillclimb at Goodwood by Brabham's son, David.



CAN-AM KING ▲
John Surtees was one of the many legendary racers to be reunited with an old friend at Goodwood, and this year he took to the wheel of a Lola T70 Spyder – the car that took him to the inaugural Can-Am title in 1966. Securing three wins that year at the Circuit Mont-Tremblant, Riverside International Raceway and Stardust International Raceway, rule changes for 1967 made it the only time the car would be raced to such success. With both Surtees and fellow legend Sir Jackie Stewart getting behind the wheel over the weekend, it was certainly a highlight for the spectators.

◀ A WORLD OF MOTOR SPORT
As well as the multitude of static displays, the Festival of Speed prides itself on showing cars from every motor sport discipline in action. Modern machines from the Formula One, Formula E, World Rally, World Endurance and World Rallycross series and the stars who drive them all took to the hillclimb course, presenting the latest innovations and excitement that modern motor sport has to offer.

MARCHING FORWARD

Goodwood owner and Festival of Speed founder Lord March reveals his highlights from this year's event and why it was important to officially welcome the FIA for the first time

The Festival of Speed continues to grow. Were you happy with this year's event?
I think it was an excellent year. We have a maximum number of people we can fit in every day, so we didn't go above that. We sell out more quickly every year, so that's an important barometer. We had about 205,000 visitors across four days.

There were 25 new car launches at this year's event. Is the Festival now as much an exhibition space as a celebration of performance?
First and foremost, it's an editorial event; it's driven by content and the industry itself has been wanting to find a different way to do motor shows, a different way to engage people, to get customers in the cars, touching the cars, seeing them in action. We very much had that feedback from some of our main partners, saying we need to get people into the cars, so that's when we came up with the whole Moving Motorshow concept. The Festival of Speed is all about the motor car, why we love driving and it's a good moment to show people all the latest and most exciting technology.

What do you feel the Festival now represents in terms of motor sport events worldwide?
It's pure enthusiasm and in that sense it's quite tricky to position it. It's not a championship, there's nothing before or after it, it's simply a celebration of the motor car and the joy of driving. I think we've always felt the Festival should celebrate the motor car in all its forms, especially competition cars. What's been really exciting for me is the excuse to have a look at everything. I think that's where the event is very unusual, in that we celebrate all genres of the sport, all in one place. Nowhere brings together IndyCar, NASCAR, F1, Le Mans, rallying and also amazing historic racing cars going back to the earliest days of grand prix racing. There are specialists in each area but no one brings them all together as we do and that gives us huge opportunities to do some great stuff.

For you, what were the highlights from this year's event?
I was really pleased with the very early cars. We had a fantastic line-up of big Edwardian racers. We had the very early Mercedes grand prix cars and we had two Fiats. To see those great Edwardian leviathans in one group was great for me. It's a bit of an acquired taste but they are wonderful things and to see them being driven was pretty exciting.

What's the future for the Festival? Is it important to keep innovating?
We definitely do. There's tons of content we can add and we intend to do that. We need to change things all the time to keep it interesting and exciting. There are great anniversaries every year we can pick up on. We have a different theme each year – it was 'Full Throttle: the Endless Pursuit of Power' for 2016. It's very important for us to have an editorial hook to hang it on. We're pushing very hard on our digital content and broadcast material, and that's what we're focused on. We had fantastic results – we had something like 30 million Facebook followers and eight million video downloads within a week of the event. The car world is one that really responds well to the internet. So we're trying to work that very hard.

The FIA had an official presence at the Festival for the first time this year. Was that an important development?
Absolutely. It was great to have the FIA formally present. It is recognised as being motor sport's governing body and it gives us credibility to have the governing body participating in the event. It's very good for us and I hope we can be useful in return and help get a very good international audience engaged with the FIA and its goals.

Edwardian cars at this year's Festival provided a highlight for event founder Lord March.

COVER STORY

FIA ROAD SAFETY CAMPAIGN

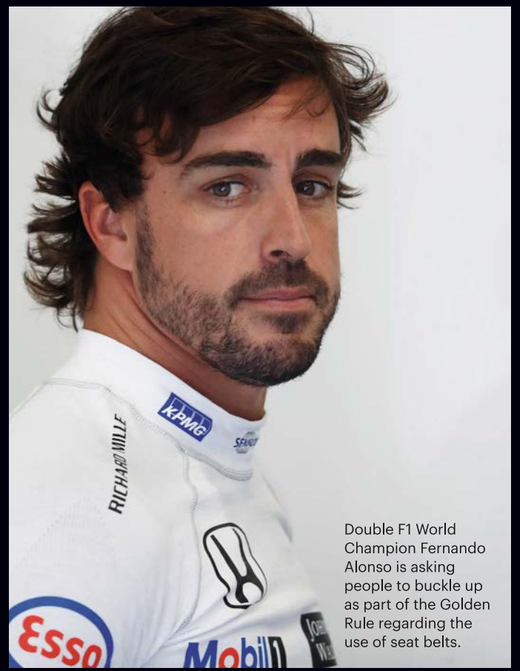
SAFETY STARS

The FIA has joined forces with a host of celebrities from the world of motor sport and beyond in its continuing quest to dramatically reduce the number of global road fatalities

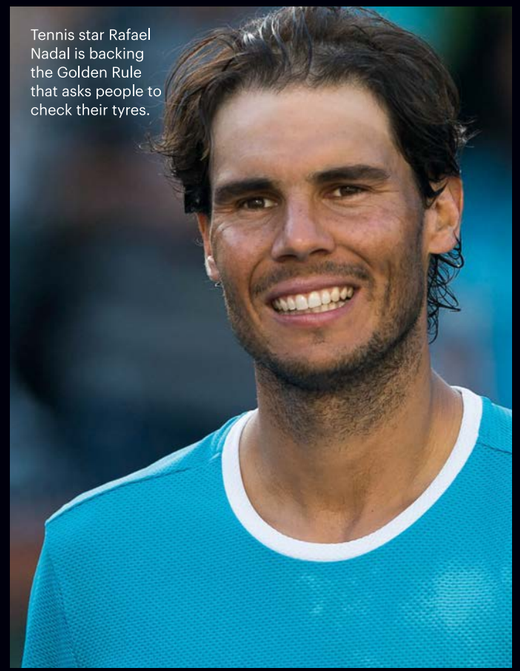
TEXT: LUCA COLAJANNI

AUTO / ISSUE #16

Music star Pharrell Williams's Golden Rule concerns the use of mobile phones: 'Hands on the wheel, phone in the pocket'.



Double F1 World Champion Fernando Alonso is asking people to buckle up as part of the Golden Rule regarding the use of seat belts.



Tennis star Rafael Nadal is backing the Golden Rule that asks people to check their tyres.

Every day, 3,500 people are killed on the roads. It's an alarming figure, a plague that needs to be stopped, a human, economic and social cost which has become unacceptable. Now, this is also the message of a global advertising campaign, the first undertaken by the FIA, thanks to a collaboration with JCDecaux, the world leader when it comes to outdoor advertising. The campaign will be launched in the near future and it links the face of a celebrity to one of each of the FIA's Golden Rules. The messages are short and simple, aimed at promoting good behaviour, which should be the norm for anyone who gets behind the wheel of a car on the road.

"Road traffic accidents are the cause of 1.25 million deaths and 50 million injuries every year," says FIA President Jean Todt, who also serves as the UN Secretary General's Special Envoy for Road Safety. "We cannot sit by and do nothing when faced with these figures. I am proud that the FIA and its member clubs are in the front line to meet this challenge and raise awareness about the importance of road safety.

"A lot can be achieved simply by respecting a few basic rules, such as those the FIA has been promoting for some time now," he adds. "We want this campaign to reach as many people as possible around the world and to achieve that we have called on a number of leading celebrities who can help, thanks to their popularity and visibility. In addition, we asked for support from the leader in the field of roadside advertising, JCDecaux."

> "WE WANT THIS CAMPAIGN TO REACH AS MANY PEOPLE AS POSSIBLE AROUND THE WORLD"
> FIA PRESIDENT JEAN TODT

FAR-REACHING APPEAL

To date, seven stars have agreed to act as campaign ambassadors - Fernando Alonso, Yohan Blake, Marc Márquez, Felipe Massa, Rafael Nadal, Pharrell Williams and Michelle Yeoh. However more could yet join, including a major star of world football. Clearly, these people don't just come from the world of motor sport, but also from other sports or different spheres of endeavour such as music and film. This diversity is aimed at attracting the attention of the largest possible number of people, especially young ones from the ages of 15 to 29, the group for whom road accidents are currently the outright number one killer. With that in mind, the campaign will also feature a push on social media with video messages and a 'making of' story relating to each photo.

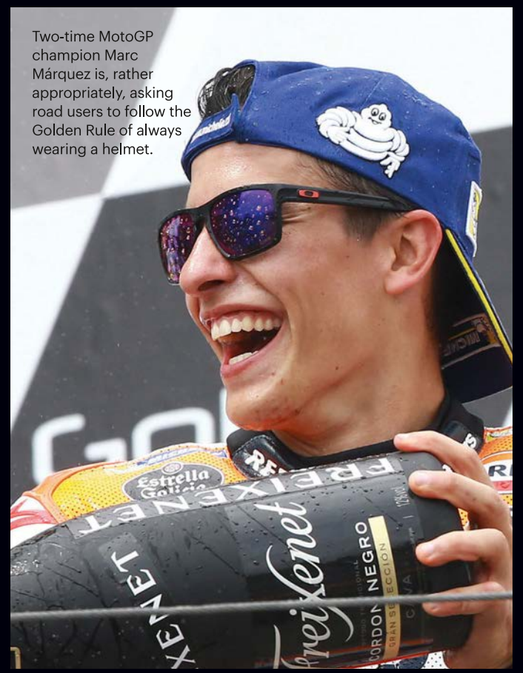
However, at the centre of the campaign are the advertising hoardings managed by JCDecaux, with a target audience that can reach 300 million people in 75 countries on all five continents, in a widespread and extremely efficient manner. "When Jean Todt told us about this project, we immediately got involved. Road safety is a battle that we must never cease to fight, and that's why we did not hesitate to associate ourselves with it," says Jean-Charles Decaux, Co-CEO of JCDecaux SA. "We must collectively and individually take action against the scourge of road accidents. This is the reason why we are very proud to contribute to broadcasting these messages to take care and stay safe – we cannot accept that so many lives are lost and so many futures ruined."

Artistic direction of the concept came from the Meanings agency, which entrusted the project to world-renowned photographer Vanessa von Zitzewitz, known for her portraits of luminaries such as Mick Jagger, George Clooney, Michael Schumacher and Ringo Starr.

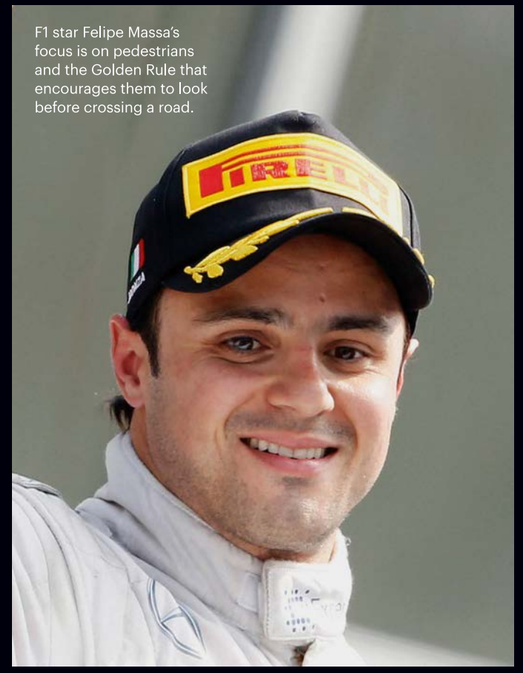
"I have immense respect for Jean Todt, who is a true friend," says von Zitzewitz. "I have always been struck by the passion with which he tackles any project and so I happily accepted this commission. Road safety is a really important topic. I have always loved speed, but now, especially as I have a young child, I have become more conscious of the risks one is exposed to on the roads and I am happy that with my camera, I can do something, because not everyone is really aware of it." ▶

Actress and road safety campaigner Michelle Yeoh's Golden Rule centres on protecting children, specifically through the use of helmets and car seats.

PHOTOGRAPHY: FABRIZIO MALTESE



Two-time MotoGP champion Marc Márquez is, rather appropriately, asking road users to follow the Golden Rule of always wearing a helmet.



F1 star Felipe Massa's focus is on pedestrians and the Golden Rule that encourages them to look before crossing a road.

"MY FAME ALLOWS ME TO DO SOMETHING FOR A GOOD CAUSE AND ROAD SAFETY IS ONE OF THEM"

PHARRELL WILLIAMS

Each of the seven faces of the campaign is linked to a Golden Rule that in some way reflects their personality or the activity for which they are best known. For example, the Jamaican sprinter Yohan Blake, twice Olympic Gold medal winner in the 4x100 relay (London 2012 and Rio 2016) and second in 100 and 200 metres in London 2012 Olympics behind his friend Usain Bolt, is the ambassador for the rule relating to respecting speed limits. "If you are running late there's no point racing at the wheel, because you'll never get the time back," quips Blake. "Speed? Leave that to me!" Two-time Formula One World Champion Fernando Alonso, who is promoting the use of seat belts, an essential tool of the trade in his line of work, says: "Racing drivers can set an example for everyone and therefore help save lives."

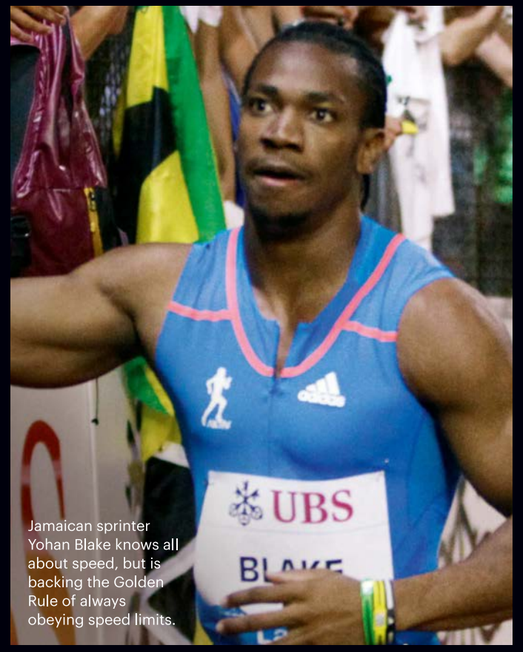
Fellow racer and former Ferrari team-mate Felipe Massa has put himself in the shoes of someone using a pedestrian crossing. "My son and Felipe's go to the same school and we often meet," reveals von Zitzewitz. "We all know the importance of holding one's children by the hand whenever crossing the road, teaching them to be careful at all times because danger is always lurking..."

Michelle Yeoh is an acclaimed actress and producer and since 2008 she has been actively involved on the road safety front. She is a Global Road Safety Ambassador for the UN Decade for Road Safety 2011 to 2020 and a spokesperson for the FIA High Level Panel for Road Safety. In this campaign she promotes the use of on-board child safety equipment.

"Road safety is a fundamental human right, starting above all with the most vulnerable in society – our children," she says. "That makes it all the more shocking that every day 500 children die in car crashes, with thousands more left seriously injured. Governments have the primary responsibility to improve road safety, but everyone has a role to play. So when you're on the road, follow the rules of the road and make sure your child always uses a safety belt, wears a helmet, and gets the best protection possible."

Pharrell Williams has redefined today's popular music scene and has an amazing following, especially among the younger generation. Who better therefore to put across the message that a smartphone, a device that's particularly popular with youngsters, is best kept in your pocket when driving? "We all drive and the last thing we want is to be involved in a road accident," he says. "In the past, I too used to use my phone to send texts while I was driving, but then I realised, partly from seeing the statistics, just how dangerous that can be. As an artist I'm perfectly aware that my fame allows me to do something for a good cause and road safety is one of them."

What results can we expect from such a wide-ranging campaign? As usual, Jean Todt's view is brief and to the point: "Even if just one life is saved thanks to the example our ambassadors can set, then we can claim it has been a success." ■



Jamaican sprinter Yohan Blake knows all about speed, but is backing the Golden Rule of always obeying speed limits.


Jean-Charles Decaux says his outdoor ad company was keen to lend its weight to the FIA's campaign.


FIA President Jean Todt, a UN Special Envoy for Road Safety, believes the new campaign can have a global impact.

AUTO / ISSUE #16

AUTO FOCUS

Future urban transport

CITIES WITHOUT LIMITS

New driverless technology is poised to help solve the growing problem of traffic congestion in our cities - with urban planning a hot topic for the United Nations

TEXT: OLIVER SMITH

The way we move around our cities will change more in the next decade than in the last 100 years.

Ground-breaking technologies like electric, self-driving and fully autonomous cars being pioneered by Google and Tesla are poised to tear up the rulebook when it comes to urban mobility, dethroning the internal combustion engine's dominance over movement.

At the same time a renaissance is taking place among city planners in the way they're thinking about transport itself. Old goals like the efficiency and speed of vehicles are being replaced with new metrics like health, well-being and the happiness of a city's population.

This October the United Nations will hold its third Conference on Human Settlements, also known as Habitat III. National governments, regional mayors and local leaders will come together to tackle the key questions facing sustainable urbanisation over the next 20 years.

Of these questions, mobility is set to be one of the defining topics of the conference. Representatives of developing cities, established cities and the world's biggest mega-cities alike are struggling to manage swelling populations and transit systems reaching breaking point.

Their findings and decisions will be published as part of the UN's New Urban Agenda, a non-binding document to shape and guide the political discourse around our urban centres for the next two decades.

For context, the last urban agenda, agreed at Habitat II in 1996, paved the way for 100 countries to adopt new legislation guaranteeing adequate shelter for their citizens and set the programme for dozens of UN policies on urban development.

The New Urban Agenda is expected to be just as impactful.

AUGMENTING THE CAR

Among the world's leading thinkers, there's one looming challenge as Habitat III approaches – finding alternative transport solutions.

"It's very simple – weaning us off the drug that the internal combustion engine has become, in terms of individualised transport and even some types of public transport," says Riccardo Marini, director at Gehl Architects, one of the world's leading urban design firms.

But it's not about replacing the car, instead city planners and mobility experts are in favour of augmenting the car, either by prioritising other modes of transport (walking, cycling and public transport) or by removing our need to own cars.

"The big game-changer is certainly Google's self-driving cars," says Robert Cervero, professor of city and regional planning at the University of California, Berkeley.

"While many auto manufacturers are introducing autonomous vehicle technologies, such as automated park-assist and adaptive cruise control technologies, it's the driverless vehicle – guided by laser, radar and sonar sensors – that could radically change how we move about cities."

Not, Cervero says, by giving everyone a self-driving car, but instead by using them to create fleets of vehicles that can be used by anyone travelling in the same direction.

BEYOND DRIVERLESS

Most estimates peg car utilisation today, the amount of time the car is actually being used, at only between four-five per cent of the time. Despite a car being the second largest financial investment of most families, most of the time it is simply parked unused.

The vision shared by Cervero and the CEO of ride-sharing app Uber, Travis Kalanick, is of an autonomous fleet of cars that could see their utilisation rates rise to 80 or 90 per cent of the time, leading to far fewer cars being needed on the road.

"It is a world that's going to exist and it is going to be a better world," Kalanick has said, openly acknowledging that Uber's ultimate goal is to replace their thousands of drivers.

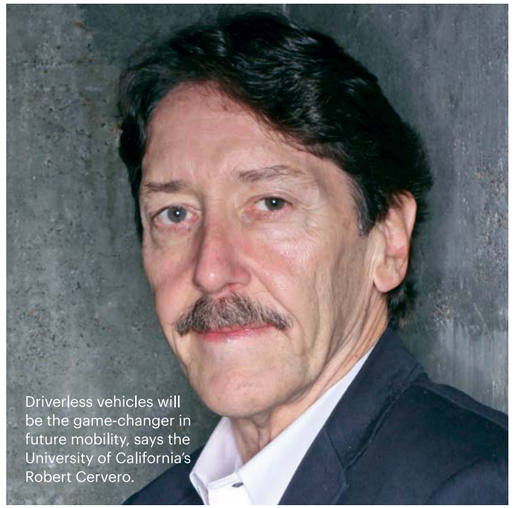
"Fewer cars also means less urban land will be needed for car parks and motorways, allowing adaptive reuse of land for other purposes, like greenways and civic spaces," says Cervero.

ALL-YOU-CAN-EAT ELECTRIC TRAVEL

Ashwin Mahesh, an urban infrastructure expert, has approached the challenge of eliminating cars from a different angle through his work with Lithium, an all-electric taxi fleet in Bangalore, India.

"At the moment Lithium can only do two or three things. In a way it's a kind of substitute for taxis, it can also encourage shared travel and it can accelerate the transformation to low-carbon travel because you're not burning fossil fuels." ▶

Uber CEO Travis Kalanick believes car sharing is the way of the future, reducing the number of vehicles on our roads.



Driverless vehicles will be the game-changer in future mobility, says the University of California's Robert Cervero.

PLANNING FOR PARIS' FUTURE

Case Study: How does a city with two millennia of history behind it keep moving forward? Paris mayor Anne Hidalgo reveals all

Mayor of Paris Anne Hidalgo: "Everyone must have a choice."

Can you outline the current state of urban transportation in Paris across road, rail and automobile?
Since 2001, the city has embarked on a development of alternative forms of transport to the private car. I have been working on this since 2014. We are working on renewing the Velib' (bicycle sharing system) contract, we have launched the Plan Velo 2015-2020, which allows for doubling the length of Parisian cycleways by 2020, we are preparing a pedestrian strategy which is due to be presented to the Paris Council in the autumn, when we will also start restructuring the Parisian bus network, and we are always developing our network of BE'Lib electric recharging points.

When it comes to pedestrians, we have increased the number of 30 km/h zones and we have reduced speeds to 20 km/h in the Paris Respire (Paris Breathes) pedestrian areas on Sundays. We have overhauled major Parisian squares and we have launched the pedestrianisation of the Champs-Elysées one Sunday per month. Also, from this autumn, the Berges de Seine on the right bank of the Seine will be pedestrianised. It's a big job!

What are the existing problems and what are the issues the city will face in the coming decades?
There is a major challenge when it comes to public health in terms of pollution. Urban transport is the main cause of local pollutants, notably the fine particles which cause over 6,500 deaths per year when looking at the Greater Parisian Metropolis. We absolutely must reduce this local pollution. Since September 2015 we have put in place a restricted circulation zone in Paris, with a further step taken in July 2016. The oldest cars, which cause the most pollution, are gradually being banned. In decades to come, Paris will have to meet ever more significant demands on mobility, while abandoning forms of energy from the last century and finding less polluting forms of mobility. We are doing a lot of work on electric mobility; hydrogen is also coming on the scene and renewable energy will also soon be applied to urban transport.

In the past you have spoken about making all of Paris' public transport electric by 2030 – how is that going?
I have a primary objective for 2020, which is to eliminate diesel cars from Paris as much as possible. We have set up a restricted zone that allows us to ban polluting vehicles, only allowing the cleanest forms of power from 2020. The RATP (Paris' transport authority) is renewing its fleet, going in the direction of electric or natural gas vehicles. So yes, by 2030, I think we can do it.

How do you and your team aim to cope with the changing face of mobility?
Everyday, mobility evolves in Paris. There are more and more people on bicycles, more and more driving electric cars... it's not something new. Cityscoot [an electric scooter hire scheme similar to Velib] is on the scene and taxis run on hydrogen. We are doing more than just window dressing, we are keeping up with all evolutions on the mobility front and indeed we have been the pacesetters for some of these evolutions.

A large metropolis has the means to create new solutions and to drive trends. It is the Ville de Paris that launched Autolib' and contributed to the development of a new sector of electric cars. And we are working on finding an area within Paris to experiment with self-driving vehicles.

What place do motorists have in all this, those for whom the car is still the favoured means of transport?
In Paris, we are working on providing a wide range of mobility choices: everyone must have a choice.

In some instances, the car is still necessary and there is no question of Paris not having a place for motorists. The plan is to simply make mobility more sustainable, avoiding car journeys when a cleaner solution is available, involving more sharing. Autolib' is a solution for motorists. However, the effects of pollution are too significant for us not to act. We cannot give the private car as much freedom as it had in the last century. The car, yes, but with well thought out usage, with a cleaner engine, probably an electric one.

In some countries car ownership is promoted over other forms of transport – a problem that is set to be debated at the United Nations.

Lithium's electric taxi business model is unique. The group currently only serves corporate clients who pay a flat fee to access a fleet of 200 electric cabs, which they can then use on an unlimited basis for no additional charge.

"It's the energy problem related to mobility that is the one that's going to be addressed most quickly by electric mobility, and in that process we will introduce shared mobility."

It's still early days, but Lithium hopes to increase its fleet to 400 vehicles soon and eventually launch a version for consumers.

Google's driverless cars and driven electric fleets pioneered by companies like Lithium are different in their execution, but both envisage a future where new technologies let people share and pool resources to reduce the number of cars on the road.

"The principle of the sharing economy where the collective is more important than the individual, that could be really powerful," says Gehl's Marini.

A NEW MINDSET FOR MOBILITY

For now at least this driverless vision of cities remains just a vision, and while ride-sharing through services like UberPool and Lyft Line are growing in popularity, they remain niche modes of transport.

Instead most cities are simply focusing on dealing with the congestion they already have and, according to Mahesh, that's part of the problem.

"Congestion has become the origin of our thinking about mobility, in fact if there wasn't any congestion I doubt there would be much of a discourse about mobility," he says.

There's a growing mindset among city planners and urban mobility experts that the predominant goal behind most 20th century city design, making urban environments as vehicle-friendly as possible, is simply broken.

"Wellness has to be the origin of our thinking about mobility and in turn we will address congestion," adds Mahesh.

Focusing on the health impact that transport choices can have on a population and giving people the option to travel how they wish – supporting other modes of travel with pedestrianisation or the construction of cycle highways – has been proven to reduce the burden on our roads.

MISSING THE POINT

"Many cities get distracted by tinkering around to make the system work for vehicles, but to me they've missed the point," says Marini.

San Francisco uses a system called SFPark, with wireless sensors that detect which parking spaces are in use and dynamically changes the price of parking around the city to encourage people to park in less congested areas.

Meanwhile Singapore and London have introduced variable congestion charges, which can be adjusted by location, time of day or vehicle type to deter drivers from taking their cars through the city centre during peak hours. Both are high-tech ways to manage and augment car travel, but neither comes close to resolving the problem.

"Start from the principle that a city centre should make it easier for pedestrians, cyclists or any other sub-set of people walking, because it has total direct impact on air quality, health, well-being and it makes the place more attractive," says Marini.

It's a powerful idea, and one that's popular in the developed world. But it's among less developed cities and poorer emerging mega-cities (with populations in excess of 10 million people) where this idea isn't catching on for one simple reason.

THE DEVELOPING CHALLENGE

"If I'm in Africa, parts of Latin America or China, once you move out from the big centres of habitation, cycling is for poor people," says Marini.

In his experience the local and regional officials in developing cities are often squarely focused on increasing the number of drivers and cars on the roads, without regard for the paralysing hyper-congestion they might face in the future.

Marini recalls the mayor of one city in eastern Europe telling him: "You must remember we're coming out of the Soviet era, we want the American dream, we don't want people cycling any more".

That's a problem because these cities are among the world's most populous and to promote the automobile at the expense of encouraging pedestrianisation and the use of public transport will leave them gridlocked and could contribute to increased pollution.

PUTTING PEOPLE FIRST

Technology will transform the way we move around cities over the next decade, but technology alone won't be enough to solve the urban mobility crisis facing cities.

As Marini says: "The biggest challenge is how to understand that movement is critical, but car-dominated movement is actually negative in terms of health, well-being and happiness."

Leaders at the UN's Habitat III conference will need to debate this new mindset for urban mobility. A mindset that blends the future of driverless cars with the values of a sharing economy, where not everyone needs to outright own a car any more – and a mindset that prioritises the welfare and the happiness of people.

That's a big jump in thinking for governments, regional mayors and leaders who, for the past hundred years, have focused on maximising the movement of vehicles.

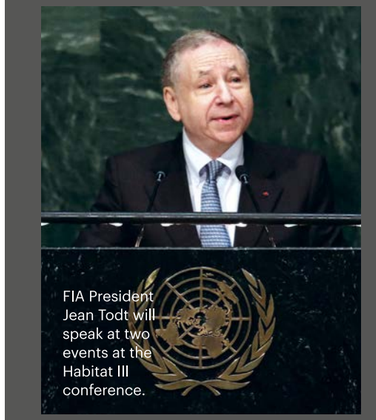
But it's a jump that may need to happen. ■

PHOTOGRAPHY: ISTOCK

Riccardo Marini, director at Gehl Architects

Ashwin Mahesh, urban infrastructure expert

THE FIA AND HABITAT III



FIA President Jean Todt will speak at two events at the Habitat III conference.

The FIA and FIA Foundation will be participating in Habitat III, which will agree the New Urban Agenda, a document to shape urban development over the next 20 years.

During the conference, FIA President and UN Secretary General Special Envoy for Road Safety Jean Todt will address stakeholders at two side events. He will co-host an event with the Inter-American Development Bank entitled 'No Urban Agenda without Safe Mobility' and he will host a UNECE event on 'The Role of Road Safety in Achieving Sustainable Cities'.

The FIA Foundation has been involved in negotiations on the New Urban Agenda at the UN and in Habitat III preparatory meetings throughout 2016. During the conference it will be highlighting the importance of liveable cities and sustainable urban mobility as part of its 'safe, clean, fair and green' agenda.

This includes a focus on road safety, air quality and vehicle emissions in cities, including the importance of walking and cycling, and sharing the findings of research into women's security on public transport – including South Africa and South America – as well as a joint report with UNICEF on the links between road traffic injury and poverty.

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AUTO FOCUS

Road Safety

THE RIGHT WAY: CHILDREN FIRST

A new report published by the FIA Foundation and UNICEF has revealed the high financial costs that burden the families of children involved in road traffic collisions in the developing world, and calls for urgent action to prevent these accidents occurring.

TEXT: AVI SILVERMAN

Children die every day on public highways. Road traffic collisions are the global leading cause of children over the age of ten losing their lives prematurely. For those who do survive, the financial burden of their recovery on their families can be crippling.

A safe route to school is often taken for granted by some people around the globe, but many young students are exposed to danger and death as they make that journey on a daily basis. A new report jointly produced by the FIA Foundation and UNICEF has revealed that injuries sustained in road traffic accidents exacerbates child poverty and imposes a severe burden upon the young and the poor across low and middle-income countries.

The report, titled 'Rights of Way', concluded that this problem must be addressed as a global sustainable development priority. Thanks to the work of the FIA Foundation, this topic will be incorporated into the UN's upcoming Habitat III conference, which will agree on the New Urban Agenda, a document to shape and guide urban development for the next 20 years.

VICIOUS CIRCLE

The cycle of tragedy is relatively simple: children from poor families are vulnerable to road traffic injury. When an accident occurs, they suffer severe and protracted effects; and too often, victims and their families are locked into yet more struggles with poverty. Globally, road traffic injury serves as a brake on poverty eradication and development.

"Poverty eradication is a core objective of the sustainable development and new urban agendas," said Saul Billingsley, Executive Director of the FIA Foundation when the report was launched. "But if we are to make progress in combatting poverty, we must address road traffic injury – the leading global killer of children in their second decade of life. As this report highlights, the solutions are readily available. As a global policy priority we must promote sustainable mobility as matter of social equity, and every child should be afforded a safe and healthy route to and from school."

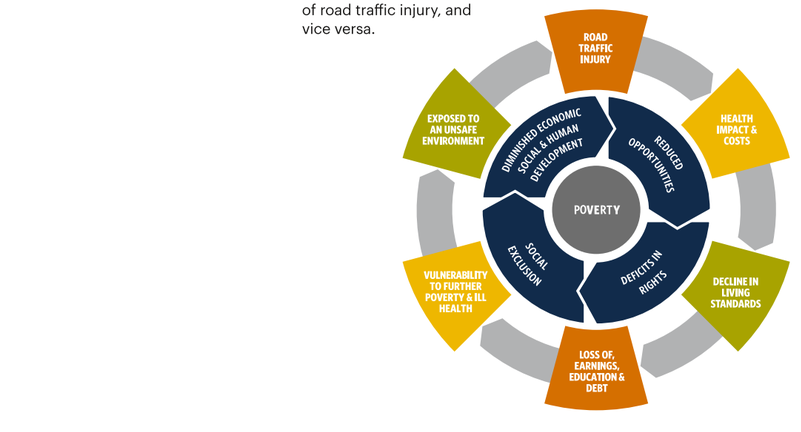
The report, which was launched at a Habitat III Prepcom event co-hosted by the FIA Foundation, UNICEF and the Government of Brazil, contained case studies from Dar es Salaam in Tanzania, Nairobi in Kenya and Accra in Ghana, as well as six cities across Latin America and Asia, which laid bare the costs road traffic injury places on families and children living in poverty. For Dar es Salaam's urban poor, road traffic fatality rates among children in 22 schools surveyed by NGO Amend are at 45 out of every 100,000 across the population, a level exceeding other major public health crises.

In Nairobi, families living in poor neighbourhoods on the outskirts of the city faced medical costs twenty times their monthly wage following a road traffic injury. While families hit by road traffic injury in Brazil, Colombia, Mexico, India, Indonesia and Thailand experienced loses of income of typically of over 50 per cent, struggled to retain employment, faced a severe drain on living standards and loss of education.

'Rights of Way' draws on work from members of a new partnership established by the FIA Foundation - the Global Initiative for Child Health and Mobility. Partners contributing to the report included the World Resources Institute through its 'Cities Safer By Design' principles and the United Nations Environment Programme's 'Share the Road initiative', which was developed with the FIA Foundation. The Amend NGO and International Road Assessment Programme also provided case study and research material.

DEVELOPMENT GOAL

The report established that as a response, the international community must focus on the objective of a safe and healthy journey to and from school for every child by 2030 as a priority within Habitat III's upcoming New Urban Agenda document and the UN's



Poverty Cycle: The report describes how poverty increases the likelihood of road traffic injury, and vice versa.

FIA Foundation Executive Director Saul Billingsley launched the 'Rights of Way report at the Habitat III PrepCom in Surabaya.

Sustainable Development Goals. This involves ensuring safe routes to school for all children, with pavements that are fit for walking, safe road design and effective speed management.

It also suggested prioritising pedestrians and cyclists in urban planning and increasing investments in safe infrastructure for non-motorised transport to encourage active, low carbon, mobility, as well as improving vehicle safety on school journeys with helmets for motorcycle passengers, seatbelts and safety checks for school buses. Encouraging policies to address wider health impacts from transportation, reducing vehicle emissions and improving air quality were also recommended.

"Tackling road traffic injury must be a priority in the New Urban Agenda," said Carlos Cuenca, Head of the Division of Social Issues of the Ministry of Foreign Affairs, Government of Brazil. "I was pleased that the second Global High Level Conference on Road Safety, hosted by Brazil, addressed child safety as well as important issues of sustainable urban mobility."

During the Habitat III Prepcom, representatives from the FIA Foundation- UNICEF partnership on child road traffic injury held a plenary session that included coverage of the report's advocacy. "Children can be the cornerstone of social change, inclusion and sustainable development," said FIA Foundation Deputy Director Avi Silverman in the submission on behalf of the partnership.

"Only once we guarantee the wellbeing of children is it possible to break the cycle of poverty and inequity. The New Urban Agenda must prioritise the protection of vulnerable road users, pedestrians and cyclists in policy frameworks and design principles. And a core part of this must be the protection of all children, including the poor and vulnerable."

Also in attendance at the event to launch the 'Rights of Way' report were key partners in the Child Health Initiative who added to the calls for action. On behalf of the WRI, Holger Dalkmann, its Director of Strategy and Global Policy, discussed the 'Cities Safer by Design' report and the efforts underway to implement its recommendations for prioritising walking and cycling in urban design, while Brian Sriprahastuti, Senior Manager at Save the Children Indonesia, highlighted the need for sustainable mobility to protect children in South East Asia. ■

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AUTO FOCUS

Le Mans Classic

RECIPE FOR A CLASSIC

With a plethora of stunning cars and a quality driver line-up, it's little wonder that the Le Mans Classic is increasing in popularity

TEXT: SIMON ARRON

A total of 441 starters took part in this year's Le Mans Classic, which drew a crowd of 123,000 people.

There are three hours to go before the flag drops to signal the start of the eighth Le Mans Classic, but the breadth of local motor sport history is already apparent. Neatly arranged in six paddocks separated by eras spanning 1923 to 1981, you'll find cars produced by Bentley, Porsche, Jaguar, Ferrari, Matra, Lola, Chevron, Maserati and many more of that ilk, marques with a strong Le Mans 24 Hours or endurance racing pedigree. Such are the dominant forces, but in between you'll find the handiwork of a few oft-forgotten artisans. Inaltera and Moynet might be relative footnotes in automotive history, but remain relevant for the scale of the dreams they once represented. The Le Mans Classic embraces all.

First run in 2002 and since staged biennially at the Circuit de la Sarthe, the Classic runs for 24 hours – but not in the manner of a traditional day-night enduro. Cars are separated into six groups of roughly compatible age and this year's event attracted 441 starters, the smallest field (1923-39) featuring 64 cars and the largest (1962-65) 79. Each takes part in three races that last 43 minutes and run sequentially from 4pm on Saturday, with short intermissions to allow for recovery and repairs before the flag falls at 4pm on Sunday.

Like the Le Mans 24 Hours from which it derives, the Classic attracts a knowledgeable and enthusiastic audience from around the globe, with classic car clubs gathering en masse at the circuit. Although the crowd was relatively small in the early years, it was this year estimated at 123,000 – a symbol of its growing appeal.

WIDE APPEAL

It isn't just fans that are drawn, either. The entry featured several Le Mans winners, including Emanuele Pirro, Henri Pescarolo, Marco Werner, Gérard Larrousse, Andy Wallace, Gijs van Lennep, Jochen Mass, Eric Hélary and, perhaps most significantly, Romain Dumas. Three weeks after sharing the winning Porsche 919 in this year's 24 Hours, Dumas was back to race a 962.

"We are all here for one reason," says Dumas, "we're passionate about Le Mans."

Even the Classic's principal partner took part, with watchmaker Richard Mille sharing the fifth-placed Lola T70 with PSA Group Chairman Carlos Tavares in the 1966-71 race.

"For me, it is the most logical and pleasurable sponsorship," he says. "My passion is vintage racing cars, I try to race as often as I can, and the period covered by the Le Mans Classic is my favourite. With this sponsorship I can share this passion with our clients, other car collectors, and I can grab a moment to race one of my cars... My only problem is I am so busy during this event that I cannot race much."

The event has been organised from year one by Paris-based promoter Peter Auto, headed by Patrick Peter. "There were far fewer historic meetings on the calendar when we launched the Le ▶

"MY PASSION IS VINTAGE RACING AND THE PERIOD COVERED BY THE LE MANS CLASSIC IS MY FAVOURITE"

RICHARD MILLE

The diverse field covered a period spanning almost 60 years, and featured cars from marques such as Fiat, Talbot, Jaguar, Inaltera and Panhard.

Henri Pescarolo and Emanuele Pirro (left) were among the former Le Mans winners at this year's Classic.

Cars are split into six groups of roughly compatible age that each take part in three races covering a 24-hour period.

Mans Classic," he says. "It was quite complicated, because you have to close a few local roads and we had to convince residents it was worth doing that for something other than the 24 Hours. In 2002, after the first running, all the drivers said they wanted to come back, so..."

It goes without saying that the pace is a little more leisurely than the current qualifying record (3m16.887s, set by Porsche driver Neel Jani in 2015). Christian Träber and Spencer Trenery (Talbot Lago, 5m52.974s) took pole – by 26 seconds! – in the 1923-39 section, while Yves Scemema (Toj, 4m08.292s) did likewise in that for cars from 1972-81. The differences between then and now are aural as well as visual – not just the obvious stuff, such as the raw, mechanical bark of a Cosworth-DFV or the mellifluous yowl of a Matra V12, but also the occasionally fluffed gearshift, the kind of thing electronic guardians disallow in this day and age.

"IT'S ALL VERY WELL PUTTING THESE CARS IN A MUSEUM, BUT ON TRACK YOU CAN SEE WHAT THEY'RE SUPPOSED TO DO"

SIMON KING

RESTORING A CLASSIC

Many of the participating cars would have telephone-number price tags, should ever the owners decide to sell, but that doesn't dilute competitive desire. A team of Bentleys attracted much media attention, after being driven to the race from London, racing and then returning once again by road. They weren't the only ones to adopt this strategy, however. Nigel Wills took an identical approach in his Talbot 90, which bears the registration PL3 – the same as the car that Brian Lewis and Hugh Eaton took to an Index of Performance-winning third place at Le Mans in 1930. Nigel does not, however, pretend his car is something that it is not.

"I've owned it for about 35 years," he says. "I bought it as a pile of bits but it is a true copy of PL3, which disappeared at some point around the Second World War. I thought it would be fun to recreate that car as accurately as one can while being perfectly clear that it isn't original. PL2 survived, owned by a chap called Pat Stephenson in Cambridge, and he was happy for me to copy every nut and bolt. At about the same time I met a registration plate dealer who was able to supply me with PL3, so we mated the number with a Talbot chassis, a Talbot engine and a Talbot everything else – all the parts are the correct age and year, though obviously there isn't a continuous history. I spent a long time tracking down the bits, put together a kit of parts – all correct – and recall one of the London dealers saying to me, some years later, that my car has been PL3 for longer than PL3 was PL3, so as far as he was concerned it was PL3!

"I use it for everything – shopping, exploring the Alps, going down to the Mediterranean, driving around racing circuits... Why would I want to put it on a trailer? That would be mad, because Talbots are just brilliant."

Sharing with John Polson, he was classified 35th – eight places behind another car crafted from boxes of bits, the 1937 Morgan 4/4 of Simon King and Philip St Clair Tisdall. Long a marque aficionado – he bought his first Morgan when he was 21 – King built his 4/4 with a keen eye on the company's Le Mans past.

"There are two Morgans here," he says, "and the other one competed at Le Mans in 1938 and 1939. In '39 they changed the body style significantly, removing the doors and fly screen. There are quite a few differences from how the car was in 1938, when it was raced by Prudence Fawcett and Geoffrey White. That look had been consigned to history and I wanted to bring it back.

"This is a recreation, but the car that raced here in '38 started off as a road car and that's why ours looks like it does. It has the same 1100cc Coventry-Climax engine and Meadows gearbox. The components are all correct – we just had to get the details right.

"When I picked it up it was quite literally in boxes, but there were lots of bits we could use. It took two years to get it all done, but fortunately there were lots of good period photos for reference. We had it ready – by the skin of our teeth – for the 2014 Le Mans Classic.

We had to get the FIA paperwork, which wasn't the work of a moment because not that many cars were built, there was no homologation back then and you have to provide documentary evidence to prove the car was in a particular specification. But the garage that built the '38 car is no longer there, the factory has no records because it wasn't their project and all the people involved have sadly passed on, so we could only go by period adverts and other documentation. We were eventually able to confirm everything – and received the papers about three days before we were due to board a ferry.

"It's a great car and handles really well, as modern Morgans do, although it's not very quick on the straights. It's fun, though, because you can corner much more quickly than some of the faster cars and then it's a case of wondering whether you are far enough ahead before they'll be able to blast past again.

"It's all very well putting cars like this in a museum, but I think it's best for them to be on the track so that people can see what they are supposed to do."

RESCUE MISSION

Morgan might be a niche manufacturer, but it's positively mainstream compared with Inaltera (whose name derives from its period sponsor, a wallpaper manufacturer). Built in Le Mans by Jean Rondeau, who in 1980 became the first (and so far only) driver to win the 24 Hours in a car bearing his own name, the company raced at Le Mans in 1976 and 1977, after which the backer withdrew and Rondeau went on to build eponymous sports-prototypes.

In '76, four-time Le Mans winner Henri Pescarolo shared an Inaltera with compatriot Jean-Pierre Beltoise, the pair finishing eighth overall and winning the GTP class. Forty years on the 73-year-old Pescarolo was back at the car's helm for the Classic, with Julien Beltoise substituting for his late father (after a strong first race, problems eventually consigned them to 50th). Today, this car is owned by Frenchman Jean-Jacques Cantryn.

"The Inaltera programme stopped abruptly at the end of 1977," he says, "and I knew the cars had gone to Switzerland. I had no idea where, though. When I moved there in '83 I decided I'd try to find them. In 1987 I managed to buy one of the cars, but it wasn't in very good condition – it was exactly as it had finished Le Mans in 1977, with a damaged front wing and windscreen. It took five years to restore it, because there were various problems, but when the owner of the Pescarolo/Beltoise car saw what I was doing he agreed to sell it to me. That was easier to restore because it was in much better condition – the first one had been sitting outside, was full of moss and more or less had mice living inside it..."

Today, that car resides in the Le Mans circuit museum, one of many static exhibits for those who can't wait two years to savour the past in action. ■

PHOTOGRAPHY: DPPI; ACO; MATHIEU BONNEVIE; DOMINIQUE BREUGNOT; STEPHANIE BEZARD

AUTO / ISSUE #16

AUTO FOCUS

World Rallycross

WINNING WAYS

Flexibility in the rules means drivers with dramatically different styles can compete successfully on an equal footing in the increasingly popular World RX Championship

TEXT: HAL RIDGE

Longtime rallycross competitor Robin Larsson demonstrates his sideways style aboard his Audi A1 at Holjes, Sweden.

"IN RALLYCROSS THERE WILL ALWAYS BE DRIVERS FROM DIFFERENT SPORTS TO ENSURE DIFFERENT DRIVING STYLES"

PETTER SOLBERG

Mattias Ekström and Petter Solberg are arguably the two fastest drivers in the 2016 FIA World Rallycross Championship. But watch them take certain corners and you could be forgiven for thinking they are racing in different competitions with disparate machinery.

Solberg is renowned for his trademark 'flat out' sideways style, while Ekström is known for being very neat and tidy, always using the circuit racing 'line' in an attempt to achieve the best lap time. That can often mean that two cars racing in close proximity are at totally opposing angles of trajectory, as seen at the Sachs Curve at Hockenheim, Germany, Paddock Bend at Lydden Hill, UK, and the Joker Lap in Hell, Norway, for example.

So how can two drivers with opposing styles, taking different lines into the same corner, be equally fast on track (they were first and second in the championship as of September 1, 2016)?

Much of this is because, although strictly controlled, the technical regulations for the World RX series are designed to embrace engineering innovation and diversity (see Technology panel, p65). The competition is close, very close, thanks in no small part to rules that allow engineers to provide cars in which drivers of widely varying driving styles can be equally competitive.

As such, World RX is rife with high-quality drivers who have switched disciplines to take part in the series, with Solberg and Sébastien Loeb from rallying competing alongside Ekström and Timmy Hansen, who previously plied their trade in circuit racing.

"I like to drive with clean lines and close to the grip limit of the tyres on both the front and rear axle," says Ekström. "A tiny bit of oversteer makes me fast. I think fast, long tarmac corners show who drives more clean, or more sideways. Lydden Hill is a good place to show that in general."

The Swede believes that as a driver, racing a competitor who is using a totally opposing style can be a challenge. "It's certainly difficult to follow, especially closely, as they set the mid-corner speed differently depending on how they drive," he explains.

Solberg's style is quite the opposite of Ekström's and his sideways antics are a firm favourite with the fans. However, the former FIA World Rally Champion and two-time World Rallycross Champion says his car's 'softer' set-up, allied to his own driving style, is designed to suit the requirements of rallycross rather than a perceived love of travelling sideways.

"I have an inline [longitudinal] engine in my car, and some have transverse. It's a bit like when I was in the WRC trying to compare the Subaru Impreza to the Citroën Xsara, it's just a different philosophy with a different chassis," he says. "I like to drive with a tiny bit of understeer, with good reaction from the front. I don't like an oversteering car – I like it to be responsive and precise at the front so it turns in well. I can drive faster on tarmac with a stiffer car, but it's always a balance. When you have loose surfaces, and because the starts are so important in rallycross, it's best for us to go softer. It's about the clock, not about how clean it [the driving] looks."

Ekström believes that the tyres used in World RX (control crossply Cooper Tyres) play their part as well as the fundamental car set-up in allowing different driving styles. "The tyres are very forgiving and in rallycross tyre management is relatively small compared to other series. We have eight dry tyres for a weekend, which is a lot when you consider how few kilometres we do on them. That means there is zero tyre wear on some tracks, but on high-wear tracks it can be different. The similar lap times with different driving styles comes from similar power and grip of the tyres. The question is how long can you drive fast and make your tyres last."

The Swede, who uses a stiffer chassis with less feedback for the driver, says he might struggle with a softer set-up like Solberg's and vice-versa. "I think they [Solberg and similar drivers] would struggle to drive my car a bit to start with, and I doubt I would be fast in his soft 'boat'," he quips.

Series leaders Petter Solberg and Mattias Ekström show their different cornering styles at Lydden Hill.

ENCOURAGING COMPETITION

The absence of strict homologation processes in the World RX regulations (aside from areas like the ECU hardware and software, to combat any illegal use of electronic driver aids) also gives teams freedom to re-engineer components race-by-race. If something breaks, they can create a better version.

Solberg believes this is key to the success of the championship. "That's a big part of the fun," he says. "With rallying it's very different, but here if somebody is faster than you in one race you can do something for the next race."

The reigning champion also thinks engineering diversity and a range of driving styles is one of the big appeals of World RX. "Rallycross is old-fashioned in some ways, but it's very good for competition," he explains. "If everybody drives exactly the same with the same set-up then it would be boring. You drive for the spectators and the show. In rallycross there will always be drivers from different sports to ensure different driving styles."

Kenneth Hansen, the sport's most successful driver with 14 FIA European titles to his name and now team principal of reigning World RX champions Peugeot-Hansen, says rallycross allows for driving styles that perhaps shouldn't work.

"It's an interesting point, as the different ways people drive shouldn't all work," he says. "The clean style should be the way, but in rallycross everything is changing all the time – the level of grip in each corner, on each lap. You can gain time with a stiffer racing car style, but it can also be that the more sideways rally way can gain in other places. That makes it quite interesting because these two styles don't follow exactly the same speed around the track, so it opens the way a little for overtaking and makes it good to watch."

Hansen is keen that the technical regulations should evolve to maintain traditional values without excluding current or potential participants. "I think it's good if we can balance the regulations so it's not too easy for a manufacturer to develop a very good car. It should also be that privateers can still build good cars like in the past and can compete at a good level.

"It will be good if we can keep it that way – if we had full homologation it could be expensive and close doors for many people. The top might stay the same but for the grades down, at European and national level, that would be complicated and not so good."

Ultimately, competitors and fans alike are winners from the current technical regulations in World RX, which provide exciting racing, interesting engineering and are attracting an influx of high-profile drivers, teams and manufacturers. ▶

Freedom in the World RX rules helps to ensure a more level playing field and keeps competition close.

TECH FREEDOM

World RX regulations are helping to ensure that rallycross retains its kudos of being a 'raw' sport, not only because the 600bhp Supercars spit flames due to their aggressive anti-lag systems – and race door-to-door in a frenzy of quick-fire sideways action – but because the rules allow for innovation.

The technical rules are structured in such a way that privateers and major teams (now often manufacturer-supported) can compete side-by-side. Part of this is the freedom to design in-house, with no requirement to homologate specific parts, as is the case in world rallying, for example.

Supercar constructors have the freedom to run the engine and transmission either transversely or longitudinally in the engine bay and modify the chassis accordingly, to change a chassis' balance and centre of gravity. At each corner of the car, while other disciplines require items like suspension to follow a specific directive, World RX is more open.

In the 2016 FIA World Rallycross Championship there are a number of engineering interpretations prompted by what designers believe to be the best solution to the constant compromise of competing on both sealed and unsealed surfaces in the space of a kilometre lap.

Some cars, such as the Team Peugeot-Hansen Peugeot 208 WRX, follow a philosophy more akin to WRC and use McPherson suspension all round, with a damper, upright and lower 'A-arm'. Others, like the new-for-2016 Ford Focus RS RX, use a double-wishbone design more akin to Supercars of previous eras. Münnich Motorsport's SEAT Ibiza employs a McPherson front and double-wishbone rear to try to reach the optimum set-up.

The development of cars is constantly evolving and, as such, many adapt their methods year-on-year. Two-time champion Petter Solberg had run his private Citroën DS3 with double-wishbone suspension all round, but has switched to a McPherson design for 2016. While the M-Sport-built Focus RS RX has been designed using double-wishbone suspension, when its predecessor, the Fiesta, used McPherson similar to its WRC cousin.

"There is more freedom compared to projects such as the WRC," says Tim Jackson, chief engineer for rallycross at M-Sport. "Because we're not limited, like in other formulas where you have to run a certain type of suspension, you have a bit more freedom. We looked at various options and determined that this [double-wishbone] was the best package for us, but there are several solutions people use."

A double-wishbone suspension is better for some teams, as the non-OE layout allows engineers to design all the required suspension geometry into the chassis from the offset, sometimes more easily than with McPherson.

The engine (orientation and general design) and suspension are the big items for innovation, but freedom also extends to the drivetrain; different gearbox manufacturers, whether to use a centre differential or not, differential type and set-up, and so on.

The stability of the technical rules plays a key role in managing costs, despite the freedom of the engineering. The rules do include restrictions on materials that can be used, and the amount of alteration allowed to certain areas of the chassis. All World RX teams have a seat in the FIA Rallycross Technical Working Group, which keeps a watchful eye on technologies that could affect costs, and teams are also represented in the FIA's Off-Road commission to play a part in that rule-making process. ■

Münnich Motorsport's SEAT Ibiza features both a McPherson and double-wishbone suspension...

While M-Sport's Focus has a more traditional double-wishbone set-up.

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REAR VIEW

Legend

IN A CLASS OF HIS OWN

In an era of great racing characters, Jacky Ickx stood out from the crowd - most famously at Le Mans where his protest at the start in 1969 changed the face of the race

TEXT: TONY THOMAS

Ickx came closest to winning the F1 title with Ferrari in 1970, but is glad he didn't 'steal' the trophy away from Jochen Rindt.

The magnetic pull of a powerfully charismatic individual draws eyes across the lounge of a Turin business hotel. A compact, stylishly attired gentleman – groomed hair, assured manner – strides from the lift with measured, deliberate cadence. He's precisely on time, knows the value of it. He's in no hurry.

This is Jacky Ickx, unmistakeable despite this being a first meeting. And that walk... for 10 electrifying seconds at the start of the 1969 Le Mans 24 Hours, it said *everything* about Ickx.

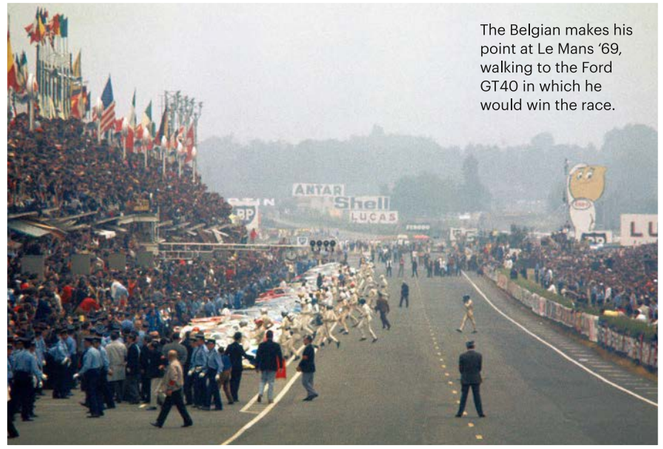
That year he staged a calculated and very public protest against what he regarded as the insanity of the time-honoured Le Mans starting procedure, whereby drivers would sprint across the track to their cars, lined up opposite, and gun away, belts loose.

This being the era when moves to improve driver safety were gathering momentum, they were elsewhere required to be belted tight inside their cockpits. The power of Le Mans tradition exempted the race from that nicety, tempting every hot-shot to get the car started and moving *first*, then worry about belting in somewhere round the lap... most likely down the Mulsanne Straight... single-handed... surrounded by rivals jostling for track position... at more than 200mph. Crazy, thought Ickx, with 24 hours of racing ahead. He alone refused to sprint and strapped in good and proper before starting – dead last.

Perhaps it was inevitable that privateer John Woolfe would be killed on lap one of Le Mans '69; his death – and Ickx's iconoclastic protest – meant there would never be another 'Le Mans' start.

Still only 24, he had made his point: "The era then was dangerous and there were a lot of people dying in motor racing," Ickx reflects. "It was clear that running to the car and starting without putting your seatbelt on, to be able to start as quickly as possible, was not a good idea. And also the fact that we were not supposed to be a real contender for the win helps you to have the idea of walking, to show that in 24 hours, starting first and last doesn't change anything."

But it so nearly did. Ickx and driving partner Jackie Oliver won in a Ford GT40, beating the Porsche 908 of Hans Hermann and Gérard Larrousse by just 110 metres – the closest finish in Le Mans history. A few more seconds' tightening belts at the start and they wouldn't have won. "You see the story as you see it today," Ickx posits. ▶



The Belgian makes his point at Le Mans '69, walking to the Ford GT40 in which he would win the race.

The fourth of six Le Mans wins was scored with Jürgen Barth and Hurley Haywood in a Porsche 936 in '77.

"Now imagine that I finished second by around 20 metres. That's not at all the same story. You would be sitting here telling me it would've been wiser to start like the others. It was a very attractive start for the show, but it wasn't a solution any more."

Yet such strength of character to make that stand...

"When you are young you dare to do a lot of things that you wouldn't do later on," Ickx continues. "That's the advantage of being young – you have no fear. And nobody knew anyhow, because I did not mention it to anyone."

A PLACE IN HISTORY

The win was the first of six Le Mans victories for the man who would come to be known as *'monsieur Le Mans'* and he remains closely associated with the majestic event. His ties allow an informed judgement of elite sportscar racing, which is booming now in the guise of the World Endurance Championship, as it did in the late 1960s and early '70s. Ickx reckons it difficult to compare the two eras, however. "Endurance racing is like grand prix racing now," he says, "flat out, non-stop. There was a time where you could lift off a little bit and be quiet, but today it is pure, pure, pure racing, because the game has changed so much. We used to have three cars in a truck and no motorhomes. There were no facilities, so we changed in the car. The mechanics cooked with ham from the trunk, spaghetti, cheese and a bottle of propane. We would all sit together in the truck, the paddock was just some grass in the middle... There was a lot of atmosphere and soul in it and the goals were not the same as they are today."

The 'Ickx' name sits somehow most comfortably with that turn-of-the-decade time, alongside Stewart and Rindt in Formula One; Bell, Vaccarella and Attwood in sports cars. And he's happy to acknowledge the rich colour of a period forever framed in black-and-white: "Very often I'm presented as someone very eclectic in this sport," he says, "but we were all like that in a way simply because there were no exclusive contracts. I was a year with Ferrari driving for Ford at the same time. We never had that kind of exclusivity and the power of the finance was not as important as it is today."

And then a phrase to gladden the heart of anyone who has ever loved motor racing: "*Driving was the goal,*" he asserts, "and when I'm saying that, I was not the only one – Jim Clark did it, Stewart, Brabham – all of us. We were racing in saloon cars and other categories. The competition now is so tough, to reach the few places where there is a pinnacle of racing drivers. It looks hard to me and that's one of the reasons that you will never get the same sort of personalities, because today you can only do one thing at a time."

Ickx's "pinnacle", in a baldly statistical sense, was his close run to the 1970 Formula One World Championship, with Ferrari – then, as now, a team like no other. ▶

"WHEN YOU ARE YOUNG YOU DARE TO DO A LOT OF THINGS THAT YOU WOULDN'T DO LATER ON. THAT'S THE ADVANTAGE OF BEING YOUNG – YOU HAVE NO FEAR"

As history records, Jochen Rindt was crowned posthumous 1970 world champion having been that season's form man, with five wins for Lotus, before a fatal accident in practice for the Italian GP. But Rindt's death had left Ickx in second place with two grands prix remaining, opening the invidious opportunity of taking a dead man's title, should he win both. Fourth place at the penultimate round, the US Grand Prix, cleared Ickx of that ghastly burden and freed him to race for the win at the season-closing Mexican GP, conscience clear.

Ickx describes himself as "lucky" not to have snatched the title from a deceased opponent: "It would have been dreadful to live all these years with a stolen trophy," he says. "What a chance, what a chance... Jochen deserved it. You do not dream about beating someone who cannot be there to defend himself. It was well written this way. It wouldn't have been normal to forget his accident and lift that trophy. I have no regrets. When I see all I have received through these years and to still be alive – you have no right to complain."

His Ferrari years, spanning 1968-73 in sports cars and F1, he reckons "could have been more successful", but he prefers to cherish scarlet memories, than dwell on regret: "When you have driven once for Ferrari, you have them forever – your heart is painted red," he says. "It is a legend. And Enzo Ferrari... I think for me he had a special sentimentality or respect or whatever. I would love to say that he treated me how you would treat one of your children, in a way. I liked him and he liked me, but there were a lot of hidden sentimentalities in him that I understood later – he didn't want to be too close to his drivers because when he started himself to compete it was really dangerous. He lost a lot of drivers and also friends. To avoid being in that sort of situation – knowing the danger and knowing the risk – he avoided expressing his tenderness to those who were driving for him, but I have plenty of nice memories of him and the people around him."

"IT WOULD HAVE BEEN DREADFUL TO LIVE ALL THESE YEARS WITH A STOLEN TROPHY... YOU DO NOT DREAM ABOUT BEATING SOMEONE WHO CAN'T DEFEND HIMSELF"

FROM LE MANS TO DAKAR

There's a strong sense with Ickx, 71, of calm perspective and he notes in passing that "sooner or later, someone will come along and beat you." It's as if the qualities that allowed him to make a stand, in his twenties, became further distilled as he progressed through a life that embraced peril, even as he rejected needless danger: "If you go motor racing you know what you are doing and it is an accepted risk. The deadly accidents used to hurt, of course, but it was something that we had accepted."

Not blindly though. At the 1984 Monaco Grand Prix, Ickx was clerk of the course and made the bold call to stop the race amid a deluge, with 45 laps to run. There were accusations that Ickx, a Belgian, had acted to help race leader Alain Prost, a Frenchman, win on what was effectively home soil, as he was being closed down by Ayrton Senna.

Ickx draws parallels between his decision that day and his Le Mans '69 defiance: "You know, safety cars did not exist then and I stopped the race because of the rain. You have to do what you feel is right, especially for survival against unnecessary accidents, because the goal for a driver is to survive and carry on doing what he likes to do. You have a duty to avoid accidents and that's the situation of every referee or clerk of the course today – you have to take the right responsibilities and decisions."

Half-points were awarded for the race, giving Prost just 4.5 – and he would lose that year's title by half a point to team-mate Niki Lauda. "That's just a detail," Ickx insists. "The important part is that before, when we started a race in good conditions or in bad conditions, we had to finish and nobody took care. We admit to all of that now, but luckily we see those risks differently today. It was an open door for a new era, when the results and the points were secondary [to a driver's safety]."

Aside from occasional race-officiating duties, Ickx was still pursuing a top-line professional racing career in the '80s, as a factory Porsche driver, winning his sixth and final le Mans in 1982 and placing second in '83. He raced on with Porsche into 1985, though his final circuit-racing season was scarred with tragedy. He and emerging German ace Stefan Bellof touched at Eau Rouge corner as they fought for the lead of the '85 Spa 1000km race, causing Bellof to crash fatally.

At age 40 it was time for Ickx to take stock. He had enjoyed a vivid racing career, driving for several of motor sport's greatest teams and conquering its most daunting machines and circuits, but the moment had come for this uncommonly reflective driver to take a view on how far he had travelled and what adventures might still lie ahead.

"When you are young," he says, "you don't care about your growth, because you want to climb up the mountain and you don't care about the rest. You have one goal and you try to reach your goal and you want to be one of the best – or the best if possible – but you don't pay attention to the people the same way that you would when you have done the larger part of the track that you're on. In motor racing, you require qualities that are not really qualities in a normal life. That's why very often you'll say that the guy who is in the car is not the same one that you met in the restaurant two days before. In my opinion, they are two different personalities."

At something of a personal crossroads, Ickx, still feeling the urge to compete, but yearning for something *more*, had become drawn to the beckoning vistas of the Paris-Dakar rally. He first entered in 1981, beginning a love affair with the event, which he won in '83 and in which he would participate until 2000. This was more than racing for Ickx; the 'Dakar' was a spiritual journey into an endlessly fascinating continent and, even, into his very existence.

"It is," he says quietly, measuring his words with great care, "the most extraordinary race. And it is also the most incredible opportunity to look around you, to see the other people around you, to see the continent and to see also how small you are and to see how unimportant you are on this planet. Of course it changes your views on life and it gives you a chance to pay attention to those who are around you.

"Clearly," he continues, "you may say that I have been quite successful in motor racing, but you have to keep in mind that we are the result of a group of people in motor racing who have a project and all of them together give you a car. So probably the most interesting aspect of it all has come at an age when the distance ahead is not so far – that is, the intellectual part where you discover you are not alone on the planet. We are what we are because we are surrounded by people who change your life."

This most generous conclusion, after a lifetime's pursuit of the most singular goals. ■

Ickx was active in F1 over a 12-year period, making his final appearances during 1979 with Ligier. Below: he won the 1983 Paris-Dakar for Mercedes.

AUTO / ISSUE #16

REAR VIEW

Legend

STREET FIGHTING YEARS

It started life over 60 years ago as an event for GT cars before becoming the F3 race that all junior drivers want to win - and today the Macau Grand Prix is as important as ever

TEXT: MARCUS SIMMONS

The Macau Grand Prix is the jewel in the crown of Formula 3, and arguably the most important single event anywhere in the world for drivers in the junior single-seater ranks. Also carrying the title of FIA Intercontinental Formula 3 Cup, it's the prestige race that brings together the leading contenders from the FIA Formula 3 European Championship, the All-Japan Formula 3 Championship, plus a smattering of 'wildcard' drivers from other series. The November classic is the one they all want to win.

But it hasn't always been this way. Back in 1954, the first Macau Grand Prix was held on a circuit layout almost identical to that used today, although the surroundings have changed significantly in past decades, with a proliferation of high-rise hotels and casinos, as well as reclaimed land, meaning that part of the circuit is considerably further from the South China Sea than it used to be.

That first event, 62 years ago, was held for mainly local drivers in production GT cars, with Eddie Carvalho – his name betraying Macau's former status as Portugal's Chinese enclave, in the same way as Hong Kong belonged to the British – taking the win in a humble Triumph TR2. Two years later, in 1956, a Sumatra-born entrepreneur by the name of Teddy Yip made his first Macau GP start in a Jaguar XK120, and the ball started rolling on building Macau into the event it is today.

The race switched to single-seaters in 1961, initially mainly Formula Junior cars, before attracting more potent machinery from drivers visiting from Australia plus other areas of South East Asia. ▶

The Macau Grand Prix brings together leading contenders from the world's F3 series, all keen to add the prestigious race to their CV.

The open Formula Libre era ended when Formula Atlantic rules were introduced in 1974. This category, popular in Australia, Japan, the US and the UK, featured cars powered by the high-revving 1600cc Ford Cosworth BDA engine. By now Yip was a team owner, and his Theodore Racing squad would bring over international drivers to raise the profile of the event. In Yip's cars, Formula One driver Vern Schuppan and European Formula 2 Championship star Geoff Lees won the Macau GP, while the rival Bob Harper Racing brought over new F1 sensation Riccardo Patrese for two wins.

During this era the English Motor Race Consultants company was hired to coordinate the entry. MRC boss Barry Bland, whose secretary was a friend of Yip's, played a big role in bringing the increasingly international field together, but with the Atlantic class fading worldwide a new concept was required...

PARTY ATMOSPHERE

For 1983, Bland – who still coordinates the entry today – arranged the first grid of Formula 3 cars to make the trip to Macau, among them the newly-crowned British F3 champion: Ayrton Senna da Silva. The Brazilian sensation stayed with the West Surrey Racing team that had run him throughout the season, but along with Eddie Jordan Racing's Martin Brundle and Roberto Guerrero he was sponsored by Theodore Racing. Senna dominated the race.

Yip, without an F3 squad (he was concentrating on F1 and Indycars), had now turned into Macau patron rather than team principal. He would back drivers through to 1992, 11 years before his death at the age of 96. Yip's hospitality was legendary, and his parties became part of the very fabric of the race. His son Teddy Yip Jr, who revived the Theodore Racing name for the 2013 Macau Grand Prix to commemorate the 30th anniversary of Senna's win, says: "I was unfortunately too young to be involved in much of the fun but my father certainly knew how to enjoy racing on and off the track! Let's just say he knew how to throw a party and make the most of having like-minded people around him."

One of the victims of that party atmosphere was Senna. Along with Guerrero and Pierluigi Martini, he arrived straight from a tryout for the Brabham Formula One team at Paul Ricard. Fighting off the jetlag, he completed just three laps on the first qualifying day before hitting the wall, although that was still good enough for third fastest. The following day he put it on pole, and then went out for a few drinks... The excess vodka (West Surrey boss Dick Bennetts believes some of the other drivers spiked his drink) meant Senna was still feeling groggy for the first heat, but he dominated both races to become Macau's first F3 winner.

Macau had truly arrived on the international scene, with drivers from all the national F3 series in Europe and Japan. One particularly famous race was 1990, which brought together British champion Mika Häkkinen and German title winner Michael Schumacher. These days, the first race acts a qualification race, forming the grid for the final. Back then, the Macau GP was run as a football-style aggregate of two heats, with each driver's combined finishing times forming the final result.

Häkkinen had won the first heat, and all he had to do was finish right behind Schumacher to claim the overall honours. But the Finn couldn't help trying to pass at the flat-out Mandarin Oriental kink. They collided, Häkkinen was in the barriers, and Schumacher continued to victory to begin a rivalry that would enthral F1 for the next decade.

Even now, it is regarded as a race that drivers have to contest to impress those in F1. "It's always difficult to remain relevant to a new generation in a rapidly evolving sport, but it's great to see the Macau Grand Prix held in such high regard today," says Yip Jr, whose Theodore Racing revival backed Prema Powerteam drivers Alex Lynn and Felix Rosenqvist to victory in 2013 and '15 respectively.

Last year, the FIA GT World Cup joined touring cars and bikes on the Macau bill.

"It's a race that all drivers want to win and is still seen as one of the ultimate challenges in motor sport. It's about speed, skill and accuracy, lap after lap, and it also takes that little bit of magic to win. It doesn't matter if you are an F1 driver, IndyCar driver or junior driver, if you haven't won the Macau Grand Prix you want to give it a go. I read a Red Bull article which quoted Daniel Ricciardo as saying, 'Macau is the ultimate street circuit. Just hearing the name gets me excited. It's big, it's ballsy. It's Monaco but twice the length and even crazier. Commitment is the key to a successful weekend.'"

It's also an event the team personnel love visiting. Carlin team boss Trevor Carlin, a Macau regular since the 1980s, says: "You do the whole season to earn the right to work 16 hours a day in Macau and party for eight hours. The guys work really, really hard and still manage to go out and have fun and be back at work the next morning fully functioning. And if you're a professional guy who loves motor racing, one of the biggest challenges is repairing a car in a timeframe no one thinks is physically possible. Miracles happen in Macau – and the adrenalin crushes any alcohol left in the system!


Red Bull F1 driver Daniel Ricciardo rates Macau as the ultimate street circuit.

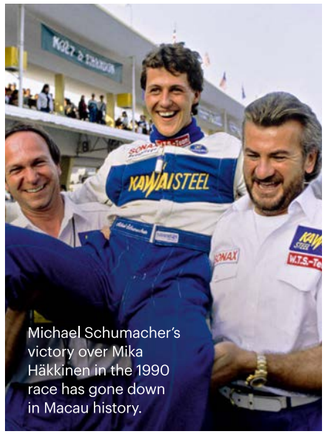
"Macau is literally bonkers. I don't think there's a challenge like it in motor sport. The track is perfect for F3 – it's sensational to drive there. You couldn't do it in a GP2 car; it's too big and you wouldn't be able to push it so hard."

And it's not just the Grand Prix. The Macau Guia touring car race has been a traditional support act since the 1970s, the Motorcycle Grand Prix thrills crowds, while the new FIA GT World Cup joined the timetable in 2015. It's a festival of motor racing.

"The Macau Grand Prix is incredibly important to me and my family for many reasons," concludes Yip Jr. "My father was instrumental in organising the inaugural Macau F3 Grand Prix and also passionate about putting Macau on the world map. As the only motor racing team to originate from Macau we consider ourselves 'Theodore Racing' as a local team and the Macau Grand Prix as our home race. It truly is the highlight of our race season and every year I return with a renewed passion to win. This year is no exception."

And that passion for the event has well and truly extended throughout the motor sport world. ■


Teddy Yip Sr brought a host of international drivers to Macau – and hosted many a wild party.



Michael Schumacher's victory over Mika Häkkinen in the 1990 race has gone down in Macau history.

In 1983, Ayrton Senna dominated the first races run for Formula 3 cars.

In 2004, Lewis Hamilton won the Qualification Race for Manor Motorsport as a promising 19-year-old.

FRANCE'S CITY OF RACING

While the Macau Grand Prix is the highlight of the F3 calendar, the Pau Grand Prix is a hugely popular stop-off on the FIA Formula 3 European Championship schedule.

Held each May, the race has been run for F1, F2 and F3000 cars in the past, but it became an F3 event in 1999 and has been staged for these cars most years since then.

As with Macau, the circuit layout has changed very little since the first race was run in 1933. Unlike Macau, there are few long straights but the tight, twisty corners and ultra-fast Foch chicane provide a great challenge. It's in a beautiful setting, too, with Pau overlooked by the Pyrenees and the circuit winding its way past the railway station, up a steep hill and then – via a couple of sharp hairpins – the cars blast through the scenic Parc Beaumont before returning to the start-finish line.

The prestigious Pau GP title itself is given to the third race of the European championship weekend, and this year was won by young Italian Alessio Lorandi, who is always a force on street circuits. "It's just unique, and really narrow," he enthuses. "And at every corner you can see the fans. It's a flow, no room for mistakes, more challenging and exciting than a normal track.

"Like in Macau, you need to go step by step to find the limit, getting closer to the wall. And if you crash, you lose confidence straight away. It's actually easier at Pau than Macau: in Macau you have low wing for the long straights, so in fast corners the car is very light, while in Pau you have full downforce.

"Street circuits are really nice. They're quite dangerous, but sometimes risk is exciting!"

FINAL LAP

Freeze frame

FAST AND FORTUNATE

"Who knows if his children would believe him if he told them how close he came to being one of the greatest racing drivers?" So said Enzo Ferrari in his book, *Piloti, che gente* of New Zealand Formula One legend Chris Amon, who recently passed away at the age of 73.

The Ferrari chief's 1983 assessment of Amon is one that followed him throughout and beyond his top-level motor sport career, with the Bulls native being regularly classified as one of the finest drivers never to have won a grand prix, despite contesting 96 events between 1963 and 1976.

He came close on more than one occasion, most notably in Monza in 1971, driving for Matra. In the lead and with just nine laps remaining, he inadvertently pulled off the visor from his helmet rather than a strip, thus exposing his eyes to the elements. In a race that ended in one of F1's tightest ever finishes, with the top five all within the same second, Amon came home sixth, 32 seconds down.

He narrowly missed out again at the 1972 French Grand Prix at Clermont-Ferrand. This time a puncture prevented him from taking a win that seemed within his grasp.

However, while F1 success eluded him, Amon fared much better in sports cars. The New Zealander's biggest win came in 1966 when, along with fellow countryman Bruce McLaren, he drove a Ford GT40 to the first of its four consecutive wins in the Le Mans 24 Hours.

That success earned him a place at Ferrari, where he spent the next three seasons, winning the 1967 Daytona 24 Hours and the Monza 1000 Kilometres as well as also the 1969 Tasman Series.

Mauro Forghieri, his technical boss at Ferrari, said Amon was "by far the best test driver I've ever worked with. He had all the qualities to be a World Champion but bad luck just wouldn't let him be."

In a note written to Amon, Enzo Ferrari addressed him as the "best and the unluckiest driver".

Amon, though, didn't agree with that sentiment. "Actually, I am very lucky, I'm luckier than Jimmy [Clark] and Jochen [Rindt], and Bruce [McLaren] and Piers [Courage]. Luckier than my team-mates [Lorenzo] Bandini, [Ludovico] Scarfiotti, [Jo] Siffert and [François] Cevert. I had several big accidents that could have killed me; I broke ribs, but I was never badly hurt."

When he saw Niki Lauda's car in flames at the Nüburgring in 1976, Amon felt his F1 career had reached the end of the line. He briefly got behind the wheel at the start of '77, to drive a Can-Am car, but after one race he realised "that I was not enjoying it any more".

After his retirement, Amon stayed involved in New Zealand motor sport with the Toyota Racing Series junior formula – the winner of which receives the Chris Amon Trophy; past winners include GP2 driver Mitch Evans and F3 Euro drivers Nick Cassidy and Lance Stroll.

Chris Amon was regarded by many as one of the sport's finest racing drivers despite never winning a grand prix.

ELECTRIC GROWTH

One million electric cars and rising

The worldwide electric car stock increased beyond the one million mark in 2015 and this number is accelerating upwards, according to a study from the International Energy Agency. In 2015, sales of electric cars around the world amounted to 477,000 (a 70 per cent increase on 2014), taking the total volume on the roads up to 1.15m.

The US, China, Netherlands and Norway accounted for 70 per cent of all the electric cars sold worldwide. In 2015, China became the world's largest electric car market. But growth was also occurring outside these countries. The number of countries with a market share of electric cars greater than one per cent grew from three in 2014 to six in 2015. This trend is only increasing as electric cars become more practical, affordable and desirable.

ELECTRIC CARS INCLUDED IN THE REPORT

BEVs
Battery Electric Vehicles
Eg. Nissan Leaf

PHEVs
Plug-in Hybrid Electric Vehicles
Eg. Toyota Prius

2015 saw the global total of

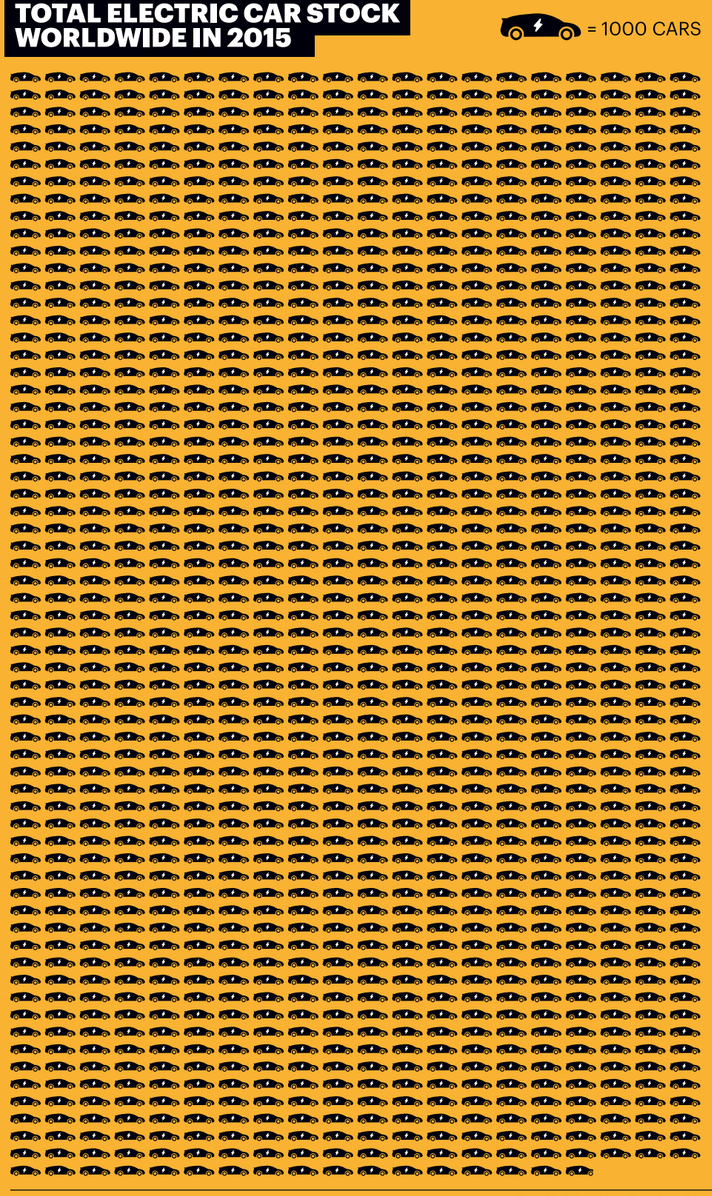
1 million

electric cars on the road exceeded

TOTAL ELECTRIC CAR STOCK WORLDWIDE IN 2010

12,480

TOTAL ELECTRIC CAR STOCK WORLDWIDE IN 2015

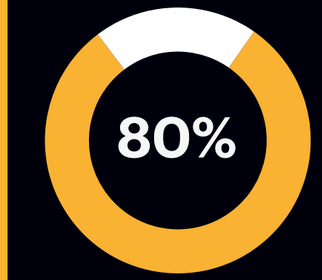


1,256,900

ELECTRIC CAR STOCK BY COUNTRY, 2010-2015

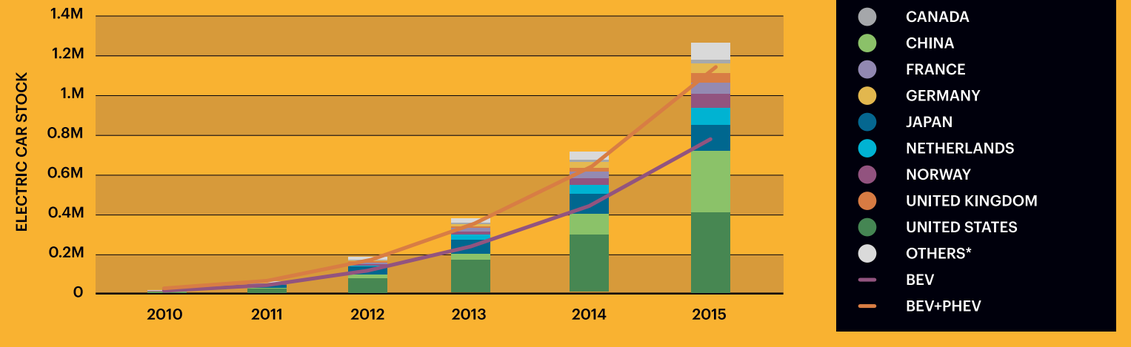
COUNTRY	2010	2011	2012	2013	2014	2015
CANADA	–	520	2,600	5,710	10,780	18,450
CHINA	1,430	6,500	16,400	31,740	104,910	312,290
FRANCE	300	2,930	9,250	18,880	31,500	54,290
GERMANY	250	2,340	6,130	13,250	26,030	49,220
INDIA	880	1,330	2,760	3,130	4,020	6,020
ITALY	640	760	1,420	2,470	3,990	6,130
JAPAN	3,520	16,140	40,580	69,460	101,740	126,400
KOREA	60	340	850	1,450	1,520	4,330
NETHERLANDS	270	1,140	6,260	28,670	43,760	87,530
NORWAY	790	2,800	7,210	15,420	35,210	70,820
PORTUGAL	20	220	320	530	820	2,000
SOUTH AFRICA	–	–	–	30	50	290
SPAIN	70	650	1,200	2,210	3,660	5,950
SWEDEN	190	370	1,250	2,650	7,090	14,530
UNITED KINGDOM	290	1,370	3,780	7,280	21,860	49,670
UNITED STATES	3,770	21,500	74,740	171,440	290,220	404,090
OTHERS*	–	1,730	4,480	8,760	19,590	44,890
TOTAL	12,480	60,650	179,230	383,090	706,770	1,256,900

* Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Iceland, Ireland, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Poland, Romania, Slovak Republic, Slovenia, Switzerland, Turkey.



of the electric cars on road worldwide are located in the United States, Japan, China, Netherlands and Norway

EVOLUTION OF THE GLOBAL ELECTRIC CAR STOCK, 2010–2015



Data covers battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) only.

ILLUSTRATION: MATT COLES

FINAL LAP

The last word

THE CAT IS BACK

Jaguar's James Barclay on why, after 12 years away from top-level motor sport, the brand has chosen to return - in Formula E

Q After a 12-year absence, Jaguar is making its return to top-flight motor sport with FIA Formula E. Why now and why with electric racing?

A As a performance brand, racing is part of our DNA, but we were not going to go racing for the sake of it. We always said we would return to motor sport but it had to be at the right time, with the right formula and for the right reasons. Formula E carries strategic benefits when it comes to our technology, and Formula E is a fast-growing series that captured our imagination and is aligned to our future plans.

Jaguar has always gone racing to prove new technology. We were the first to use disc brakes at Le Mans with the C-Type, proving it in competition so that we could transfer it to our road cars. We aim to use the same approach in Formula E. Electrification is a large part of our future as a business, and in order to support that strategy we wanted a racing category that would allow us to test and prove our technologies in a competitive performance environment.

Q In taking that decision, was the format of Formula E important – bringing motor sport to the people rather than the other way round?

A With races in major cities and a young, urban audience, Formula E will help us reach the next generation of Jaguar drivers as the sustainability benefits of electric racing are really something we can see benefiting our future vehicle range and ultimately our customers. The accessibility of city centre racing is a huge appeal to us and we believe Formula E is unique in this sense and will bring racing to a new audience.

Q When you made the announcement that Jaguar would enter Formula E, you also revealed that electrification is to be a major part of Jaguar future road car direction. How can the championship help in that regard?

A Where motor sport can play a role in this is that it offers a competitive environment where lessons can be learned and where the speed of development and progress is increased. These lessons can then be applied to road car programmes.

For us, the key thing about electrification is proving to people that it can be about performance as well as range. What you'll see in Formula E in the future is that it will provide proof and showcase that electrification is not just about sustainability, which is crucial, but it is also about exciting performance and range. It will also address the questions that surround electrification.

Overall the championship will help drive the awareness and understanding of electrification technology.

Q You mention rapid development in motor sport – what can technology transferred from track to road accomplish in the coming years?

A Our engineers believe that we will see more development in the automotive industry across the next five years than we have seen in the past two decades.

The key themes are going to be around electrification, connectivity and lightweight materials as it will be just as much about sustainability and environmental benefits as well. I think with electrification, be it hybrid or battery electric vehicles, we will see some huge changes in the next couple of years. We are on the cusp of a very exciting moment, and Formula E has come along at a great time for Jaguar.

Being a manufacturer with our own team in Formula E will allow us to test our latest electrification technologies in a performance environment.

Q What are the hopes for your first season? Do you have to temper your expectations?

A It is a very competitive championship and the other teams have a two-year head start on us. We are under no illusion that the challenge from the other teams will be strong, but we look forward to taking it on.

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