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### THE BRAWN AGENDA

As Formula One prepares for major technical change, famed team boss Ross Brawn on why the devil is in the detail P28

### SAFETY ON DISPLAY

Ahead of the launch of a major FIA road safety campaign, AUTO reveals the key visuals and the stars behind the messages P34

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### 20 UNDER 20

At the end of a fascinating year in motor sport, experts from racing and rallying choose their stars of the near future P58

### UNFLAPPABLE GURNEY

From racing to running race teams, from great car control to inspired car design, Dan Gurney was the complete competitor P68

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# AUTO

P38

## BRAVE NEW WORLD

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RALLY CHAMPIONSHIP





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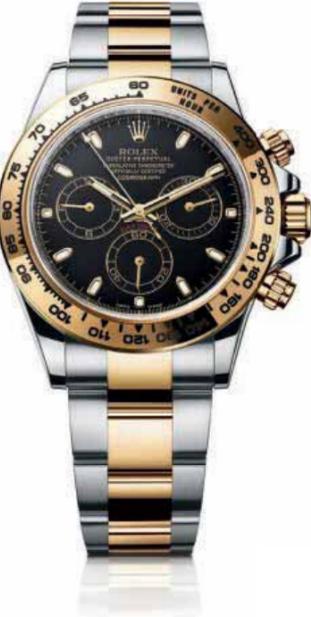
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TBWA\PARIS

ISSUE  
#17

# 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 reader,

An enthralling year of motor sport has just come to an end, but already fans are looking forward to next season when some disciplines will be embracing significant changes.

The World Rally Championship will have a new look, with more powerful and exciting cars, and our cover story examines its new rules and the challenges they will bring. Despite the unexpected departure of Volkswagen, I am sure next season will provide a great spectacle and attract an even wider audience.

Formula One is also preparing for significant change, especially on the chassis and tyre front. As always, it's a question of how the regulations are interpreted, a topic we look at in detail with eight-time Constructors' Championship winner Ross Brawn.

The battle to improve road safety remains a priority for the FIA and its partners. There is much to do, as can be seen from the Step Change report: an Action Agenda on Safe Walking for Africa's Children published in this issue. In Auto #16, we previewed the launch of a major roadside advertising campaign scheduled for early next year, created in conjunction with the world leader in that field, JCDcaux. Since then, other stars have agreed to act as representatives of the campaign and later in this issue you can see the key messages they will deliver in a bid to save lives on the world's roads.



Jean Todt,  
FIA President

# CONTENTS

From the World Rally Car revolution to making Africa's roads safer for school children, this is AUTO

12

## UP FRONT

**P12-17 GALLERY**  
Celebrating the FIA champions of 2016

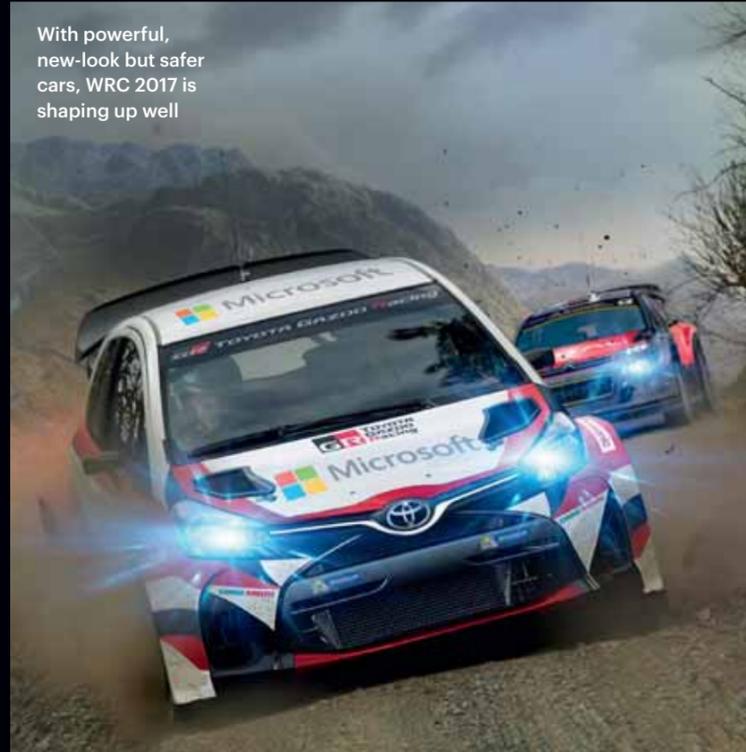
**P18-24 NEWS**  
Venturi sets new Land Speed Record for an electric vehicle; Mercedes GP team eyes Formula E entry; Volkswagen shifts its motor sport focus to electric racing

26

## AUTO ASKS

**P26-27 THE BIG QUESTION**  
How will virtual reality affect the way we watch motor sport in 10 years' time? Three experts give their view

With powerful, new-look but safer cars, WRC 2017 is shaping up well



34

## AUTO FOCUS

**P34-37 JC DECAUX**  
Ahead of the launch of a major FIA road safety campaign, AUTO reveals its key messages

**P46-51 BATTERY CHARGE**  
How improvements in battery performance could transform the electric vehicle market

**P52-57 DRAG RACING'S RISE**  
Why the FIA European Drag Racing Championship is poised to become motor sport's next big success story

**P58-63 TWENTY UNDER TWENTY**  
As 2016's motor sport season draws to a close, racing experts choose their stars of the future

**P64-67 SAFER ROADS IN AFRICA**  
How the FIA is working with other groups to improve road safety for vulnerable youngsters across Africa



Dan Gurney reflects on a pioneering race career

68

## REAR VIEW

**P68-75 LEGEND: DAN GURNEY**  
American racer's far-reaching career

**P76-81 LAMBORGHINI MIURA**  
Tracing the history of the original supercar

84

## AUTO GRAPH

**P84-85 PRECIOUS METALS**  
How the FIA is grading drivers to create more level playing fields

Former F1 chief Ross Brawn provides an insight into how F1's rules really work



28

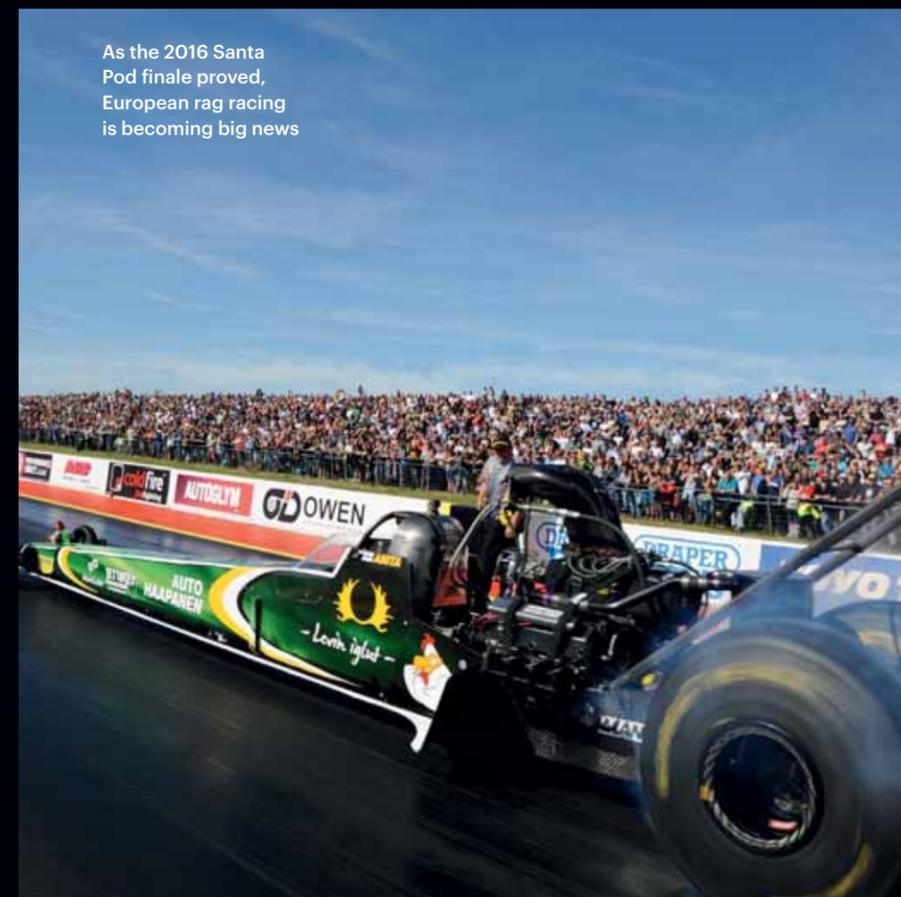
## TECH REPORT

**P28-32 BRAWN ON F1'S RULES**  
The respected engineer on how new technical regulations affect team planning, and the future for F1 engines

38

## COVER STORY

**P38-45 WRC REVOLUTION**  
The most exciting World Rally Cars in a generation have got fans dreaming about the 2017 championship



As the 2016 Santa Pod finale proved, European rag racing is becoming big news

86

## FINAL LAP

**P86 JIM LIAW**  
The Formula Drift founder on regulating motor sport's underground sensation

Formula Drift explained by founder Jim Liaw



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UP  
FRONT

Motor Sport 2016

# CHAMPIONS

*From the pinnacle of competition - Formula 1 - where the drivers' title fight went to a final-round showdown, all the way through to rallying, endurance and across the single-seater ladder it's been a vintage year for motor sport. In every category it took special qualities to lift the big prizes but eventually champions were revealed...*

## F1 NICO ROSBERG

TEAM: Mercedes AMG Petronas F1

After 20 races and nine wins each, an enthralling battle between Mercedes' defending champion Lewis Hamilton and team-mate Nico Rosberg came down to a final-round showdown in Abu Dhabi. Across 55 nail-biting laps, Rosberg clung to leader Hamilton and despite the three-time champion's attempts to bring rivals into play, Rosberg held out to take a fifth second-place finish of the season - and the title. In the end it was those second places that helped earned him a first crown, to match the one won by his father Keke in 1982. Rosberg may have taken one less 2016 win than great rival Hamilton, but across their seven other podiums each, Rosberg's five second places to Hamilton's three played a large part in the German's triumph. Mercedes' almost complete dominance - Red Bull Racing was the only other team to win, in Spain and Malaysia - meant the German marque took a third consecutive Constructors' title in irresistible fashion.

WRC  
**SÉBASTIEN OGIER**

TEAM: Volkswagen Motorsport

On the surface, six wins, two second places and two thirds make Sébastien Ogier and co-driver Julien Ingrassia's fourth consecutive World Rally Championship title win look like a walk in the park. However, after starting with victory in Monte Carlo and Sweden events, success eluded the duo for six events. The French crew got things back on track in Germany and then rattled off three wins in a row in Corsica, Spain and Britain. By that time the title was theirs. VW was again the class of the field, taking nine wins from 13 starts. Six were down to Ogier, two came from Andreas Mikkelsen and one from Jari-Matti Latvala. It was a fitting to sign off, with VW announcing its withdrawal from the 2017 campaign as the current season drew to a close.



WEC  
**NEEL JANI, MARC LIEB,  
 ROMAIN DUMAS**

TEAM: Porsche

Consistency was key for the World Endurance Championship title-winning trio of Marc Lieb, Neel Jani and Romain Dumas. The Porsche crew got their season off to a winning start at Silverstone, finished second at Spa-Francorchamps and then took the big one – Le Mans 24 Hours, although only after Toyota's dramatic late failure. Though the trio did not return to the podium again during the campaign, it was the bullet-proof consistency of the Porsche 919 that carried them across the line to a first Drivers' title win. The German marque, aided by four wins scored by the drivers of the second 919, Brendon Hartley, Mark Webber and Timo Bernhard, landed its second team title in a row.

UP FRONT

## WRX MATTHIAS EKSTRÖM

TEAM: EKS

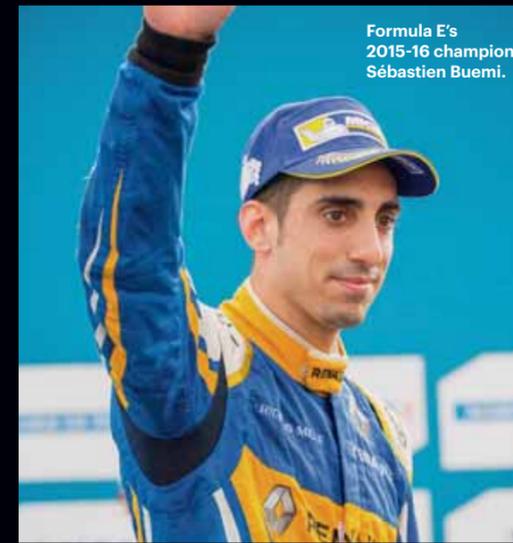
At the wheel of the Audi S1 prepared by his own EKS team, Ekström won three of the first four races of the season in Germany, Belgium and Great Britain, before going on to win in Spain and taking two further podium finishes. A fifth place in Estering was enough to give him the World Rallycross title prior to the final round in Rosario. The Swedish former DTM champion thus ended the reign of Petter Solberg who won back-to-back titles in 2014 and 2015.



## WTCC JOSÉ MARIA LÓPEZ

TEAM: Citroën

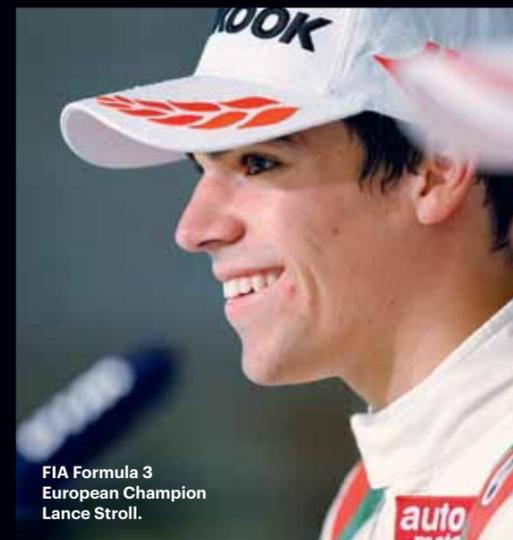
The Argentinian took his third consecutive FIA World Touring Car Championship title, all scored at the wheel of Citroën's phenomenal C-Elysée. While the French team did not enjoy the advantage it had in previous seasons, 'Pechito' hammered home his superiority, winning eight times from 22 starts. Only once did he fail to score points, at race four of the season in Hungary. Thereafter, he notched six victories and two other podium finishes to wrap up the Drivers' title ahead of team-mate Yvan Muller with an event to spare.



Formula E's 2015-16 champion Sébastien Buemi.



CIK-FIA OK Champion Pedro Hiltbrand celebrates victory in Bahrain.



FIA Formula 3 European Champion Lance Stroll.

## BEST OF THE REST - FIA DRIVER CHAMPIONS 2016

- FORMULA E – Sébastien Buemi
- F3 EUROPEAN CHAMPIONSHIP – Lance Stroll
- F4 AUSTRALIAN CHAMPIONSHIP – Will Brown
- F4 BRITISH CHAMPIONSHIP – Max Fewtrell
- F4 CHINESE CHAMPIONSHIP – Bruno Carneiro
- F4 GERMAN CHAMPIONSHIP – Joey Mawson
- F4 ITALIAN CHAMPIONSHIP – Marcos Siebert
- F4 JAPANESE CHAMPIONSHIP – Ritomo Miyata
- F4 NACAM CHAMPIONSHIP – Axel Matus
- F4 NEZ CHAMPIONSHIP – Richard Verschoor
- F4 SPANISH CHAMPIONSHIP – Richard Verschoor
- F4 UNITED STATES CHAMPIONSHIP – Cameron Das
- MASTERS HISTORIC F1 CHAMPIONSHIP (HEAD & LAUDA CLASSES) – Nick Padmore
- MASTERS HISTORIC F1 CHAMPIONSHIP (STEWART & FITTIPALDI CLASSES) – Michael Lyons
- MASTERS HISTORIC SPORTS CAR CHAMPIONSHIP – Keith Ahlers, Billy Bellinger
- WORLD CUP FOR CROSS COUNTRY RALLIES – Nasser Al-Attiyah, Mathieu Baumel
- AFRICAN RALLY CHAMPIONSHIP – Don Smith, Robert Kaugi
- ASIA PACIFIC RALLY CHAMPIONSHIP – Gaurav Gill, Glenn Macneall
- CODASUR RALLY CHAMPIONSHIP: Gustavo Saba, Edgardo Galindo
- NACAM RALLY CHAMPIONSHIP – Ricardo Triviño, Marco Hernandez
- EUROPEAN RALLY CHAMPIONSHIP – Kajetan Kajetanowicz, Jaroslav Baran
- MIDDLE EAST RALLY CHAMPIONSHIP – Nasser Al-Attiyah & Mathieu Baumel
- WORLD RALLY CHAMPIONSHIP JUNIOR – Simone Tempestini, Giovanni Bernacchini
- WRC 3 – Simone Tempestini, Giovanni Bernacchini
- WRC 2 – Esapekka Lappi, Jane Fern
- F3 WORLD CUP – Antonio Felix Da Costa
- EUROPEAN TRUCK RACING CHAMPIONSHIP – Jochen Hahn
- EUROPEAN DRAG RACING CHAMPIONSHIP (TOP FUEL) – Anita Mäkela
- GT WORLD CUP – Laurens Vanthoor
- WORLD ENDURANCE CUP GT – Marco Sorensen, Nicki Thiim
- EUROPEAN TOURING CAR CUP – Kris Richard
- EUROPEAN RALLYCROSS CHAMPIONSHIP – Kevin Hansen
- EUROPEAN AUTOCROSS CHAMPIONSHIP (SUPERBUGGY) – Bernd Stubbe
- EUROPEAN AUTOCROSS CHAMPIONSHIP (BUGGY1600) – Florent Tafani
- EUROPEAN AUTOCROSS CHAMPIONSHIP (TOURING AUTOCROSS) – Vaclav Fejfar
- EUROPEAN AUTOCROSS CHAMPIONSHIP (JUNIOR BUGGY) – Milan Vanek
- EUROPEAN HILLCLIMB CHAMPIONSHIP – Nikola Miljkovic (I), Simone Faggioli (II)
- HILL CLIMB MASTERS – Lucio Peruggini (I) Simone Faggioli (II), Scott Moran (III)
- INTERNATIONAL HILL CLIMB CUP – Gabriella Pedroni (Production), Vaclav Janik (SPORT), Ronnie Bratschi (E1)
- HISTORIC HILL CLIMB CHAMPIONSHIP – Vladimir Konica (I), Giuliano Palmieri (II), Jean Marie Almeras (III), Stefano Di Fulvio (IV), Ondrej Chytil (V)
- MASTER HISTORIC SPORTS CAR CHAMPIONSHIP – Keith Ahlers, Billy Bellinger
- LURANI TROPHY FOR FORMULA JUNIOR CARS – Chris Drake
- HISTORIC RALLY CHAMPIONSHIP – Antonio Parisi, Giuseppe D'angelo (I), Valter Jensen, Erik Pedersen (II), Esa Peltonen, Hannu Lamminen (III), 'Pedro', Emanuele Baldaccini (IV)
- TROPHY FOR HISTORIC REGULARITY RALLIES – Christian Crucifix, Joseph Lambert
- CIK-FIA WORLD OK-JUNIOR CHAMPIONSHIP: Victor Martins
- CIK-FIA WORLD KZ CHAMPIONSHIP: Paolo De Conto



# AUTO NEWS

In this issue, Venturi sets a new Land Speed Record for electric vehicles as the Bloodhound bid draws nearer, Mercedes GP team eyes Formula E entry and Volkswagen shifts its motor sport involvement



**The 3000bhp VBB-3 set a new electric vehicle speed record at Bonneville of 549.43km/h.**

## VENTURI SETS NEW LAND SPEED RECORD

The Venturi electric vehicle company has set a new outright Land Speed Record for electric vehicles.

The Buckeye Bullet 3 car was built by Venturi, the Monegasque company that also races in the FIA Formula E Championship, in collaboration with the Ohio State University Center for Automotive Research. Its driver, Roger Schroer, works for the Transportation Research Centre and has played a part in each of the previous five records established by the partnership.

On the bed of the Bonneville salt lake in Utah, the car reached 341.39mph (549.43km/h) to break the outright record of 306.99mph (494.06km/h) set by its predecessor in 2010. Venturi and OSU had been trying to better that marker for a number of years but were repeatedly thwarted by adverse weather at the Bonneville test area.

Speaking after the record was broken, Schroer outlined his pleasure at setting a new target, something he feels the partnership could improve on again in the future.

He said: "Each time I drove the car I enjoyed the experience and was pleased with the results. But at those speeds you have to focus on your task, not on your emotions, and I know we can go even further. This week the track was in good condition and so there was no main vehicle instability. We always have to be patient and wait for the track to be ready."

The new record also delighted Gildo Pastor, Venturi's owner, who said: "VBB-3 is the most powerful electric car in the world (3000bhp). We wanted to demonstrate that it was also the fastest. We have now achieved that by breaking our own record set with the VBB-2.5 in 2010. It shows that our partnership between students and a manufacturer can bring a lot in this new automotive industry in terms of research and development."



## PRESIDENT TODT ADDRESSES HABITAT III CONFERENCE

**FIA President and UN Secretary General's Special Envoy for Road Safety Jean Todt was among the speakers at Habitat III, the United Nations Conference on Housing and Sustainable Urban Development, which took place in Quito, Ecuador, in October.**

The conference was aimed at strengthening the global commitment to sustainable urbanisation by bringing together leaders from around the world to agree on the implementation of a New Urban Agenda. The event was also the first United Nations global summit organised after the adoption of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals.

Throughout the conference, President Todt participated in a number of side events and sessions. He joined a discussion organised with the Inter-American Development Bank, which was built around the topic of safe mobility and the New Urban Agenda. He also addressed the audience in his role as the UN Secretary General's Special Envoy for Road Safety during the Special Session on Transport and Mobility, as well as speaking at the UNECE event on the role of

road safety in achieving sustainable cities. Along with other high-level panelists, Todt highlighted the role of road safety in the New Urban Agenda saying: "Road safety should not just be an additional criterion, but a basic condition for liveable cities."

The Habitat III conference was also an opportunity for the FIA to demonstrate extended support to cities committed to implementing the New Urban Agenda. Also in October, 'Safer City Streets', a new global traffic safety network for liveable cities created by the FIA and the International Transport Forum (ITF) was launched with Todt and the Mayor of Mexico City, Miguel Ángel Mancera.

The FIA presence at the conference was also marked by its stand at the Habitat III exhibition village, where more than 100 governmental and international organisations featured their urban projects and initiatives. Assembled with the help of the Automóvil Club del Ecuador, the stand became an interactive learning platform that helped to raise awareness about how the FIA and its partners are involved in the field of sustainable urban mobility and road safety.

**Jean Todt was among the speakers at UN conference Habitat III.**

## BLOODHOUND CLEARS THE WAY

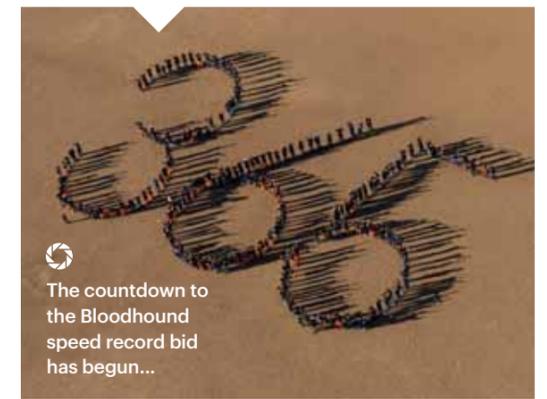
The President of the FIA Land Speed Records Commission, David Dean, has praised the preparation work undertaken by the Bloodhound Supersonic Car team to prepare the area where its jet-and-rocket-propelled machine will attempt to break the Land Speed Record in October 2017.

The attempt will take place at the vast Hakskeen Pan salt flat area in South Africa. To prepare the terrain as well as possible for the record, the local Mier community helped to remove 16,000 tons of stones by hand from the bed of the lake. This has freed up a surface area of 22 square kilometres, making it the biggest-ever area for a motor sport activity.

Dean recently visited the Pan where the Bloodhound team will not only try to break the current record, set in 1997 at 763.035mph (1227.985km/h,) but also take it past the 1000mph barrier, and was impressed by the efforts that have been made to reduce the risk of the terrain hampering the record attempt.

He said: "It is only when you stand on the vast expanse of Hakskeen Pan and see the piles of rock stacked at the side of the track that you understand the scale of the work done here. It is an epic achievement. Moving 16,000 tonnes of stone, by hand, in hot, dusty conditions, is an incredible undertaking and shows tremendous commitment."

"Next year, Project Bloodhound can make an attempt on the World Land Speed Record without worrying that a stray piece of rock might shatter a wheel or punch through the bodywork, and that will be spectacular testimony to the partnership forged between the team, the local community and the Northern Cape Government. It is in the best tradition of motor sport that people come together to share a unique experience – and that is certainly the case here."



**The countdown to the Bloodhound speed record bid has begun...**



## MAHINDRA FORMULA E TEAM SETS SUSTAINABILITY BENCHMARK

Mahindra Racing has become the first Formula E team to achieve accreditation in the FIA Institute's Sustainability Programme after proving its environmental credentials.

The Indian team has attained Progress Towards Excellence, the second of three levels in the programme. Auditors were impressed with the team's commitment to minimising its environmental impact through a strong environmental policy and specific improvement targets.

Several elements of the team's environmental strategy are still in an early developmental phase, so Mahindra has been encouraged to follow up, register, monitor and implement the current routines in an efficient way to help it attain the highest level of accreditation, an Achievement of Excellence. Based on its recent assessment, auditors are confident that with the necessary guidance the team could achieve this objective.

Garry Connelly, FIA Institute Deputy President and Environmental Ambassador, said: "As the first Formula E team to become accredited in the initiative, I must commend Mahindra for its efforts and commitment to sustainability. As ever when it comes to the environment there is always more that we can do and I call on the other teams in the all-electric series to sign up and join the programme."

Formula E was also the first championship promoter to reach Achievement of Excellence in the Sustainability Programme in November 2015. The series' commitments to encouraging urban mobility and promoting the mass use of electric cars are part of its core message, as is its pledge to host sustainable one-day events in city centres around the world.

## MERCEDES AIMS FOR FORMULA E ENTRY

The Mercedes Grand Prix team has agreed to reserve an entry in the fifth season of the FIA Formula E championship.

Mercedes-Benz GP Ltd signed an agreement with Formula E CEO Alejandro Agag, which means the team can choose to become one of the maximum of 12 entries that will take part in the 2018-2019 series.

The fifth season of Formula E is expected to be the first time the electric series will switch from its current two-car format to a single car being used by each driver for the duration of an ePrix. Any move by Mercedes to officially enter the series is subject to FIA approval.

Mercedes motor sport boss, Toto Wolff, explained that the team's desire to enter Formula E had been partly motivated by the increased role of electrification in road car production.

He said: "We have been watching the growth of Formula E with great interest. Currently we are looking at all the options available in the future of motor racing, and we are pleased with an agreement that secures us an opportunity to enter the series."

"Electrification will play a major role in the future of the automotive industry. Racing has always been a technology R&D platform for industry and this will make Formula E very relevant in the future."

Agag added: "We are delighted to have reserved one of our two new entries in season five for Mercedes. Formula E wants to become the platform where manufacturers test and develop technologies they will then introduce on their road cars. Having the chance to include a brand like Mercedes in our series would be a major boost to achieving that aim."



## WOMEN IN MOTORSPORT SEMINAR SETS ROAD MAP FOR PROGRESS

The second FIA Women in Motorsport Seminar took place in Lisbon in September, bringing together representatives from 70 countries across the world.

Michèle Mouton, FIA Women in Motorsport Commission President, launched the two-day seminar and explained that the progress made in recent years on advancing women's participation in motor sport has been extraordinary but more can be done at the grass roots level.

"We have made a lot of progress with drivers," said Mouton. "We are active in nearly all disciplines. [But] we need more volume. We cannot have success on the top if you don't start at the national and regional level; all our ASNs need to support and encourage young girls."

During the seminar, attendees agreed on an eight-point roadmap for the Commission and national delegates to act on over the next four years.

The roadmap stated that National Sporting Authorities (ASNs) should classify their training requirements for volunteers and officials; identify role models and ambassadors to promote

the sport to officials; develop local programmes that highlight the opportunities available to women; and develop driver programmes at local and national levels.

The representatives also called for ASNs to find creative solutions to connect drivers and sponsors; create online social media communities that ensure the contribution made by women in the sport is recognised; showcase career opportunities; and ensure their marketing materials are written using the right adjectives for equal opportunities and illustrated with appropriate gender images.

Speaking after the conference, FIA President Jean Todt said: "The FIA's Women in Motorsport Seminar in Lisbon was another major step forward, not only showcasing the strides made so far but also the exciting plans for the future."

FIA Deputy President for Sport Graham Stoker added: "Women in sport are clear transformational role models, at the cutting edge of altering the perception of the role of women in society round the world."



## INSTITUTE LEAVES SAFETY AND SUSTAINABILITY LEGACY

The FIA Institute will complete its mission at the end of 2016 to leave behind a legacy of significantly improved safety and sustainability in motor sport championships worldwide.

The organisation, which was founded in 2004 with Professor Sid Watkins as its first President, has produced numerous developments that have made motor sport safer and more sustainable for its competitors, officials and fans.

Those projects include the development of high-performance wheel tethers and new side-impact systems for Formula One cars, crash helmets designed specifically for young drivers, and research into spinal injuries and their prevention, to name a few.

The FIA Institute handled a series of education initiatives too, which covered the areas of sustainability, facility improvement, motor sport medicine and officials and driver training. Part of this involved a young driver development programme for up-and-coming competitors. The Young Driver Excellence Academy, which ran between 2011 and 2015, gave opportunities to a number of emerging stars including McLaren driver Stoffel Vandoorne and Indy 500 winner Alexander Rossi.

The many initiatives launched by the FIA Institute will not come to an end as the safety research projects and the education programmes will be passed on to the Global Institute for Motor Sport Safety and the FIA respectively.

FIA Institute president Gérard Saillant said: "We are very proud of the work we have completed over the last 12 years and look forward to that being continued by the Global Institute and the FIA."

Global Institute chairman Luc Argand added: "We thank everyone at the FIA Institute for their efforts since 2004 and we are committed to continuing its legacy of progress in motor sport safety."



The seminar brought together drivers, engineers and leaders from across the world

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Magneti Marelli Motorsport designs and produces electronic and electro-mechanical systems for two and four wheels racing vehicles. Magneti Marelli Motorsport has contributed significantly along his history to the technological evolution of modern sport competitions, thanks to the development and introduction of certain innovative solutions.

## VW REPOSITIONS MOTOR SPORT INVOLVEMENT

Audi and Volkswagen have pulled out of the 2017 World Endurance and World Rally Championships following a switch of focus to electric racing.

The decision by VW, which owns both brands, to withdraw from both series at the end of 2016 comes in the wake of the diesel emissions scandal that engulfed the automotive manufacturer in 2015.

Audi won the Le Mans 24 Hours race 13 times while competing in the legendary race, and claimed the 2012 and 2013 WEC drivers' and constructors' titles. The Ingolstadt-based brand will switch its focus to the all-electric FIA Formula E Championship, where it has a partnership with the ABT Schaeffler Audi Sport team.

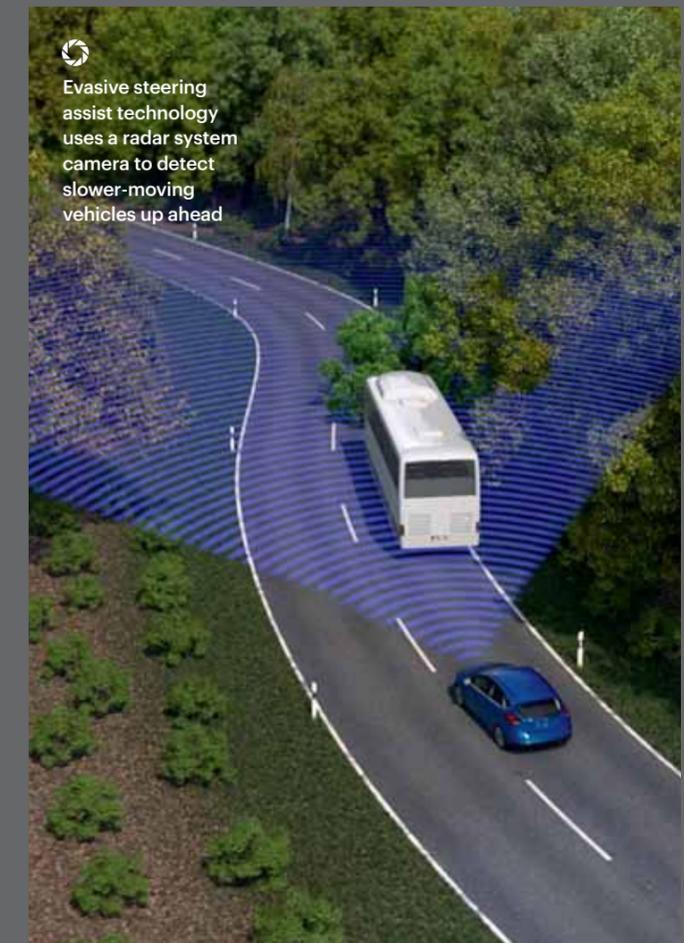
Rupert Stadler, Audi's chairman of the board of management, said: "We're going to contest the race for the future on electric power. As our production cars are becoming increasingly electric, our motor sport cars, as Audi's technological spearheads, have to even more so."

Speaking after Audi's decision to end its endurance racing programme was made public, WEC CEO Gérard Neveu reflected that such changes are a part of motor sport.

"We understand this decision, although obviously we regret the departure of a major player in the WEC," he said. "The WEC is made up of a grid of 32 cars and 20 teams, with four categories and six manufacturers entered. One manufacturer is leaving, others will soon be arriving. This is the life of a championship."

VW has won four consecutive WRC drivers' and manufacturers' titles since joining the championship with its Polo in 2013. The member of the company's board responsible for its technical development, Frank Welsch, explained that after leaving the WRC, VW would be increasing its investment in emerging technologies.

He said: "With the upcoming expansion in electrification of our vehicle range we must focus all our efforts on important future technologies. At the same time, Volkswagen is going to focus more on customer racing."



Evasive steering assist technology uses a radar system camera to detect slower-moving vehicles up ahead

## FORD MAKES PROGRESS WITH DRIVER-ASSIST TECHNOLOGIES

Ford has unveiled details of new driver-assist technologies that will improve safety and be incorporated on future models as part of a gradual move in the market towards autonomous vehicles.

Ford engineers have developed a more advanced steering-assist system that sees the car automatically swerve to avoid slow-moving or stationary vehicles. The system is capable of working at motorway or urban speeds and features radar and camera input to determine if a collision is imminent.

Engineers are also continuing to develop Ford's active park assist technology by providing additional warnings if camera and navigation data show a driver has entered a one-way street in the wrong direction. The park assist system can already control steering, throttle, brakes and gear selection for the driver.

The car maker is continuing work on next-generation adaptive headlights, which use an infrared camera to help identify pedestrians, cyclists and animals. In future they will also be able to broaden the beam pattern at junctions and roundabouts to improve visibility.

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## NISSAN WITHDRAWS ZERO STAR CAR FROM MEXICO

Nissan has announced the withdrawal from sale of the Tsuru, a high-selling but low-safety car in Mexico, following a campaign by Latin NCAP and Global NCAP, co-funded by the FIA Foundation.

The car, which scored zero stars in a Latin NCAP crash test, will cease production in May 2017. The announcement came on the eve of a car-to-car crash test organised by Global NCAP and Latin NCAP at the US Insurance Institute for Highway Safety.

The test was conducted between the 2016 Nissan Versa, sold in the United States, and the 2015 Tsuru. Both cars are manufactured in Mexico and have been previously tested by the IIHS and Latin NCAP respectively, the Versa obtaining a performance of good and the Tsuru zero stars.

The test, which involved a combined closing speed of 80mph (129 km/h), showed that a driver in the Tsuru would have had high probability of suffering life-threatening injuries. There were no airbags and the car's main structures all failed.

Alejandro Furas, Latin NCAP Secretary General, said: "I believe Nissan made this announcement as a reaction to our campaign to stop the production of zero star cars across Latin America. In April we published a report showing that the Nissan Tsuru had been involved in more than 4,000 deaths on Mexico's roads between 2007 and 2012."

After the test, the results graphically highlighted the urgent need for the Nissan Tsuru to be taken out of production.

## UN REPORT BACKS FIA FOUNDATION CAMPAIGNS

A United Nations report on sustainable transport has called for a 'redirection in infrastructure expenditure' to set the world on a more sustainable, low-carbon path.

The report, from an advisory panel established by UN Secretary General Ban Ki-moon, showcases FIA Foundation programmes including the Global Fuel Economy Initiative and the 'Save Kids Lives' campaign for safe journeys to school.

Setting out a vision of "cities with quiet streets, clean air, easy and equitable access to work and school, and vibrant community life", the High-Level Advisory Group on Sustainable Transport launched its report at the UN headquarters in New York in October. It reinforces the importance of investment in safe and sustainable mobility for achieving the UN's Sustainable Development Goals.

The report states that: "The transformation to sustainable transport requires a redirection, rather than any substantial increase, in infrastructure expenditure and can be realised through an annual investment of around US\$2 trillion"

In his report introduction, Ban Ki Moon said: "Sustainable transport supports inclusive growth, job creation, poverty reduction, access to markets, the empowerment of women, and the well-being of persons with disabilities and other vulnerable groups. It is also essential to our efforts to fight climate change, reduce air pollution and improve road safety."



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**AUTO  
ASKS**

# QUESTION:

## HOW WILL FANS BE WATCHING MOTOR SPORT IN 10 YEARS?

*AUTO asks three experts for their opinion on how spectators will consume motor sport in a decade. Will virtual reality technology make a big impact in a sport where a driver's-eye view of the racing might hugely enhance the viewing experience?*



### JESÚS HORMIGO

**CTO, VIRTUALLY LIVE**

In 10 years from now you'll not distinguish real-time computer-generated graphics from footage, the same way you can distinguish computer graphics in movies nowadays.

Every sport will be tracked to a level of detail that was never tracked before. Your favourite player will wear trackers that will accurately measure not only their movements but breath rate, sweat levels, ECG and even the basic EEG bands giving you concentration levels and ERP readings for certain patterns in real time.

You will not be watching sporting events any more but you'll be attending them, virtually, with your friends and you will feel as if you are there.

AR and VR will converge and the devices will be ultralight, having a battery that will last for days.

Sports will be reconstructed using computer graphics to give you the highest levels of detail and this will enable you to immerse in a virtual world where action is accurately recreated in real time.

New sports will arise out of this information excess and will be designed for the user to measure performance across the spectrum of mixed reality.

This will also be the source of a new fan base that will actually appreciate a different new set of skills from the traditional sports.

eSports and traditional sports will converge in a virtual reality world, where any real or fantasy sport will take place anytime with global audiences.

Computer 'clusters' will play sports only using artificial intelligence based on the patterns it has learned from the behaviour of real ones. New stars being born out of AI and not existing in the real world will play against the AI model of the existing ones.

### ZAK BROWN

**EXECUTIVE DIRECTOR, MCLAREN TECHNOLOGY**

"I think Virtual Reality will be applied to many motor sport viewpoints, from cars to drivers' helmets, to pit stops, to trackside views you can't physically stand in because of safety. The 360-degree cameras already in use today, such as at 360racing.com, will only get even better in quality and smaller, allowing you to put them in places that have previously been inaccessible.

How cool would it be to watch the Belgian Grand Prix trackside at Eau Rouge? Or when a car pits from the lead of a grand prix, to watch the pit stop from the tyre-changer's helmet? Or if it's the Le Mans 24 Hours, from the perspective of the refueller? But unlike TV, where you're being directed, you choose what you see - you are the director.

As these cameras get smaller and smarter, you'll be able to do even more cool stuff - like showing how the car is working. You could see what goes on in the driver's footwell, or inside the wheelwell, so you could see the suspension and tyre working, and the brakes lighting up. We've seen glimpses on traditional TV, but to see it live, while deciding what to look at next adds an extra dimension.

Today's consumer, certainly the millennials, want to engage and even interact - to be as 'in-the-game' as possible. Virtual Reality offers that immersive and interactive experience. Generally, if you look at the growth in video gaming and the 3D experience it offers, and the way consumers are migrating to VR technology, there's no doubt that younger audiences wish to consume their entertainment in this format. A lot of that is sports - the majority driven via social media.

In addition, I think there's a clear safety aspect to Virtual Reality, as well as enforcing track limits and even technical regulations. Of course, that's not for consumers but it goes to show the multiple layers in which VR can work.



### ALEJANDRO AGAG

**CEO, FORMULA E**

It's a really interesting question and something we ask ourselves regularly when looking at the future of Formula E. Formula E isn't just pioneering in terms of performance on the track, but also in the way we interact with our fans.

The way we consume not just motor sport, but sport in general, is changing all the time. I don't think many people have the luxury of dedicating hours each day to watching sport at home, no matter how much you love it. People are on the move - I know it's a phrase I use regularly, but I truly believe that the future of urban mobility is electric, driverless and connected. This also ties in with the way we go about our daily lives, consuming sports coverage on the move. Fans follow their favourite sport from their fingertips on their phone. I still believe in watching sports live at the event and also from the comfort of your own home - but fans expect more, a second screen experience when watching the race from trackside, or live streaming while doing your weekly shop. Formula E is looking at new ways to do just that.

One area that Formula E has been actively pursuing is gaming and eSports - we even have our first virtual race in Las Vegas at CES in January, where 10 fans will be competing against the Formula E drivers for the chance to win a share of \$1 million. This shows that fans may not only be watching motor sport in 10 years, but actually participating in it! It's vital we offer fans an immersive experience to bring them closer to the sport than ever before. Formula E does this through FanBoost, where fans can vote for their favourite driver to receive an extra power boost during the race - fans can feel that they have a direct influence on the result. We saw this in Mexico last season, where Lucas di Grassi used FanBoost to overtake Jerome D'Ambrosio for the lead of the race.

The other element linked to how fans are now gaming or viewing motor sport is through virtual reality. Fans want to be able to follow their favourite driver with a selection of onboard views and 360-cameras - virtual reality allows you to do this. We have been trialling this with Virtually Live, which allows you to follow the action on a virtual reality headset - sit in the car, or even stand up and move around the car as they are racing on track. I tried it in Long Beach last season and I was blown away. Looking up and seeing the skyscrapers, and checking behind to see where your closest rival is - it takes motor sport viewing to a whole new level.




 TECH  
REPORT

F1 Regulations

# READING THE RULES

*Interpreting the new regulations and making them work for your team is key to success in Formula One - and it's something Ross Brawn was a master at, as he explains to AUTO*

TEXT: JUSTIN HYNES

**During your Formula One career you experienced several sets of major regulation changes. What's the key to maximising the opportunity large-scale changes represent?** I think the first thing is to be active in trying to shape those regulation changes because the discussions are always inclusive, unless it's a safety issue where you tend to find decisions are understandably made for you.

Normally if there's a significant regulation change what happens is the FIA, sometimes in combination with the commercial rights holder, will say, 'We've got to make some changes here because we feel Formula One is going in the wrong direction,' for any number of reasons. In the past, that decision was handed down to the various working groups, which were then asked to come forward with proposals. I was active in those working groups, and being involved with defining regulations from an early stage you start to understand what's trying to be achieved and what the priorities are. ►

**Is that process defined by where your team wants the regulations to go, or by the greater good of the sport? How impartial can a team be in helping to formulate regulations?** I can honestly say that in that early gestation period of the regulations I was focused totally on trying to achieve the objectives that we'd been set, because at that stage no one's got an advantage or disadvantage really. As long as the regulations are in two or three years' time, then you can take a position that is impartial to your team perspective and look at what's good for F1.

Where it becomes sensitive to your team is the next year, when you feel that possibly you're being disadvantaged, in which case you then get quite strong in your views of what should or shouldn't happen.

If you're given the opportunity and say, 'In two years' time we want to achieve these objectives, what's the best way?', then you can work impartially to try and achieve those objectives.

So I was always very active in making sure I was part of that process. When that process is complete then you've got fine-tuning of the regulations where interpretations start to come into it and you have to clarify the regulations around the interpretations. Once those regulations are firm enough, you start to put the teams together to build the cars or the engines, or decide what you're going to do.

**How Machiavellian do you have to become when it comes down to that fine detail?**

You do get competitive, inevitably. Once you've started your programme, once you've started putting your teams together, you want to steer it in a certain direction because you're committing to a certain path.

If you have an interpretation of a regulation that you feel is going to give you a competitive advantage then you want to try to maintain that. That's where politicking and other elements can come in.

I always had a clear conscience on that because if I started the process in a completely impartial way, once we'd passed that gate, then I had to put my other hat on and say, 'Now I'm working just for the team. I've got to find the best solutions for my team around those regulations.' Some would argue, and I understand it, that you can never separate the two completely, but I think I made a fair attempt.

**To take a global view and then narrow the focus?**

Exactly. But once you get into the application of the regulations for your team, then you defend your corner in order to get all the advantages you can.

The other interesting thing about the process, if you start early enough, if you're the first team to query interpretations

**"YOU'VE GOT TO HAVE A VISION OF WHERE YOU WANT TO BE IN SIX, 12 MONTHS, A YEAR, TWO YEARS"**

ROSS BRAWN



Brawn GP used the regulations to its advantage in 2009 with the double diffuser – a title win was the result.

The Briton oversaw Ferrari's golden era in the early Noughties when Schumacher and the car dominated.



with the FIA, is that then you have an advantage because you can start to shape the arguments.

Being early in that process was important and we found that with the engine when I was at Mercedes. We'd started the engine project very early. With the queries we were making to the FIA for clarifications, it was clear that we were the first ones to do that, so we could start to debate various elements of it. It also gave us some encouragement because we knew no one else was ahead of us.

It is an involved process. What I'd always do was put a small team onto the project early on, because they open up areas where you start to understand what sort of team you need to build to implement the changes properly.

**The 2017 technical regulations were locked down in February 2016, so what would be the normal procedure at a team following ratification?**

My approach was to devote research to it and make that sacrosanct, because in the cut and thrust of normal F1, it's too easy for that resource to get moved into day-to-day dramas, and then you put it back on the project a week or two later and suddenly you've lost that time and you can't recreate it.

My practice was to set up a team, identify what was needed to get the project running properly and say: 'Right, there's a small project team. I want to know what's going on, but otherwise we're not going to touch them.'

**You say it's easy to get lost in the day-to-day competition. How difficult is it to resist that, particularly if you're racing for a championship? Did you ever have to say, 'We're going to sacrifice this because I've got to take a longer-term view?'**

I did, and I think that happened in 2013, my last year in F1. Up until the summer break, we were fighting with Red Bull for the championship, but I had a programme where resources were being moved across to the 2014 programme.

My judgement now is that Red Bull didn't do that because they came back after the summer break with a car that was a lot faster, so they must have kept an effort going on that existing car or else they had more resources than we had! However, the consequence of that was that they began 2014 on the back foot. Having the opportunity and the conviction to make the call [on which fights you pick] is essential.

It is a tough call to make, especially if you are beholden to masters who may be impatient to see a competitive return on their investment. You get confidence from the experience of seeing it happen in the past and saying to yourself, 'Look, slim chance of winning the title this year. Do we really want to throw everything at it, or should we keep our strength of conviction and head for the future?' The future should win.

PHOTOGRAPHY: DPPI, LAT

**Was there a temptation in 2013 to turn to the Mercedes board and simply say 'Just give us more money'?**

You can't turn it on that quickly, unfortunately. There's an inertia in these systems and if you decide you want to add to them, it's a six-month programme.

Mercedes' 2014 success was actually born at the end of 2011, 2012 when we had a tough meeting with the board. They were either going to stop or they were going to step up, because 2010 and '11 weren't good enough. We had been following the resource restriction philosophy, which was collapsing. We were 450 people and we were fighting teams that were 500 or 600 people, and there's no solution to that.

We said to the board: 'Either we step up or we ought to step back because we're in between at the moment.' The board, all credit to them, said: 'OK, we'll step up. We'll give it a go. What do you need?'

So it was then that we put the project teams together for 2014. We hired Aldo Costa. We hired Geoff Willis. We hired the people we needed and it started to come together. That's the strategic planning you need. You've got to have a vision of where you want to be in six, 12 months, a year, two years.

**In the heat of battle, and under pressure from a paymaster to achieve, that's often hard to implement. Some would say it's a problem affecting your other team, Ferrari, at the moment. Is that your view?**

It looks that way from the outside, and I think they've got to get the stability back and get the confidence back to start building their programmes.

It's always difficult to stabilise in the short term while then building for the long term, but if everything is a knee-jerk reaction, you never get out of it. You might find a quick solution but you get caught in this vicious cycle of short-term response and reaction. You never take your focus off that so what you should be doing over here, getting good programmes established, which are then feeding into your race programme, never happens. ►

Once you've done the research on new regulations, once the project teams bring back their initial findings, someone has to make a call on a direction to take. Was that you?

I describe myself as a friendly dictator. What I wanted was a group effort because then you harness all the power and resource. But yes, eventually someone has to make a decision as to what direction you go in and I was happy to do that. But I wanted everyone to sign up to it as well. So my quid pro quo was: I'm going to make the decision but you are going to be part of the team that will enable me to make the best decision I can. Therefore, as you are part of the team maybe that decision is not quite what you thought it should be, but you are going to commit to it because you had your opportunity to feed into it.

In most cases it was rare that there was one big decision to make, it would be more a case of saying, 'I can see that they need more resource there, I'll stick some more people on that' or that they might come to me and say, 'Look, we're not clear on whether we can take this interpretation or not, what should we do?' I would give them my opinion and it might get to the point that I would go to the FIA and debate and discuss it.

I did less of that in later years, because me getting involved usually meant there was a big issue! I'd play devil's advocate, coach the people involved on how they should approach it and then send them off to have a debate with the FIA.

There was a pretty structured approach to all those things with project teams, objectives set, timings agreed. I would hold their feet against the fire if they weren't moving along well enough and I'd move resource around when it was needed. It was, I thought, a pretty proper structure to achieve goals.

Also, I think you waste resource if you run parallel programmes where you then try to decide at the end what is best. You might decide to pursue a couple of different ideas to see what proves to be the best solution, but I would expect those teams to work collectively on those ideas.

**What do you think of this set of regulations?**

I've not been involved in the process to generate these regulations. When you are involved you know them intimately. I've read this set broadly and they're a big step in a certain direction. Outwardly they should make the cars a lot quicker. They'll look racy, with wider track, wider tyres, and the way the wings are profiled the cars are going to look pretty exciting.

It will be fascinating, though, as it's putting the emphasis back on the chassis. There is a view that it was too much towards the engine, but actually I think it brought some balance. We went through a phase where the influence of the engine was almost neutral because everything was frozen and they were almost just a bracket between the gearbox and the chassis, whereas now people talk about the engines.

**The engine-orientated regulations led to Mercedes dominating, so will the 2017 rules upset the pecking order?**

Mercedes will have been pulling resource off this year's programme onto next year very early, once they saw where they were with the car. If I was there, and I'm sure they've carried on a similar philosophy, I'd be saying, 'Right, we've got a strong car, we can only beat ourselves, let's get everyone onto next year's programme'. I don't know how many other teams could do that. Success breeds success. Mercedes will be strong next year, despite the greater emphasis on chassis.

**The next hurdle comes in 2020 with a decision needed on the future of engines. How do you think F1 should progress?**

F1 has to take a hard look at what it wants from an engine. What

“SUCCESS BREEDS SUCCESS. MERCEDES WILL BE STRONG NEXT YEAR, DESPITE THE GREATER EMPHASIS ON CHASSIS”

ROSS BRAWN



we've done in the last few years is align ourselves with road cars. We've got this revolution going on, and the road cars we'll have in five to 10 years' time are going to be very different.

Can we maintain the technological marvel of F1 but acknowledge that perhaps now is the time to start diverging from where road cars are going? If we don't, logic says we should have electric or fuel-cell F1 cars in a few years' time. We have Formula E and that's establishing its place, but for me F1 isn't just a technological demonstration, it's a whole circus, and what's the best way of maintaining that? It might be time to say, 'We've had this technological marvel, but we're going to step back and think about what F1 ideally wants from an engine, which may have to contain some technologies that are relevant.' We have to sit down with the manufacturers, teams and interested parties and decide what we want beyond 2020. Maybe it's what we've got now but refined in terms of cost and complexity, because the engine is too expensive.

In some ways the current engine is a technological marvel and it did re-engage the manufacturers, but if F1 starts to look at 2020 now there's time to do it without anyone feeling any competitive disadvantage, with the investments and plans being made correctly. You need two years to sort an engine out. By the end of next year, Formula One needs to know what sort of engine it needs for the future.

Total Competition: Lessons in Strategy from Formula One by Ross Brawn and Adam Parr is out now from Simon & Schuster ■

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Road Safety

# A VISIBLE DISPLAY OF SAFETY

*Next year the FIA, in partnership with advertising giant JCDecaux, will launch a major new road safety campaign. Here, AUTO reveals the visuals behind the global initiative and the key messages to be delivered by its star ambassadors*

TEXT: LUCA COLAJANNI

The message is stark: each year 1.25 million people die on the world's roads and a further 50 million are injured. Time and again, however, research has shown that simple steps can help reduce fatalities, including promoting better behaviour among road users. To that end, the FIA will next year launch a major roadside educational campaign aimed at promoting the FIA's Golden Rules for Safer Motoring. Each rule will be associated with a major public figure and AUTO can now reveal the imagery that will feature in the initiative. "A lot can be achieved through respecting basic rules," explains FIA President Jean Todt. "We want this campaign to reach as many people as possible around the world and, to achieve that, we have called on people who can help thanks to their popularity. In addition we asked for support from the leader in the field of roadside advertising, JCDecaux." ▶

TODAY, 3,500 PEOPLE WILL DIE ON THE ROAD...

**STAY BRIGHT**

**HAILE GEBRESELASSIE,**  
OLYMPIC AND WORLD CHAMPION  
LONG DISTANCE RUNNING



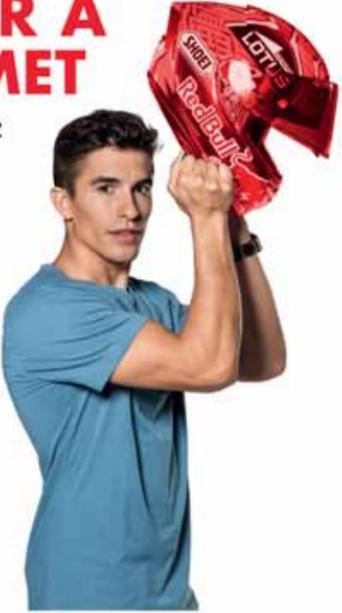

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TODAY, 3,500 PEOPLE WILL DIE ON THE ROAD...

**WEAR A HELMET**

**MARC MARQUEZ**  
MOTO GP WORLD CHAMPION




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TODAY, 3,500 PEOPLE WILL DIE ON THE ROAD...

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**FELIPE MASSA**  
FORMULA ONE RACING DRIVER,  
VICE WORLD CHAMPION




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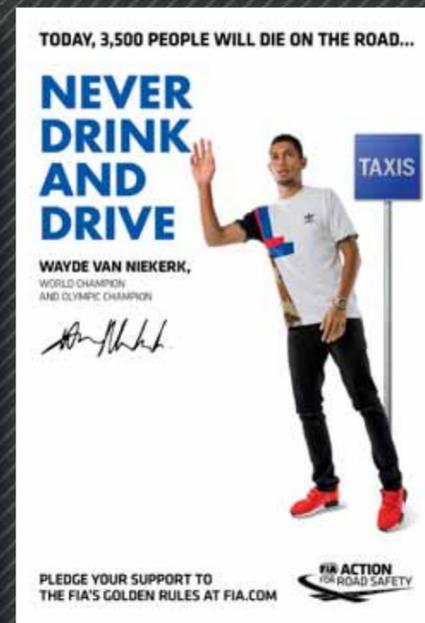
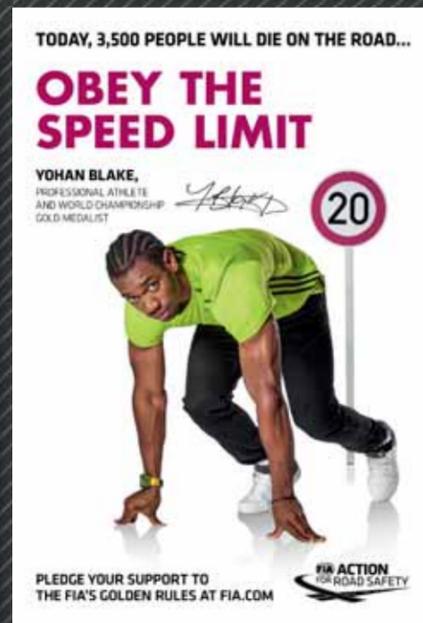
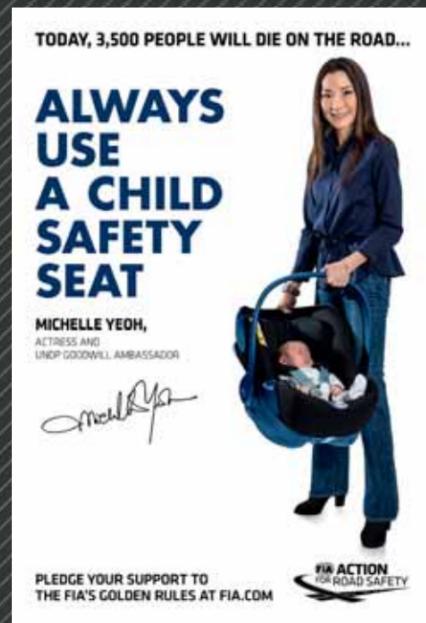
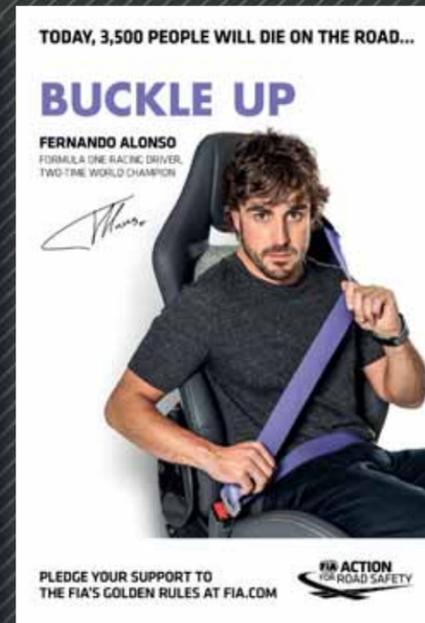
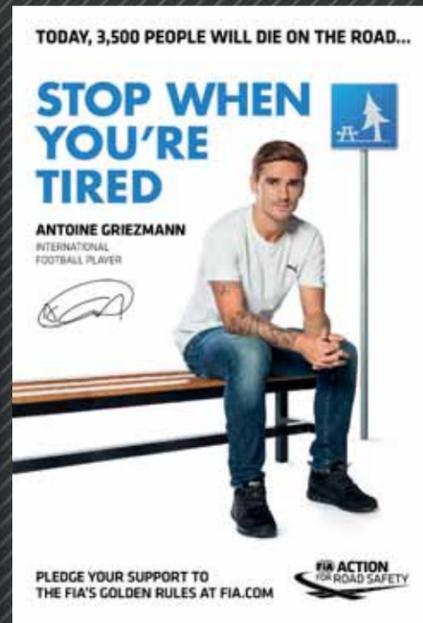
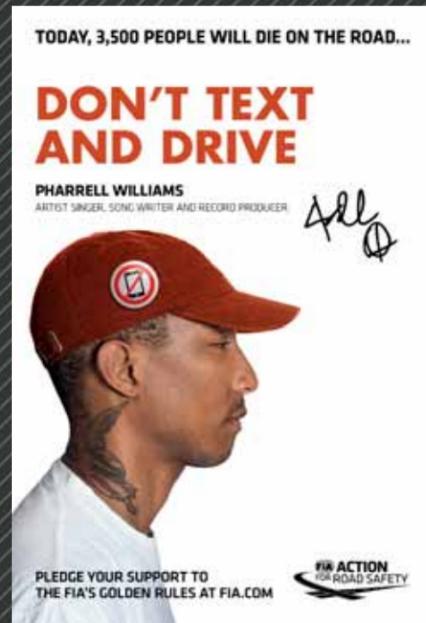
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## JEAN TODT AND MICHELLE YEOH JOINTLY PRESENTED WITH HUMANITARIAN OF THE YEAR PRIZE

*FIA President and UNDP Goodwill Ambassador honoured by United Nations Association of New York for road safety campaigning*



AUTO FOCUS

The involvement of these 10 stars in the FIA's latest information campaign shows that even when it comes to celebrities of this stature, the topic of road safety is gaining prominence.

The FIA is on the front line in gaining more recognition for the issue, as is the United Nations, and the fact that the FIA President has been conferred with the role of the UN Secretary General's Special Envoy for Road Safety adds further weight to the actions of the FIA.

The commitment of FIA President Todt and of Michelle Yeoh, Spokesperson for the FIA High Level Panel for Road Safety and UNDP Goodwill Ambassador, was recognised in October by the United Nations Association of New York, which awarded them its Humanitarian of the Year Award.

A non-profit organisation dedicated to building understanding of and support for the ideals and work of the UN, the UNA-NY each year honours outstanding individuals and companies for their work in helping to realise the UN Sustainable Development Goals. In presenting the award to President Todt and Ms Yeoh the association draws attention to the UN's

commitment to stabilising and reducing road traffic deaths around the world. "Jean Todt and Michelle Yeoh have mobilised sustained commitment toward road safety and development," said UN Secretary General Ban Ki-moon at the award presentation at the J W Marriott Essex House in New York.

"Road safety is not a privilege but a basic human right," he added. "I pay special tribute to this evening's honourees: my Special Envoy for Road Safety, Jean Todt, and UNDP Goodwill Ambassador Michelle Yeoh."

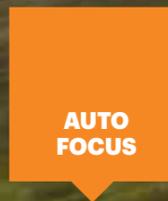
In accepting the award, President Todt said: "We cannot accept that every year 1.25 million people die on the road and 50 million people are injured. Road safety is unfortunately far too often ignored as a leading international cause. Road injuries rank among the top ten leading cause of death around the world, comparable to HIV/AIDS, Tuberculosis and Malaria and should be treated with the same urgency as these pandemics. This is as important as a humanitarian emergency. And the numbers are getting worse as the world urbanises, motorises, and as there is

more movement of people and goods. If no action is taken, road traffic injuries will be the chief cause of death globally by 2030.

"I take this symbol, the Humanitarian of the Year Award, as more than an award for Michelle and myself but as the opportunity to highlight this carnage," he added.

Michelle Yeoh, actress, producer, spokesperson for the FIA High Level Panel for Road Safety and UNDP Goodwill Ambassador declared: "Improving road safety is one of the world's great health and development challenges, and it's too often ignored. Most people have no idea that every day 500 children lose their lives on the world's roads. We know that this does not need to be the case, and we know that with the right political leadership and a commitment to the Sustainable Development Goals we can make the world a better, safer, place for all."

Presenting the award, UNA-NY President Abid Qureshi, thanked Todt and Yeoh for putting road safety "at the forefront of the developmental agenda of world leaders."



World rallying

# LIVING THE DREAM

*The most exciting cars to grace the World Rally Championship since the days of Group B will arrive on stage in 2017, only this new breed should be among the safest too*

TEXT: DAVID EVANS ILLUSTRATION: SEAN RODWELL

Finnish summers are about long days and fast cars. Today, the day couldn't get much longer. The car certainly couldn't get much faster. And 12-year-old Jukka's beaming smile has just proved FIA president Jean Todt right.

Skipping double maths or extended English, Jukka and his father have come to this road, just outside their hometown of Jämsä. The road is the same one they use to drive to school every day. Not today.

Today, it's being borrowed by Kris Meeke, Paul Nagle and the Citroën WRC team. And it's not being driven. It's being flown.

Trouble is, it's lunchtime and Jukka's father wants to get home while the road's not being used. Jukka's not for moving, arms locked around a lamppost in protest.

His father raises his eyebrows.

"He dreams for this car," he smiles in his son's direction, while trying to prise fingers open and his son out of his dream.

It's not hard to see why Jukka would want to skip lunch.

This is a typically Finnish road, full of blind crests, beautiful cambers and deliciously sweeping corners.

Time after time, Meeke has sent Citroën's C3 WRC 2017 car ballistic with longitude and latitude, landing in the middle of the next corner on one wheel with three-quarter lock.

Even trained eyes blink.

To Jukka, it's another world.

It's a world Jean Todt wanted to create.

"When I look at the current World Rally Cars," Todt says, "I don't see people dreaming about them. When the new cars come, I want people to dream. I want them to dream like they did when they saw Group B cars."

"These were the cars for the bedroom walls."

That there's one on such a wall in Jämsä bears testament to Todt's aspirations for the 2017 World Rally Championship.

These cars are that good.

For too long it's been too easy to talk of the current cars looking and sounding the same. That's all about to change. The World Rally Championship is stepping up a gear. Possibly two.

#### WHY CHANGE?

Much of this was instigated from the very top of the governing body, with Todt feeling there was an absence of drama in the current cars. The last time the Frenchman had spent any time in rallying, scoops, wings, width and wonder had been *de rigueur*.

Quite simply, the sport needed more of what he'd helped deliver with Peugeot's stunning 205 T16.

And, while the current car's silhouette was getting an overhaul, why not give them a bit more grunt just to help them shift sticky tyres on bone-dry asphalt? If it's drama you're after, a squirming rally car tagging black lines usually ticks the box.

In addition to the exterior overhaul and the hike in power, the change of technical regulations offered an opportunity for further work on crew safety aboard the all-new 2017 World Rally Car.

The moment was right for evolution, but instead the FIA's gone even further. We're talking about a revolution...

#### WHAT'S DIFFERENT?

Typically, it's the increase in power that catches the eye. But moving from just over 300 to almost 400bhp has not been the work of a moment. Citroën's engine manager Patrice Davesne admits plenty



Safety and performance have combined to leave M-Sport boss Malcolm Wilson excited about the new WRC car.

of midnight oil has been burned in Versailles – even with a wealth of experience from using a similar engine in the team's vastly successful World Touring Car Championship campaign.

Davesne says: "The difference is the inlet turbo restrictor. It was 33mm and now it's 36mm, which means about 20 per cent more air flow. Because of this we need to change the turbo charger because the compressor side is not large enough, so we develop a new one to adapt to this new flow."

Citroën hasn't stopped at a new restrictor and turbo, it's gone way further and built a whole new motor – including fundamental changes to parts that have remained the same since the Xsara WRC was introduced 15 years ago.

"We develop a fully new engine," says Davesne. "We decided to change the bore, it was 82mm since the beginning of our time in WRC and now we decide to increase the bore diameter to 84mm, the limit allowed by the FIA."

The numbers are interesting, but the key question is about how these changes will affect the car. There can't be any more torque due to a limit of 2.5-bar boost pressure on the turbo. But there can be more power.

"The change of the new engine is only power," says Davesne. "With the new restrictor, we have more power at higher revs. Concerning the driveability, the feeling of the drivers is that it depends on the road: if the stage is quick, like in Finland, they said it's an evolution not a revolution. On the tricky roads, the increase of the power creates greater acceleration and the feeling of the drivers is, 'Wow, it's another world!'"

#### POWER TO THE PEOPLE

Rarely, if ever, has there been such excitement about the start of a new WRC season and the continued comparisons with Group B have only served to further that enthusiasm. ►

"I'VE DRIVEN IN GROUP B, AND I CAN TELL YOU, THESE CURRENT CARS ARE ON ANOTHER LEVEL"

MALCOLM WILSON



Kris Meeke put Citroën's new C3 through its paces in Finland – the car boasts a powerful new engine. Above: M-Sport's Matthew Wilson has hailed the Fiesta's new chassis as a "huge step forward".

“THESE CARS ARE GOING TO BE INCREDIBLE. THEY WILL BRING PEOPLE BACK TO OUR SPORT”

TOMMI MÄKINEN

## BIGGER AND BETTER

The 2017 World Rally Championship cars are set to look more visually dramatic and produce more power thanks to the new regulations that the series will adopt for next season. With sweeping changes to both the bodywork and engine rules, the new WRC machines have been extensively tested before the first 2017 rally in Monte Carlo. Here are the major changes.

### 2017 WRC REGULATION CHANGES:

- Overall car length increased to at least 3.9 metres or more
- Minimum weight of the car reduced by 25 kilograms to 1,175kg

### ALL-NEW AERODYNAMIC PACKAGE:

- Potential front bumper overhang can be an additional 60mm
- Additional aero devices can be placed ahead of the front wheels
- Rear wheel overhang aero devices can be increased by an extra 30mm
- Bigger door sills also permitted
- Fixed rear wing can be increased in size
- Free-shaped diffuser can protrude up to 50mm from the rear bumper

### ENGINE UPGRADES:

- 1.6-litre turbo engine retained
- Diameter of the turbo restrictor increased from 33mm to 36mm
- Turbo pressure remains 2.5b maximum



Fans could get close to the new Toyota Yaris WRC – also pictured on previous page testing in Finland – at the 2016 Paris Motor Show.

“These cars are going to be incredible,” says Tommi Mäkinen. And he should know. Before Mäkinen signed up as Toyota Gazoo Racing team principal, he won four FIA World Rally Championship drivers’ titles. Oh, and he’s done a whole heap of testing in the all-new Yaris WRC – the car that marks the Japanese car giant’s first return to the series since 1999.

“The car is fantastic to drive,” he adds, “with so much power and so many changes in the aerodynamics. These cars will really bring back the people to our sport.”

Visually, it’s impossible to ignore the step with the 2017 cars. They’re wider, longer, come with a deep front and rear splitter and a bigger, even bolder wing that sits higher above the roofline and looks down on wider arches than in recent years.

In short, the 2017 World Rally Car is simply gorgeous.

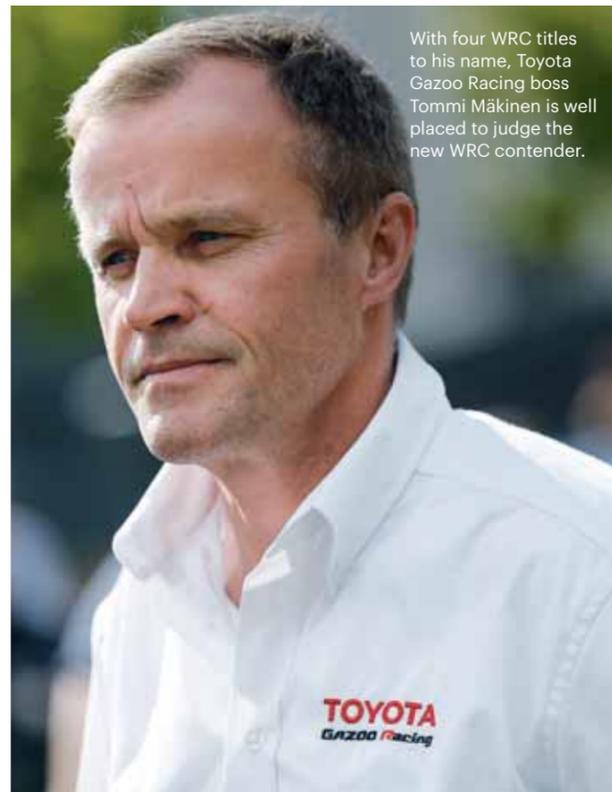
“It’s not hard to see where the comparison comes with Group B cars,” smiles M-Sport boss Malcolm Wilson. “I’ve driven both, and I can tell you, these current cars are on another level again. They’re sensational.”

Even the withdrawal of Volkswagen from the sport (for entirely unrelated reasons) has not dented spirits. World champion and now former VW driver Sébastien Ogier is just as excited as everyone else.

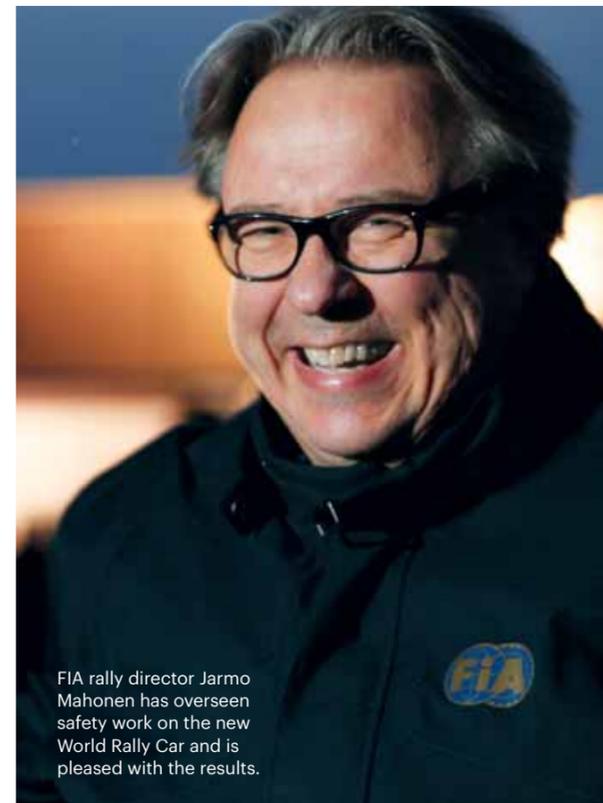
“They’re going to be special cars to drive,” he says. “It’s an exciting future in 2017 with these cars. The speed is fantastic, not so much from the torque from the engine, but the power and the way the aero is working. I’m really looking forward to next season and I think it will also be nice for the fans as well.”

“The cars look so aggressive, you can see this even from the pictures and the videos on social media. We have all been watching them and we are all looking forward to seeing them on the stage.”

As well as the visuals, one of the key changes comes in the suspension and transmission set-up.



With four WRC titles to his name, Toyota Gazoo Racing boss Tommi Mäkinen is well placed to judge the new WRC contender.



FIA rally director Jarmo Mahonen has overseen safety work on the new World Rally Car and is pleased with the results.

## “WE KNOW THE CARS WILL BE QUICKER, BUT WE’RE ALSO WORKING TO MAKE THE SPORT SAFER”

JARMO MAHONEN

In addition to the energy-absorbing foam, sills have been strengthened and the crew even better catered for aboard.

Wilson says: “Sill protection is another big aspect, because those are the accidents that we as the manufacturers, and the drivers and co-drivers, fear: the side impact into a post or a tree.

“We actually introduced a sill beam in our cars in 2006, but that has now become compulsory. Over the years we’ve extended and extended it because we’ve been involved in accidents where you’ve had an impact in front of the seat, and, of course, you need as much sill protection there. That’s now a regulation for next year.

“There’s been a big step in roll cage design, to the point now where it is the main structure of the car that picks up on all the suspension points. This means, in an accident, you’re transferring the load throughout the entire bodyshell. But that’s just part of it: the seat is now like a safety shell, designed so it moves into the car [in a crash].

“Additionally in the seat area, we will reduce the gap between the crash helmet in relation to the proximity to the high-strength area of the seat. So what we will end up with next year is a 50mm gap either side of the crash helmet. This, coupled with the HANS device, will mean there is less head movement than previously possible and obviously less chance of any injury.”

### SAFETY FURTHER

FIA rally director Jarmo Mahonen has overseen all this safety work and he’s delighted with the progress made ahead of what’s going to be the start of a new chapter in the World Rally Championship.

“We know the cars are going to be quicker,” says Mahonen, “and we know the corner speeds will be higher – it’s these things that are going to make the WRC even more exciting than ever. But at the same time we are working to make the sport safer than it’s ever been.”

Looking back to Group B has a tendency to have folk reaching for their rose-tinted spectacles. Rallying’s most dramatic four years were not all about power and glory. There was a lot of tragedy associated with cars that were shockingly quick and staggeringly dangerous.

Lessons have been learned. And not just in the cars.

“You know how much work we’ve put into the car,” says Mahonen, “but what we’re doing now is working with the organisers and rallies themselves. We’re looking at the itineraries the events are putting together, then we have Michèle Mouton as our safety delegate and she’s looking at the roads from a driver’s view. If she’s not happy with what she finds – if she feels the fans are going to be in the wrong place – we change them. Our aim is to make this sport as safe as it can be.”

Globally fans are counting the minutes until Rallye Monte-Carlo in January. Fervour’s nothing new at the start of a new season, but this kind of borderline fanaticism is saved for the dawn of a new era.

Like now.

The road is ready. The heroes of this new world order will break cover any time soon. After which they’ll be appearing on stages – and bedroom walls – soon after.

Apart from in Jämsä. Jukka’s got that one covered. ■

Matthew Wilson has tested M-Sport’s all-new Ford Fiesta RS WRC extensively and he says the new chassis is a huge step forward.

“Last year we put the new engine into one of this year’s chassis,” says Matthew. “Being brutally honest, the current car coped with it, but it felt horrible. The new chassis with the suspension and the active centre differential have transformed it. Everything just feels right, the power and the car work beautifully together. The centre diff is something we last had in 2010 and it gives you a real chance to tune the car to the road – again, this will make the cars even quicker.”

### SAFETY IN NUMBERS

As well as more power, the FIA and the Global Institute for Motor Sport Safety have worked tirelessly to improve safety aboard the all-new World Rally Cars. The teams have already completed unprecedented side-impact crash testing and have put the data gathered to the best use possible.

The added girth in next year’s cars isn’t there just to make them look meaner, it’s there to add strength.

That added width is packed with safety features.

M-Sport’s Malcolm Wilson explains: “The current situation is that we have the crash protection already; the energy-absorbing foam on the inside of the door panel and around the area close to where the seats are, and a carbon fibre door panel, which has got some honeycomb aluminium to give some strength. The new regulations for 2017 stipulate the foam must be increased from 200mm to 240mm in depth, which provides a 20 per cent increase in energy management and side-impact protection.”

Side-impact protection has been at the forefront of every driver, co-driver and car designer’s mind since Michael Park’s death while co-driving Markko Märtin in a Peugeot 307 WRC in 2005.

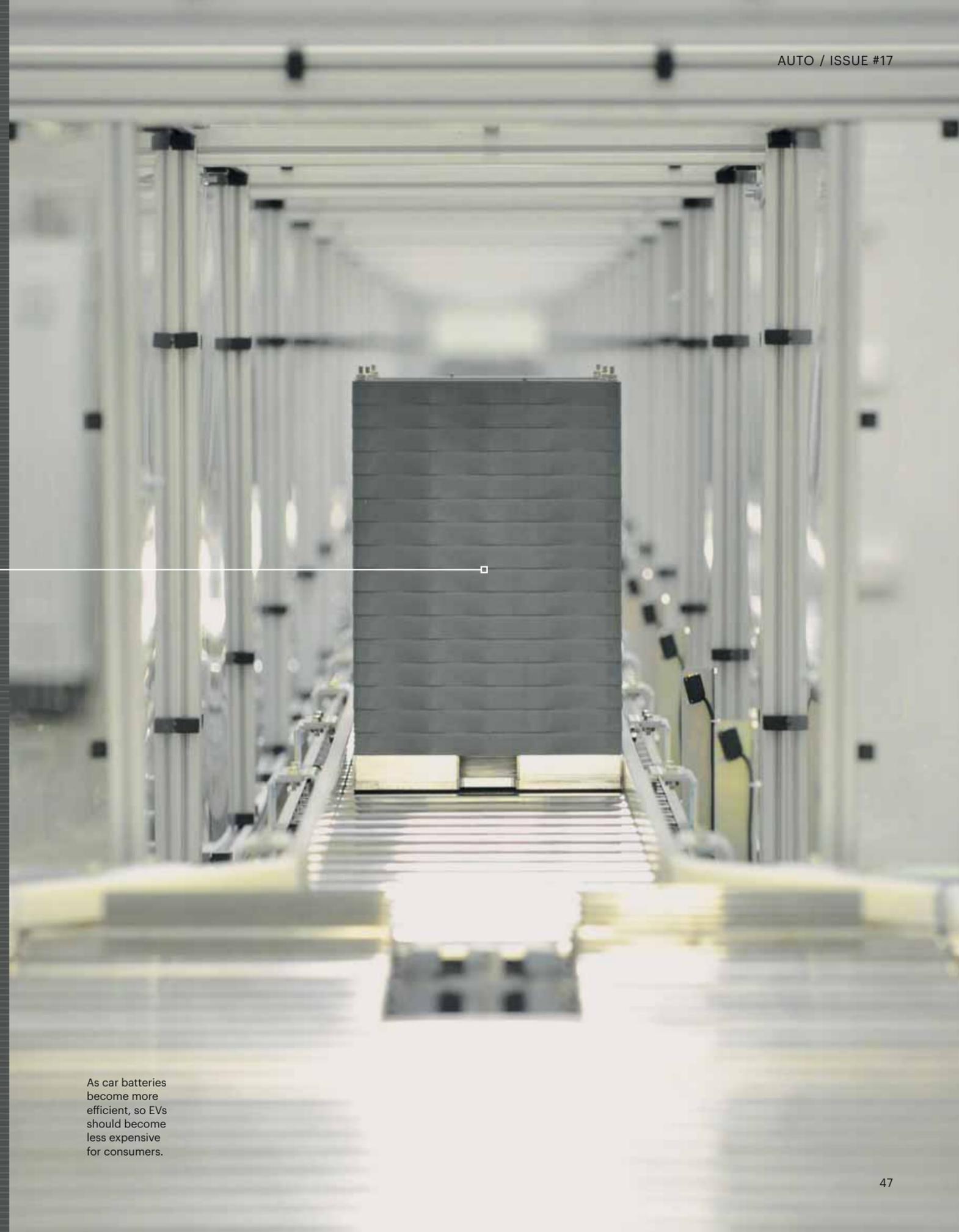
**AUTO  
FOCUS**

Electric vehicles

# LEADING THE CHARGE

*Marked gains in battery technology mean that electric vehicles could soon be poised to rival sales of the internal-combustion car for the first time in more than a century*

TEXT: BEN BARRY



As car batteries become more efficient, so EVs should become less expensive for consumers.



The Nissan Leaf has led the way in EV sales, which currently still make up a fraction of the market in Western Europe.

In the late 19th and early 20th century, electric vehicles (EVs) rivalled steam- and internal-combustion-powered cars for outright sales. In fact, in the very early 1900s, more EVs were sold in the US than any other vehicle. They were quiet, did not require drivers to toil with a hand-crank, clutch or gearstick, and limited driving ranges mattered little because they were typically used for short journeys in urban areas.

But with the advent of widespread oil exploration, the introduction of the electric starter motor and Henry Ford's mass-production techniques, internal-combustion cars became cheaper to buy and run, more practical too.

As a result, electric mobility spent much of the 20th century consigned to history, or the golf course. But during the last seven years electric cars have enjoyed a renaissance, as improved technology, the need to reduce vehicle emissions and government incentives combine.

The Nissan Leaf, Tesla Model S and Renault Zoe have all appeared during this period. Mercedes and Volkswagen were among the manufacturers that announced all-new commitments to the segment at last September's Paris Motor Show.

And yet the success of electric vehicles remains modest. The Nissan Leaf, the world's best-selling EV, might have notched up more than 230,000 sales since 2010, but Automotive Industry Data Limited reports that Battery Electric Vehicles (BEVs) account for just 0.6 per cent of all new vehicle sales in Western Europe. The figure could be about to dip below 0.5 per cent after July saw a third consecutive fall in monthly sales.

Batteries remain the nub of the issue. They are responsible for range anxiety, the fear that an EV will run out of power before the driver can find a re-charging station. Batteries also account for around one-third of the cost of building an EV, and therefore contribute heavily to the high prices passed on to EV customers. The Volkswagen E-Up!, for instance, retails at €26,900 in Germany, where conventional Up! models stretch from €9,850 to €14,025. Even with healthy government subsidies, EVs command very significant premiums.

These issues are gradually being addressed, however.



Paul McNamara of Williams Advanced Engineering says size and weight are key to improving car battery performance.

Bloomberg reported that battery prices fell by 35 per cent in 2015. Tesla is building a Gigafactory and plans to produce more lithium-ion batteries annually by 2020 than were produced worldwide in 2013, boosting economies of scale and reducing costs. Renault's business model incorporates re-using EV batteries to store electricity after their usable life powering cars has expired, therefore increasing the batteries' residual value and reducing lease costs.

Meanwhile, work is rapidly progressing to improve BEV range, in some cases with motor sport as the test bed. Renault sells a full range of EVs, and competes in both Formula E and at the e-Rallye Monte Carlo. Williams Advanced Engineering has provided batteries to all Formula E teams over the last three seasons. AUTO spoke to experts from both companies.

**WEIGHT WATCHING**

"We have developed the Aston Martin Rapide E luxury saloon and Nissan BladeGlider premium electric sports car concepts, and we're working on an advanced hybrid battery for a premium car maker," explains Williams Advanced Engineering technical director Paul McNamara.

McNamara describes the quest to improve battery range at its most basic level as a size and weight trade-off. An electric car battery typically consists of tens or hundreds of cells linked together and rated at Kilowatt hours (kWh); the higher the kWh per kilogramme, the greater the range. As range increases, so batteries generally become larger, heavier and more expensive.

"We're working on battery packs for premium road cars and they weigh 600-700kg, which is approaching a third of the weight of the car just in the battery," he says. "Our challenge over the next five to 10 years is to increase battery range up to 400 miles or so, or get the battery pack weight down by 20-30 per cent - it depends on the OEM requirements."

The battery in the Renault Zoe supermini EV accounts for around 240kg of the overall 1468kg kerb weight. ▶



Some car makers have succeeded in increasing battery range up to the 400km mark and beyond.

“THERE ARE BIG STRIDES BEING MADE ACROSS THE INDUSTRY WITH LITHIUM-ION BATTERIES”

PAUL McNAMARA

EV global sales director Guillaume Berthier says that while efficiency gains are being made with batteries, Renault is also targeting the interface between the battery and the electric motor; lessons here are being directly transferred from developments in Formula E, he claims. “It’s a Kaizen approach, with many small improvements contributing to overall gains in efficiency,” he says.

Berthier also sees a future where different battery options are increasingly offered to consumers, as Tesla does today. “We must adapt to different kinds of customers,” he says. “Some will want the highest possible range, even if the price is high, but others will prefer a low price with a smaller range because their daily needs are less. At Renault we focus more on providing cars that everyone can buy.”

Lithium-ion technology looks likely to remain the default choice for the long-term, after superseding nickel-metal hydride as the chemistry of choice for EV batteries.

“Other battery technologies may well appear as disruptive technologies, but they’d have to show substantial benefits as lithium-ion will start to develop an industrial base,” says McNamara. “There are big strides being made across the industry with lithium-ion and we can probably expect Kilowatts per kilogram growth at a base chemistry level of five to six per cent annually. That won’t continue forever, but at the moment the gains remain quite large.”

As much as improved energy density boosts driving range, battery weight plays a role too: the less a car weighs, the less energy it consumes. The corollaries of improved acceleration and agility add further appeal.

“Sixty per cent of a battery pack consists of cells, but 40

per cent is the safety cage for fire and crash protection, the cooling system, the control system and the electrical connectors, which are quite big to handle currents of as much as 5-600 amps,” says McNamara. “You’ve got to have buzz bars with a substantial cross-section of copper to handle that. We’re getting cleverer by learning from the requirements of the duty cycle in motor sport applications; that’s why motor sport is such a great benefit to us.”

“It is important to be efficient and save weight,” adds Berthier. “The more efficient the battery, the fewer cells you have, and therefore the cost and weight is lower. At the moment we are trying to improve range without adding too much weight.”

Electrical and heating and ventilation systems also adversely affect EV range: heating alone can reduce range by up to 20 per cent. The battery is part of the solution, thinks McNamara. “As soon as you start using a battery, it starts warming up. There are strategies for storing heat like this: glorified vacuum flasks, for instance. In an electric car you’ve got almost half of your fuel energy available as thermal energy, and we can use that to heat the car.”

Porsche, meanwhile, is even targeting infotainment systems. The German manufacturer revealed the Mission E electric sports car concept in 2015, which is likely to be specified with premium audio systems. Of the maker’s current vehicles, 80 per cent of customers upgrade to a powerful Bose system, 10-15 per cent to range-topping Burmester audio.

“The next big task is for e-mobility,” says acoustic engineer Matthias Renz. “A 1500W audio system uses energy and reduces driving range. Our latest tweeters have lighter foil and a stronger magnet for more performance and energy efficiency. Every one of the 21 speakers in the Panamera’s Burmester system has its own amplifier. Five are Class-D with 95 per cent efficiency, but the rest are Class A/B amplifiers at 70 per cent. We will increasingly switch to Class D.”

Tangible gains are already filtering through to production EVs. When the Renault Zoe was launched in

There are some 60,000 EV charging points in Europe, but availability is still an issue.



Porsche’s Mission E concept features a more efficient infotainment system that won’t drain battery power.

2012, its 22kWh battery offered a driving range of 208km on the NEDC cycle. That recently increased to 238km with a more efficient electric motor and control strategy. Then, at the 2016 Paris Motor Show, Renault announced a new 41kWh battery to boost the Zoe to 400km, almost doubling the range in just over four years.

Developed in partnership with LG Chem, the new battery has thicker cells optimised for extra energy density, but remains the same size and weighs only 22kg more.

Tesla Motors, the first to use lithium-ion battery cells, recently unveiled a new 100kWh battery pack for the Model S and Model X. The chemistry of the cylindrical cells – most makers uses pouch cells – remains unchanged, but the battery stores more energy in the same space. As a result, range increases from around 460km to well over 480.

Makers hope that increased battery range, together with an ever-expanding charging network – there are more than 60,000 public charging points in Europe – and reduced charge times could entice more buyers into EV ownership. If that happens, so economies of scale will accelerate, reducing the cost of batteries and, therefore, the costs of the cars.

It’s already happening. “We have entered the virtuous circle of battery production,” says Berthier. “There is more and more demand, so more investment and research, and more production, which helps prices to fall.” Bloomberg New Energy Finance reported battery prices falling by 35 per cent in 2015, as worldwide EVs sales increased by 60 per cent. Taking all data into account, Bloomberg predicted that EVs would achieve price-parity with petrol and diesel cars at some point between 2022 and 2028.

Should that analysis prove correct, EVs will be in a strong position to regain the sales crown from internal-combustion vehicles for the first time in a century. ■

POWER MAKERS

The FIA Formula E Championship has demonstrated that electric racing has a place at the top table of motor sport. But it has one recognised flaw – the batteries that power the cars cannot last until the end of the race.

Currently, drivers have to change cars halfway through each race to make it to the end. But all that is about to change, thanks to ground-breaking hardware supplied by McLaren Applied Technology, the research division of the Formula One team.

McLaren has won the tender to supply batteries for the series’ fifth season onwards, where the aim has always been for the batteries to last the full race distance. To help with this it has partnered with Japanese company Murata, the world’s biggest supplier of energy-storing ceramic capacitors.

Murata recently bought Sony’s battery technology division and is aiming to be a major player in the burgeoning electric car industry.

To meet FIA requirements, the battery has to have at least 54 kWh of available energy (almost twice as much as the current 28kWh battery used by the series) and should be capable of providing 220kW of power (50kW more than currently available).

But McLaren has just two years to prove its worth. The FIA has confirmed that due to “the ongoing rapid development of battery technology”, Formula E will only use McLaren’s battery for two seasons before the tender goes out again.



AUTO  
FOCUS

European drag racing

# THE DRAG EFFECT

*This year's FIA European Drag Racing Champion Anita Mäkelä was crowned in front of a record crowd at the UK's Santa Pod Raceway - a sign of this unique and adrenaline-filled sport's growing popularity*

TEXT AND PHOTOS: REMCO SCHEELINGS

Anita Mäkelä took her Top Fuel Racing dragster to European title glory at Santa Pod Raceway, the sport's spiritual home.





Liam Jones's crew celebrates his top qualifying run in front of a home crowd at Santa Pod.



Top Methanol honours went to Swede Jonny Lagg. Top right: Finn Mäkelä stayed focused on the racing to avoid title pressure.



Michael Gullqvist defended his Pro Modified title at the Santa Pod Finals.



The mighty 8.2-litre Top Fuel engines produce 10,000bhp and reach top speeds in excess of 310mph. Below: Jimmy Ålund won his 10th Pro Stock title in 2016.



Drag racing has been run at Santa Pod – a former WWII airbase – since 1966. Today, the site boasts a modern dragstrip.



“DRAG RACING HAS ALL THE EXCITEMENT AND INTENSITY OF THE OLYMPIC 100-METRE FINAL”

CHRIS HOBSON

In a race that lasts less than four seconds, a perfect start is absolutely crucial. In a heartbeat, a 10,000bhp beast charges up to 300mph, tyres smoking, engine roaring, fans shouting on their drivers, who have just seconds to secure the win. This is the explosive world of FIA European Drag Racing.

The championship is divided into five categories: Pro Stock and Pro Modified; Top Methanol Funny Car and Top Methanol Dragster; and the premier class of drag racing: Top Fuel. These dragsters accelerate from zero to 100mph in 0.8 seconds, cover 1,000 feet in 3.9 seconds and reach top speeds in excess of 310mph (502 km/h). The secret of getting 10,000bhp from a 500ci (8.2-litre) engine in the top class is the nitromethane fuel and supercharger that the teams deploy.

“The absolute power, the feeling of the earth trembling beneath them as they do a burnout, the ability to stand within feet of them when they fire up in the pits, nothing beats it,” says drag racing aficionado Chris Hobson. “The amount of work put in by the crew members, sometimes in just an hour between runs, is beyond belief. And you can watch every single minute of these mechanics working their magic. Drag racing has all the excitement, build-up and intensity of the Olympic 100-metre final.”

The 2016 European season kicked off in May at Santa Pod Raceway in Britain and led the teams to Tierp (Sweden) twice, Alastaro (Finland) and Hockenheim (Germany) before concluding back at Santa Pod. In the season-ending Finals event Anita Mäkelä was crowned the FIA European Top Fuel Champion and Duncan Micallef stormed to a stunning 3.89-second event victory at 312mph over the 1,000ft course.

The European Finals played out its climax in front of a record crowd at Santa Pod, but each venue in the series has its own character, from the state-of-the-art Tierp Arena to the special atmosphere of the Hockenheim Motodrome. To many drag racing fans, however, nothing can beat the rather unique Santa Pod atmosphere. Hobson, who has visited many of the venues on the current calendar, confirms this. “I’ve seen the best of everything, from the amazing night show and atmosphere at Hockenheim, to the excellent racing at Tierp Arena, but I can still say Santa Pod is the spiritual home of European drag racing,” he says.

Almost all the teams in the FIA European championship are so-called ‘professional amateurs’. The sheer number of hours it takes to run the operations and the money involved demand professional standards, but, except for one or two teams, there is currently not enough sponsorship money involved to make it a full-time job for many of the competitors.

Since 2009, Speedgroup, a shareholders company registered in Sweden, has been administrator of the FIA European Drag Racing Championship, but so far the FIA has acted as its commercial rights-holder. ▶



Teams are run to a professional standard in the European series by dedicated amateurs.



Fans can watch up close as the Top Fuel dragsters are serviced by pit crews.

After success in British drag racing, Michael Tooren will compete in Europe in 2017. Below: the Thomas family from the UK appreciate the sport's accessibility.



As with many other forms of motor sport, drag racing has a wide range of classes, from Junior Dragster (the category's karting equivalent) up to the highest level, the FIA European championship and its five classes. From the Junior Dragster ranks, especially over the last five years, new drivers have begun to work their way up to the top category. But the money needed to reach that level, and stay there, can be a problem for some.

**ONE BIG FAMILY**

Michel Tooren from the Netherlands is one of the new drivers to commit to the 2017 FIA championship. After a successful first season in Pro Modified, Tooren will step up to the European series in that class next season. "In my first year as a driver we decided to do the MSA British Drag Racing Championship and the results were beyond expectations," he explains. "The European championship is the highest level in European Pro Modified racing, with the best European teams, large crowds and races at different tracks in four countries. We want to race with the best in Europe."

Although the 2017 calendar was not finalised as AUTO went to press, no major changes are expected in the dates and number of races, which means Santa Pod should host the season opener and finale once again. The venue's history goes back to 1966, when permission was obtained to use Podington airfield (a wartime airbase used by the USAAF during the Second World War) as a drag racing complex. Today, the site is a modern dragstrip equipped with all the necessary facilities to host the sport's top category, but the fans reckon it has retained its character. The track therefore attracts drag racing supporters from all over Europe, and most of

them stay at the extensive on-site camping areas for at least the four days of the event, meaning they don't have to miss a single minute of the action.

Rebecca and Gareth Thomas, drag racing fans from Oxford, have been attending races at Santa Pod for 10 years and, as well as enjoying the atmosphere, they appreciate the family feel of the events. "We also go to the Isle of Man TT and MotoGP, but drag racing is so different," says Rebecca. "You have full access to the pits, can talk to drivers and mechanics and ask them whatever you want to know. It's one big family. All the classes are different and have something we like. It's hard to explain why we love drag racing: it's the noise, the power, the speed, the smell of nitro."

This family affair is extended to overseas fans too. Jan and Jaap Selles, from the Netherlands, travelled to Santa Pod accompanied by their wives and children to watch the European Finals and they all describe themselves as drag racing addicts. "It started when my brother Jan took me to a sprint in our home town," says Jaap. "We thought we had the fastest car, until we came to a real drag race. Since then we have been to so many races, as competitors, to help other racers, as spectators, but also to help the track crew. What makes drag racing so special is the atmosphere. Everybody knows and helps each other. It takes me at least an hour to go to the toilet, as I always meet so many people to talk to on the way!"

The unique drag racing experience has certainly left an impression on a newer member of the family. Jaap's daughter, Lisa, brought her boyfriend to the European Finals for his first drag race, which left a lasting impression: "It's unbelievable, mind-blowing," he said. "I have never seen or heard anything like this before. It feels like an earthquake when two Top Fuellers leave the line. But it's so much more than that. I thought that only speed was important, but now I also understand how crucial reaction times are."

**GROWING INTEREST**

The fans at Santa Pod were treated to a dramatic climax to the 2016 Top Fuel championship. With a 13-point advantage over runner-up Stig Neergaard from Denmark, Anita Mäkelä clinched the title in the semi-finals when her opponent ran into problems. The Finnish driver, who has been competing in drag racing since 1987, missed out on the number one spot last year by just a few points. She was so engrossed in the competition at Santa Pod it took a while before the championship win had sunk in. "I didn't even realise," she said afterwards. "On a race day, I'm fully focused on the run. I don't think in points. When my crew came to pick me up, they made me realise we'd won the championship. That made my day."

Mäkelä runs her team with husband, Tommi. "We simply love this sport," she says. "This is our life. Drag racing is teamwork at its best. We have 10 mechanics at the races and I'm as good as my team is. It's like a band: if the band plays poorly, even the best singer can't help. The friendly atmosphere in the pits between the teams and the fans, that nice social life, keeps us in the sport too. Drag racing is getting faster and faster, and it will become more and more professional. It needs more skills to build up and keep running these high-powered machines."

As well as becoming more professional, many people involved in the sport hope European drag racing will increase in popularity over the coming years. At the latest World Motorsport Council, the FIA made a call for 'expressions of interest' for a promoter for the FIA European Drag Racing Championship from 2018 onwards. European drag racing is growing fast. ■



The Selles family from the Netherlands travel together to drag racing events across Europe.

"DRAG RACING IS GETTING FASTER AND FASTER, AND IT WILL BECOME MORE PROFESSIONAL"

ANITA MÄKELÄ

AUTO  
FOCUS

# 20

UNDER

# 20

*AUTO brought together six expert journalists from across the world of motor sport to choose 20 young drivers who are destined for greatness*

TEXT: MARC CUTLER

Motor sport is awash with young talented drivers. There are teenage champions at virtually every level of racing and the talent pool seems to grow each year.

But there are some drivers who just always appear to be a step ahead. Who have demonstrated the consistency, speed and raw talent to take them to the very top.

So who are the next Schumachers, Loeb and Kristensens of the young generation? To find out, AUTO brought together some of the leading journalists in single-seaters, sports cars and rallying from across the world to choose their ultimate list of 20 drivers aged 20 or under (as of December 1, 2016).

The results show that motor sport's future is in safe (and fast) hands...

## JUDGING PANEL

### DAVID EVANS

A love of rallying and newspapers led him to join weekly motor sport newspaper Motorsport News 20 years ago. Evans never left and now works as rallies editor on both that and Autosport magazine.

### JEREMY SHAW

An internationally-acclaimed motor racing writer and broadcaster for more than 40 years, British-born and US-based Shaw also runs the Team USA Scholarship, which has provided opportunities for young American drivers since 1990.

### GARY WATKINS

Watkins has devoted his working life to covering sportscar racing. This season is his 25th as a motor sport journalist, during which time he has reported on major long-distance events on four continents and is approaching 60 24-hour races.

### DIEGO MEJIA

A journalist and TV commentator for Canal F1 Latin America, Mejia has attended over 150 F1 GPs, 100 NASCAR races, 50 IndyCar events plus series in South, Central and North America.

### ROBERTO CHINCHERO

A top Formula 1 journalist and co-commentator for F1 on Sky Italia, he is also an expert on grass roots motor sport thanks to his long career as a journalist at Autosprint.

### MARCUS SIMMONS

Deputy editor of Autosport magazine, he has a passion for all forms of motor racing and particularly junior single-seaters.

### NEIL VERHAGEN, US



2016 CHAMPIONSHIP:  
US F1600 SERIES

CAREER HIGHLIGHT: Winning the 2016 US F1600 championship

FUTURE POTENTIAL: By claiming the US F1600 Championship Series title at the age of just 15, Verhagen has demonstrated his talent. A career climbing the single-seater ladder in the US or Europe in the coming years is expected.

### YE YIFEI, CHINA



2016 CHAMPIONSHIP:  
FORMULA 4 FRANCE

CAREER HIGHLIGHT: Winning the 2016 French Formula 4 title

FUTURE POTENTIAL: Yifei's dominance of the 2016 French Formula 4 championship suggests that he can make the step up to Formula 3 or an equivalent level and flourish in the future.

### KALLE ROVANPERÄ, FINLAND



2016 CHAMPIONSHIP:  
LATVIAN RALLY CHAMPIONSHIP

CAREER HIGHLIGHT: Victory in the Latvian Rally Championship in 2016

FUTURE POTENTIAL: The son of 2001 Rally Sweden winner and former WRC driver Harri Rovanperä is proving his skills despite his young age. He has already tested WRC machinery and seems destined to make it to the top level.

### LANDO NORRIS, UK



2016 CHAMPIONSHIP:  
FORMULA RENAULT 2.0

CAREER HIGHLIGHT: Winning three championships in 2016 – Toyota Racing Series (NZ), Formula Renault Eurocup and the Formula Renault Northern European Cup

FUTURE POTENTIAL: Likely to be on the grid for the FIA European F3 Championship in 2017 and is on track to be a future F1 driver.

**MICK SCHUMACHER, GERMANY**



AGE  
17

2016 CHAMPIONSHIP:  
GERMAN AND ITALIAN FORMULA 4

CAREER HIGHLIGHT: Six German F4 wins across 2015 and 2016

FUTURE POTENTIAL: The son of seven-times Formula 1 world champion Michael Schumacher finished second in both German and Italian Formula 4 in 2016. With his speed and heritage, it would be a surprise if he didn't make it to F1 in the future.

**SACHA FENESTRAZ, FRANCE**



AGE  
17

2016 CHAMPIONSHIP:  
FORMULA RENAULT 2.0

CAREER HIGHLIGHT: Two race wins in 2016 in Formula Renault 2.0 Eurocup

FUTURE POTENTIAL: Fenestraz finished second in the 2015 French Formula 4 championship and he stepped up to score race wins in his first season of Formula Renault 2.0 in both the Eurocup and the NEC. If he can continue to be successful, he should rise up the junior single-seater ranks.

**CALLUM ILOTT, UK**



AGE  
18

2016 CHAMPIONSHIP:  
FIA EUROPEAN FORMULA 3

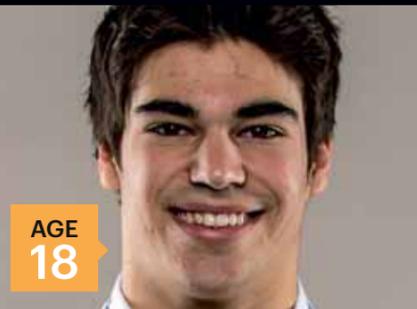
CAREER HIGHLIGHT: 2014 CIK-FIA Euro KF champion

FUTURE POTENTIAL: Iloft was a member of the Red Bull junior team in 2015 and he jumped straight from karting to European Formula 3 that season. Has signed for Prem Powerteam for the 2017 F3 season, which will offer a huge opportunity to go for the title.



Lance Stroll won the Euro F3 title and is now heading to F1 with the Williams team.

**LANCE STROLL, CANADA**



AGE  
18

2016 CHAMPIONSHIP:  
FIA FORMULA 3

CAREER HIGHLIGHT: Winning 14 races en route to the 2016 Euro F3 title

FUTURE POTENTIAL: Stroll was recently announced as a Williams Formula 1 driver for 2017 and his onward progress will depend on his ability to adapt at the top of the sport. His success in the junior categories suggests he will shine if given the chance.

**MAX DEFOURNY, BELGIUM**



AGE  
18

2016 CHAMPIONSHIP:  
FORMULA RENAULT 2.0

CAREER HIGHLIGHT: Race victory in 2016 Formula Renault 2.0 Eurocup

FUTURE POTENTIAL: Defourny made a step up from his 2015 achievements in Formula Renault 2.0 to finish third in the Eurocup and second in the NEC series, and has the potential to win a junior single-seater title in the future.

**DORIAN BOCCOLACCI, FRANCE**



AGE  
18

2016 CHAMPIONSHIP:  
FORMULA RENAULT 2.0

CAREER HIGHLIGHT: Second in the 2016 Formula Renault 2.0 Eurocup standings

FUTURE POTENTIAL: Boccocacci demonstrated his speed and consistency by finishing second and third in the Formula Renault 2.0 Eurocup and NEC championships in 2016, and his membership of the former Lotus F1 squad's junior team suggests he has the potential to go far.

**JOEL ERIKSSON, SWEDEN**



AGE  
18

2016 CHAMPIONSHIP:  
FIA EUROPEAN FORMULA 3

CAREER HIGHLIGHT: Winning the 2016 Formula 3 Masters at Zandvoort

FUTURE POTENTIAL: After winning his first Euro F3 race in 2016, the Swedish driver showed his speed and finished fifth in the standings. He should be in the fight for the European F3 or equivalent series title in 2017.

**DRIES VANTHOOR, BELGIUM**



AGE  
18

2016 CHAMPIONSHIP:  
BLANCPAIN ENDURANCE

CAREER HIGHLIGHT: Two podium finishes in his rookie Blancpain Endurance season

FUTURE POTENTIAL: After making an early switch to sportscars from single-seaters, Vanthoor is already making waves in the category. Blancpain success and a possible future World Endurance Championship career look likely for the Belgian driver.

**GEORGE RUSSELL, UK**



AGE  
18

2016 CHAMPIONSHIP:  
FIA FORMULA 3

CAREER HIGHLIGHT: 2014 BRDC British Formula 4 champion

FUTURE POTENTIAL: After two seasons in the FIA European Formula 3 Championship – where he has won races in both years – Russell's potential is clear. A successful single-seater career beckons.

**CHARLES LECLERC, MONACO**



AGE  
19

2016 CHAMPIONSHIP:  
GP3 SERIES

CAREER HIGHLIGHT: **Winning the GP3 championship this year and his Formula 1 practice debut with Haas**

FUTURE POTENTIAL: **Likely to step up to GP2 and strengthen his links with the Ferrari and Haas F1 teams.**

**MAX VERSTAPPEN, NETHERLANDS**



AGE  
19

2016 CHAMPIONSHIP:  
FORMULA 1 WORLD CHAMPIONSHIP

CAREER HIGHLIGHT: **Winning the 2016 Spanish Grand Prix for Red Bull Racing in his first-ever race for the team just over a year after making his F1 debut.**

FUTURE POTENTIAL: **Verstappen is repeatedly referred to as a "world champion in waiting" and is expected to fight for the title as soon as Red Bull can give him a car to match his talent.**

**MAXIMILIAN GUENTHER, GERMANY**



AGE  
19

2016 CHAMPIONSHIP:  
FIA EUROPEAN FORMULA 3

CAREER HIGHLIGHT: **Second place in a series dominated by his team-mate Lance Stroll is a major accomplishment and Guenther will be hoping to go one step further and claim the title in European F3 or an equivalent series next year.**

FUTURE POTENTIAL: **Finishing second in a series dominated by his team-mate Lance Stroll is a major accomplishment and Guenther will be hoping to go one step further and claim the title in European F3 or an equivalent series next year.**

**TADASUKE MAKINO, JAPAN**



AGE  
19

2016 CHAMPIONSHIP:  
JAPANESE FORMULA 3

CAREER HIGHLIGHT: **Debut podium finish in Super GT**

FUTURE POTENTIAL: **With success in Japanese Formula 4 and Formula 3, Makino has the speed to be successful in single-seaters, but his sensational podium finish in his debut Super GT race could also lead to a high-profile sportscar career.**

**LOUIS DELETRAZ, SWITZERLAND**



AGE  
19

2016 CHAMPIONSHIP:  
FORMULA V8 3.5

CAREER HIGHLIGHT: **2015 Formula Renault 2.0 NEC runner-up**

FUTURE POTENTIAL: **Deletraz was runner-up in the 2016 Formula V8 3.5 championship and is likely to continue his single-seater career in 2017 as a member of the Renault's young driver programme.**



Max Verstappen was the youngest driver ever to start an F1 race when he made his debut at the age of 17.

**MARCOS SIEBERT, ARGENTINA**



AGE  
20

2016 CHAMPIONSHIP:  
FORMULA 4 ITALY

CAREER HIGHLIGHT: **2016 Formula 4 Italy champion**

FUTURE POTENTIAL: **Siebert beat the highly-rated Mick Schumacher to the Italian Formula 4 title, which shows his speed and suggests that he could go on to enjoy a successful career in motor sport.**

**ESTEBAN OCON, FRANCE**



AGE  
20

2016 CHAMPIONSHIP:  
DTM AND FORMULA 1

CAREER HIGHLIGHT: **Formula 1 debut with Manor in 2016**

FUTURE POTENTIAL: **As a Mercedes junior driver and a former European F3 and GP3 title winner, Ocon has the potential to be very successful in F1. He has strong ties to Mercedes and has signed to the Force India F1 team for the 2017 season.**

AUTO FOCUS

**AUTO  
FOCUS**

Road safety in Africa

# A SAFER WALK TO SCHOOL

*The school journey is fraught with danger for children in Africa, but now the FIA Foundation is working with other groups to create effective road safety solutions*

TEXT: AVI SILVERMAN

Children in Africa are forced to risk their lives every day on hazardous trips to school. Right: Michael Obeng and his family.

To understand the destructive impact of Africa's hidden road traffic injury epidemic on its children, meet Michael Obeng.

Michael is a young boy from an ordinary family in Accra, Ghana – his father works for a trader in car spare parts, and his mother has a small business selling disposable cups, plates and cutlery.

Despite these somewhat humble beginnings, all of his teachers agree that he has a very promising future. They describe him as being bright, intelligent and confident.

However, in November 2015 Michael suffered a major setback when he was hit by a 'trotro' – a public minibus – on his way home from school. The roads around the school are busy at home time and there are no safe crossing places, so every day the pupils have to dart between traffic. The driver of the trotro was going fast and did not see Michael, who was dragged underneath the vehicle for several metres before it eventually came to a stop.

All the passengers disembarked and the trotro driver, with the assistance of one passenger, rushed Michael to hospital. One ankle, one hip and both of his knees were badly broken. He remained in hospital for two months and had two major operations.

He is now back at home, has missed school and has to visit the hospital twice a week. He cannot walk properly and cannot play with his friends. But his biggest concern is to not fall behind in school. At home, he sticks strictly to the school timetable, using his books to teach himself. Incredibly, he remains cheerful and optimistic.

Michael's parents and extended family support him as well as their means allow. The medical bills and other expenses have come to over \$2,000, which was beyond the means of his parents, even more so as their combined monthly income of around \$125 reduced when Michael's mother had to leave her job to care for him. ▶

**"THE ROADS AROUND THE SCHOOL ARE BUSY AND THERE ARE NO SAFE CROSSINGS; PUPILS HAVE TO DART BETWEEN TRAFFIC"**



Michael's aunt took out a bank loan of around \$1,300 – with an astronomical interest rate. The National Health Insurance Scheme, with which Michael is registered, has covered very little of the costs. Recognising Michael's potential, his family are doing everything they can to support his education, even to the detriment of some of his siblings.

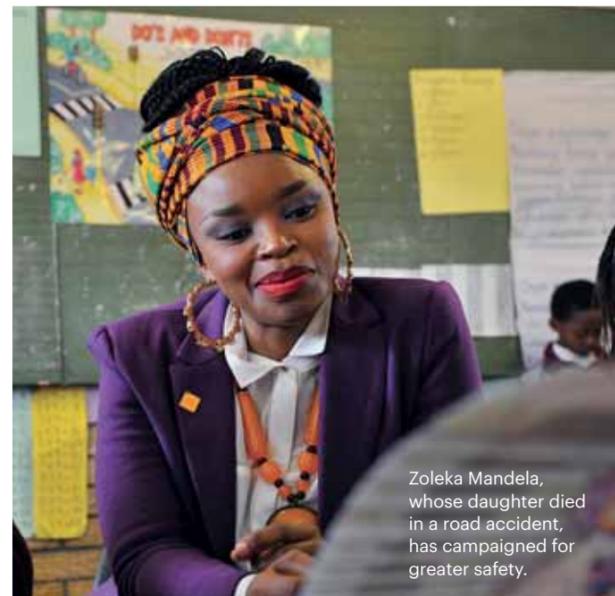
Michael's story is, unfortunately, not an isolated case. According to analysis from the Global Burden of Disease, more than 85,000 African children and youths are killed or seriously injured on the continent's roads each year – a top five cause of death for the over-fives in many African countries. Many more children have their life journey disrupted or set on a downward trajectory through loss or injury of a family breadwinner.

A new report by the FIA Foundation, the Global Initiative for Child Health and Mobility and the NGO Amend calls for urgent action to address this crisis.

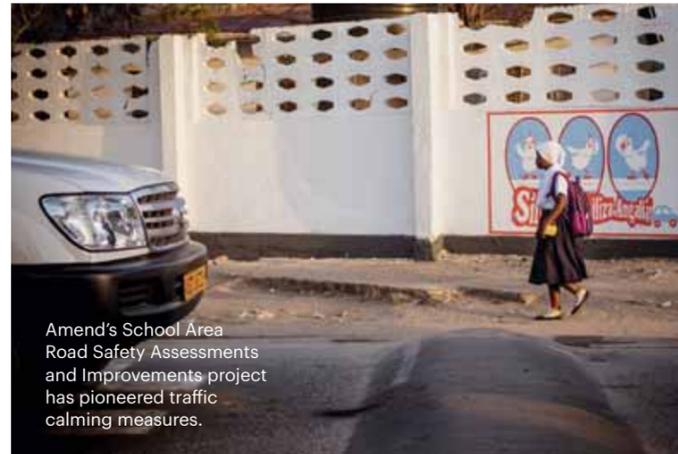
The report, entitled 'Step Change: An Action Agenda on Safe Walking for Africa's Children', shows that while three quarters of children walk to and from school, their needs are neglected, with inadequate footpaths or safe crossings and limited efforts to manage vehicle speed.

Step Change outlines the life-saving policies and interventions that are urgently required. Prioritising investment for safe walking, through providing footpaths and safe crossing points, and through reducing vehicle speed by road design and traffic calming, is a relatively low-cost but highly effective public health investment, says the report. It is an argument that has recently been boosted by inclusion of the objective of 'safe and healthy journeys to school for every child as a priority' in the UN's new global agenda for sustainable development of the world's cities.

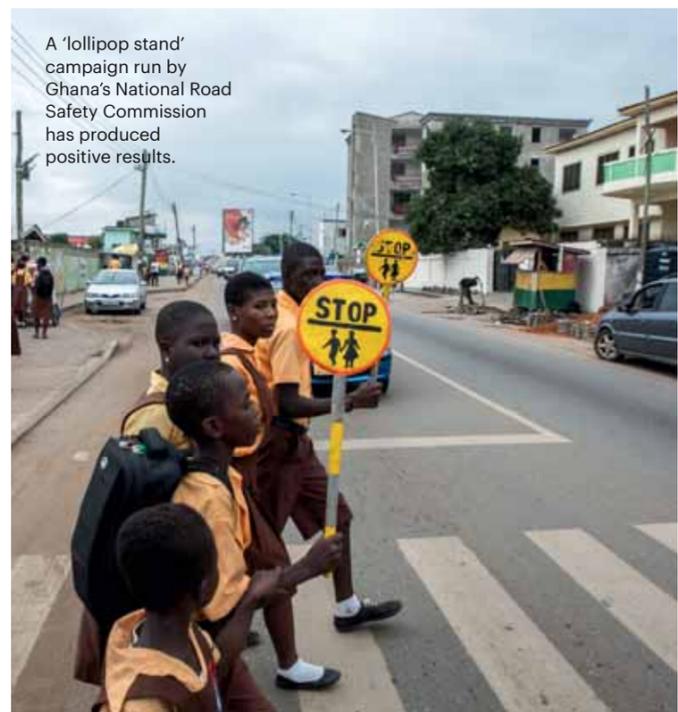
Nelson Mandela's granddaughter Zoleka Mandela lost her own daughter to a road crash in South Africa. She launched the report at a Forum on Safe & Healthy School Journeys in Accra in September. In her role as ambassador for the Global Initiative for Child Health and Mobility, she said: "This crisis on our continent has been ignored for too long. Road traffic injury is the single greatest danger our children face each and every day. It is entirely preventable. What we're asking for, really, is quite simple. We're asking for protection and safety. Safe walking for all our children



Zoleka Mandela, whose daughter died in a road accident, has campaigned for greater safety.



Amend's School Area Road Safety Assessments and Improvements project has pioneered traffic calming measures.



A 'lollipop stand' campaign run by Ghana's National Road Safety Commission has produced positive results.

surely must be a fundamental right. No excuses are acceptable. This must become a priority in policy making here in Ghana and around the world."

The solutions to the crisis on the roads of Africa are straightforward and effective. Research by the Amend NGO has shown that providing footpaths, safe crossings and speed reduction measures in the area of schools alone can reduce injuries by at least 25 per cent. Amend's interventions, with support from the FIA Foundation, have demonstrated that focusing relatively low-cost infrastructure improvements on the schools with the highest road traffic injury rates prevents one road traffic injury for every 286 at-risk children, reducing serious head injuries by half.

This approach benefits not only children but all road users on a continent where at least 50 per cent of people do not have access to a car. It is a health investment that also improves transport efficiency, urban liveability, local environmental quality and access



A lack of proper footpaths has exacerbated the road safety problem in Africa.

"SAFE WALKING FOR ALL OUR CHILDREN IS A FUNDAMENTAL RIGHT. NO EXCUSES ARE ACCEPTABLE"

ZOLEKA MANDELA

to education. It can safeguard the productive future and economic potential of millions of children.

The launch of the report in Accra coincided with Michael Obeng's first day back at school. The little boy who had been so brutalised by a horrific road traffic crash had shown determination and courage to get back to his studies at school. With road safety included in the Sustainable Development Goals and a commitment to a safe and healthy journey to school for every child in the United Nation's new urban agenda, there is international momentum for action. Now, this needs to translate into real change for children like Michael.

Africa's leaders and the international community have talked about road safety for long enough. Now is the time to walk the talk. This serious – and growing – epidemic threatens millions of lives. It is a civil rights issue for the 21st century. We need a dramatic step change in response. ■



REAR  
VIEW

Legend

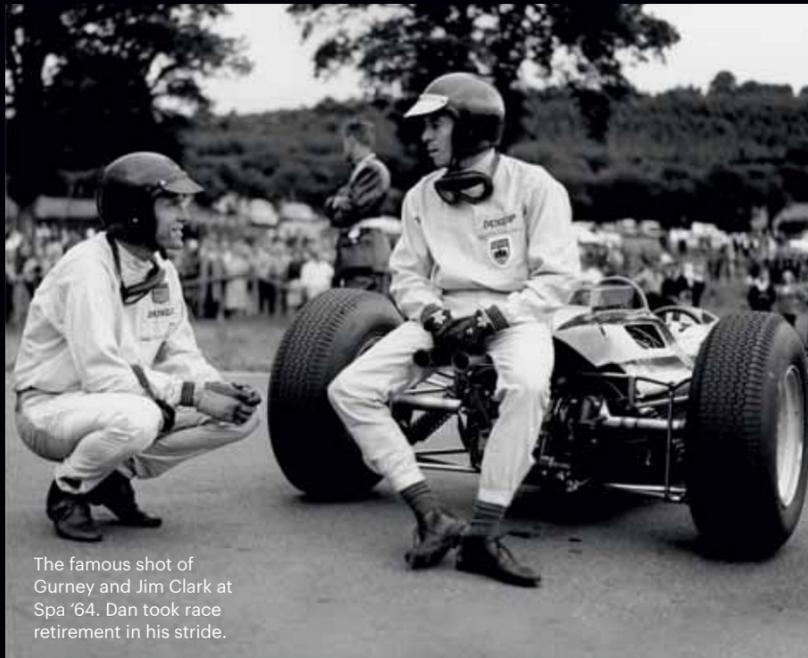
# THE UNFLAPPABLE MR GURNEY

*Throughout an impressive and diverse motor racing career, American Dan Gurney has kept his cool as a driver, team boss and pioneering engineer*

TEXT: PETER WINDSOR



Gurney won the French Grand Prix twice – the second time for British team Brabham in 1964.



The famous shot of Gurney and Jim Clark at Spa '64. Dan took race retirement in his stride.

**T**he photo lives in immortality: Dan Gurney, squatting on the track at Spa's Stavelot corner, laughs as he chats with his friend, Jim Clark, who sits astride the exhausts of his Lotus 33. It is 1964 and Gurney has just lost the Belgian Grand Prix in dramatic style – after dominating the race from pole in his works Brabham. There is not a hint of disappointment after his last-lap retirement: Dan is instead captivated by the news over the PA system that both Graham Hill and Bruce McLaren have also failed to cross the line and that the winner, after running a lowly fourth for most of the afternoon, is none other than Clark – the driver who has also just cruised to a halt at Stavelot, fuel tank dry.

Many years later I ask him about that moment. Was he really that relaxed? Was the smile genuine? Was there truly no desire to throw down his helmet or rant and rave?

He smiles (again). "It was a shock not to win, of course it was, but there were no 'Complaints Departments' in those days so my attitude was 'you might as well enjoy it!'"

It had been a rapid, if uneven, climb to Formula One. After his early days in New York and then Riverside, California, the Korean war interrupted Dan's fledgling aspirations.

"At first I applied for Air Cadet Training to be a fighter pilot," he remembers. "I passed all the tests and did well but then they discovered I was married and that was that. You weren't allowed to fly with them if you were married. So then I joined the army for two years and for about 18 months I was in Korea, working as a gun mechanic with the 78AAA (Anti-Aircraft Artillery) Gun Battalion."

Back home in Riverside, Dan "caught the virus" – his motor racing bug. A hot, self-tuned TR3 gave way to a flying Porsche Speedster. And, in the explosive hot-rod California of the 1950s, Gurney quickly befriended the likes of Phil Hill, who introduced him to Luigi Chinetti, Ferrari's US importer. Several dynamic races later, in the spring/summer of 1958, Gurney found himself in

Europe, watching the Race of Two Worlds at Monza while preparing for Le Mans and other big sports car events. He was at Reims when another tall American, Troy Ruttman, raced a Centro Sud Maserati 250F in the French GP. Troy – as talented a driver as Dan had seen – returned quickly to the States, but Dan stayed on. F1 was the goal.

And it evolved quickly. Mike Hawthorn abruptly retired in late 1958. Romolo Tavoni, Ferrari's team manager, lost little time in signing Gurney as his replacement. He placed second in the 1959 German GP at Avus and third in Portugal.

Gurney switched to BRM for 1960, hoping that the British rear-engined cars would prove to be race winners – he was two years too early, however. He then drove for Porsche. The 1961 French GP at Reims came down to a slipstreaming duel between the American and Giancarlo Baghetti, which the Italian won by millimetres.

You look at some of the on-track moves of other drivers and you wonder whether Gurney might not have jinked a bit here, or moved a bit there, in order to take the win. Not a bit of it.

"The consequences of causing an accident in those days would often result in a funeral," he says. "So we felt that if we couldn't beat him the right way we'd just let the cards fall where they may."

**GREATEST DRIVE**

The straight flush came at Rouen in 1962, when Gurney won his (and Porsche's) first Grand Prix. He followed this later in the year with perhaps his greatest drive. It was at the Nürburgring – the old 15-mile Nürburgring. And it was in the wet.

"The Porsche was very well-balanced for the dry," he remembers. "But when it rained on Sunday I elected not to make any changes to the set-up. I figured that if I had no one in front of me I'd be okay. The reason I lost places to Graham [Hill] and John [Surtees] early on was that the main battery broke loose inside the car and tangled with my left leg. The way the Nürburgring was, I was concerned that the battery would put a hole in the fuel tank and start a barbecue. ►



Gurney was snapped up by Ferrari for 1959, finishing third in the German GP to Phil Hill and Tony Brooks. Below: scoring a breakthrough win for Porsche at Rouen in '62.





**“THE CONSEQUENCES OF CAUSING AN ACCIDENT IN THOSE DAYS WOULD OFTEN RESULT IN A FUNERAL, SO IF YOU COULDN’T BEAT HIM IN THE RIGHT WAY, JUST LET THE CARDS FALL WHERE THEY MAY”**

REAR VIEW

Gurney set up All American Racers and created the Eagle for F1 – seen here at Monaco in ‘68.



The Gurney/Foyt Ford heads the Scarfiotti/Parks Ferrari at Le Mans '67, leading to that historic champagne moment, left.

“Eventually I found a way of holding the battery in position with my left leg while still being able to activate the clutch, but it took me a while and by the time I was ready to press on I’d lost about 17 seconds. I caught them both but I wasn’t able to pass them. It was just one of those could’ve, would’ve, should’ve days of racing...”

Gurney’s ability was outstanding; he managed that broken battery (and Dan was not small of limb), he was quick in the wet, quick in the dry, quick on fast corners, quick on slow ones. And he drove the cars his way, with his own, unusual steering position.

“In those days we didn’t have steering dampers and many of the tracks were pretty doggone rough. So creating a rigid framework from which you could work the steering wheel was very important. If you were going flat out through a rough section of track it helped if you had a good lock on things. So, if the steering wheel was a clock face, I used to position my right hand between one and two and my left between seven and eight, with my left elbow clamped into my ribcage. I wanted to be able to have my right hand at 12 o’clock when I was turning the car to the left, still sitting back in the seat. If you held your hands at, say, nine and three, or 10 and two, in the conventional way, you couldn’t get much strength there and in that position it was pretty easy for the bumps to feed back through your body.”

Gurney the driver now evolved into Gurney the (ever-creative) driver-engineer. He suggested to Colin Chapman that Lotus take an F1 car to Indianapolis after the 1962 US GP at Watkins Glen. Lotus did – and the rest is history. Thanks to Gurney’s spark and input, Jim Clark won the 1965 Indy 500 in a Lotus 38-Ford. A new era had begun in American single-seater circles.

He raced for Brabham from 1963-65, winning a second French Grand Prix and the Grand Prix of Mexico, then followed his heart by setting up his own team (in Santa Ana, California and Rye, East Sussex, England) to design and build his own F1 cars.

**“WE WERE UP ON THIS PLATFORM WITH LOTS OF PHOTOGRAPHERS BELOW, SO I JUST STARTED SPRAYING THE MAGNUM OVER THEM, AND THEN DECIDED TO SPRAY EVERYONE ELSE AS WELL”**

Thus was hatched All-American Racers (AAR) and the gorgeous, beak-nosed Eagle. In a golden few months, Dan won the 1967 Race of Champions, the Le Mans 24 Hours for Ford and the Belgian GP. In France, he popped the champagne and sprayed the bubbly, creating another unique tradition.

“We were up on this platform with lots of photographers below, so I just started spraying the magnum over them, covering all their lenses, and then decided to spray everyone else as well, including Henry Ford II, who was there with his new bride. I had to learn how to release lots of wonderful juice without using too much pressure...”

**INVENTING HISTORY**

It was, simply, the best of times. “In those days,” he says, “I was concerned with the reliability of most of the aircraft on which we flew and I often used to say to myself, ‘well, I haven’t won a GP yet with the car and I sure hope this plane is going to have a successful flight’. After the win at Spa, I said to myself, ‘if this plane goes down that’s okay by me; we’re in the record book.’”

Goodyear had been a major supporter of Gurney’s F1 Eagle project but now wanted to switch the emphasis towards Indy. Gurney’s American racing career began to soar at the expense of his European life (but not before he became the first driver to race in F1 with a full-face helmet – in Germany, 1968). He won a slew of NASCAR races at Riverside, recorded two second places at Indy – and AAR won prolifically in sports cars, TransAm and IMSA. It was while testing an Eagle Indycar that Dan also invented the Gurney Flap – a device that remains an integral part of modern motor racing.

“In the end it was down to necessity being the mother of invention,” he recalls. Bobby Unser and I were testing Indycars on the Phoenix oval. It was hotter than the dickens. After three days

we were still way off the pace and right at the end of our ropes, just sort of sitting there, dejected. It was about 4.30 in the afternoon. I was sitting in this little trailer, trying to get some shade, and Bobby came up to me and said, ‘Boss, can’t you do something? You’re supposed to be coming up with stuff. Dangbust it! Can’t you come up with something?’ I was aware that the spoilers on cars – which Richie Ginther had had something to do with when he was at Ferrari, and I had played with on the Lotus 19 – wouldn’t work on a car without lots of bodywork but then I suddenly thought, ‘why don’t we put a spoiler on a wing?’

We looked around for some aluminium scrap, put a 90-degree bend in it and then pop-riveted it onto the top edge of the wing. When Bobby went out his lap times didn’t improve and I thought, ‘Well, there’s another failure’, but when he coasted in after six laps or so he asked me if anybody was watching out at Turn Four. I looked up and said, ‘No, there’s no one there. Why?’ Bobby said that the back end of the car was stuck so strong that he now had a huge push at the front. That was when we realised that we had accomplished something.”

Today, AAR still operates from the same Santa Ana business unit, building top-secret carbon drones for the US government, the landing gear for the SpaceX orbital craft and Dan’s pet Alligator (motorcycles). His second wife, Evi (whom he met when she was working for Porsche in 1962) has been busy for several years on Dan’s autobiography, and their two sons, Justin and Alex, are successful in their own rights: Alex is a former GrandAm Champion, Justin the COO of today’s AAR.

“I was lucky we didn’t get a patent for the flap all those years ago,” says Dan with that smile. “We probably would have made too much money and been obliged to retire.”

He draws the r-word as if it’s the sort of virus he wouldn’t want to catch. ■



Fifty years on from its debut, the Lamborghini Miura is still hailed as "the perfect car" by joint creator and famed engineer Gianpaolo Dallara.



Heritage

# BEAUTIFUL VISION

*The Lamborghini Miura's impact on concepts of style, technology and aspirational glamour still resonate. AUTO travels to Sant'Agata Bolognese to find out how the original supercar was born and how, 50 years on, it remains a talisman for the raging bull*

TEXT: LUCA COLAJANNI

Long after he had backed away from the industry that had defined him, Ferruccio Lamborghini still sought solace in his greatest creation. "I'm enjoying the peace and quiet of my vineyard," he said of retirement. "But when I miss the sound and the fury I take refuge in my garage and turn the key in the ignition of my Miura... Just enough to make the needle move."

There could be no more simply eloquent expression of the impact the Miura made on the automotive world, how this fluid, exquisite machine defined its era and how it was regarded as the ultimate expression of style and technology on four wheels.

The name belongs to a breed of bull, one of the fiercest in Spain, and it was the company founder who came up with it in the early 1960s when the manufacturer that would go on to glory in the car world was just taking its first steps in the industry.

According to Gian Paolo Dallara, the Miura is "the perfect car". He might be biased, as the engineer from Parma is one of the fathers of the Miura, but it's hard not to agree with him.

"Looking at it 50 years on, with all the experience I've acquired over that time, I can say with conviction that I would change nothing, nor would I want anyone else to do so. Some cars are like that - extraordinary works of art." ►

Dallara, who along with Paolo Stanzani and Marcello Gandini from Carrozzeria Bertone, designed the Miura, recalls the car's genesis.

"I was an eager youngster when I came to Lamborghini," he says. "I had already worked at Ferrari and Maserati and I'd caught the racing bug, so pretty much immediately I asked Ferruccio if, sooner or later, we would produce racing cars. He said we would and to prove it, he sent me to the Le Mans 24 Hours.

"However, the demands of growing the company were such that we didn't do anything. The Ford GT40 stood out at Le Mans and was a font of inspiration, along with an F1-derived 12-cylinder, 1500cc engine that was cast as one part including the gearbox, which I had worked on at Maserati.

"The aim of the Miura project was to mount the 12-cylinder engine in the rear transversally, with the gearbox and differential cast along with the engine in a unique way. It was a totally innovative solution at the time and we were able to do it because Lamborghini was extremely tolerant and had great faith in his people."

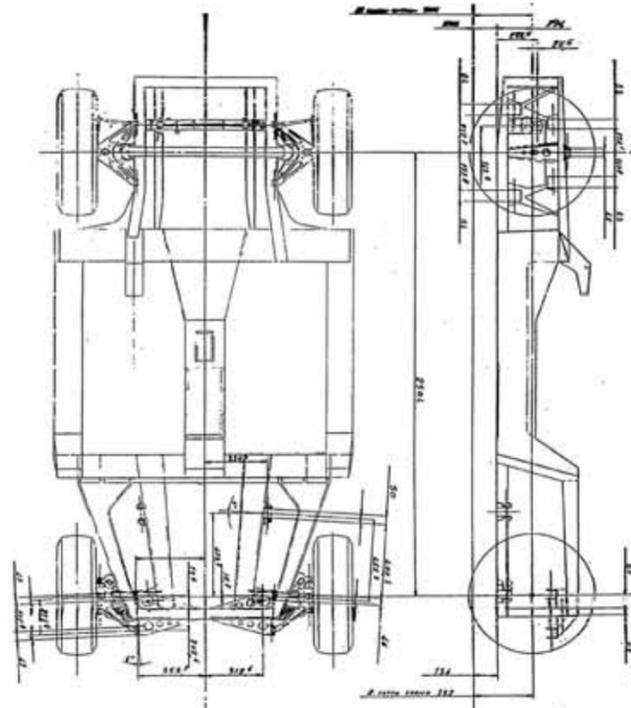
Dallara doesn't deny there might have been an element of recklessness in designing a car like this.

"Today, with all the simulation tools available, maybe there is no room for a leap in the dark like this. Back then, you learned through trial and error, whereas today, there is plenty of research and experimentation carried out before even a single part is produced. It's still possible to include something intuitive in the design, but it's definitely harder and maybe everything is more homologated. On the other hand, it's far easier to create a design that is totally safe."

Designer Marcello Gandini simply based the Miura on other sports cars typical of its era - the Swinging Sixties.



The Miura was uniquely designed to hold its 12-cylinder engine in the rear transversally.



During a quiet retirement, company founder Ferruccio Lamborghini still kept a Miura in his garage.



The Miura stayed in production until 1973 with, according to official records, 764 models built.

REAR VIEW

"I WAS STUNNED BY THAT CHASSIS. I REALISED WE COULD CREATE SOMETHING CRAZY"

NUCCIO BERTONE

Lamborghini signed off on a chassis formed of drilled sheet metal with a limited number of pressed parts and it was presented at the Turin Motor Show in October 1965.

It was spotted by highly-regarded coachbuilder Nuccio Bertone. Lamborghini courted him incessantly, having worked up to then with Touring for the 350 GT and the 400 GT.

"I was stunned by that chassis," recalled Bertone years later, talking to Italian journalist Gino Rancati. "I realised we could create something crazy."

After some hesitation, Bertone took on the task of designing the bodywork and gave the project to Marcello Gandini, then in his thirties. "The Miura was my first car. I had no experience in this field, but Bertone had seen some of my sketches and decided to entrust me with the design," he says. "The car had to be ready for the Geneva Motor Show in March and it was already November.

"I didn't take my inspiration from any car in particular: the Miura was simply a synthesis of sports cars typical of the '50s and '60s. ▶



Launched at the 1966 Geneva Motor Show, the Miura was an immediate hit both with the press and the public.



Lamborghini will soon open its own workshop in Sant'Agata to help maintain examples of the iconic Miura.



REAR VIEW

The reason for its amazing success was that it was incredibly innovative, although it didn't break with the styling cues of the time."

Around the time of the end-of-year festivities in 1965, Lamborghini called Dallara and asked him to come to the factory to see the first sketches that Bertone had sent to Sant'Agata.

"I realised immediately that Bertone had created something that had never been seen before," says Dallara. "From then on I have always been convinced that masterpieces are created when the concept comes at the first stroke, with no retouching required."

The Miura P400 was launched at the 1966 Geneva Motor Show, the model on display painted in the orange colour that became something of a signature for it. The Miura was an immediate hit, both with the press and the general public.

Initially, Ferruccio Lamborghini thought the car would effectively be a flagship for the marque, but after a few months, it was clear from the sales figures that history would decree otherwise: not only did the Miura become the ambassador for the Bull around the world, it also enjoyed incredible commercial success, staying in production until 1973.

Several evolutions were introduced, although it's always difficult to distinguish between a real model produced officially in the factory and variants, such as the Jota, produced largely thanks to the efforts of New Zealand test driver Bob Wallace, who introduced significant modifications on a Miura S.

So exactly how many Miuras were built? According to official records, there were 764, but according to Enrico Maffeo, who runs the Historic Lamborghini Centre, the exact number remains unclear. "At the celebrations for the Miura's 50th anniversary, I met

"I REALISED THAT BERTONE HAD CREATED SOMETHING THAT HAD NEVER BEEN SEEN BEFORE"

GIAN PAOLO DALLARA



one of our customers who told me he'd had a serious accident with his car and that, when he brought it to the factory for repair, the body had been changed while keeping the same chassis number. So how do we count that? Is it one or two cars?"

The end of Miura production coincided with the completion of Lamborghini's disengagement from his most prized creation, as the oil crisis hit and demand flagged. "The golden age was over," he later recalled. To survive we launched the Countach and the Urraco. In 1970 I had chosen to sell 51 per cent of my stock. I sold the rest in 1972."

Sheer momentum kept Lamborghini going but, as the situation became ever more turbulent, the existence of the brand came under repeated threat through the 1970s and '80s, until it was finally rescued by Audi in 1998. Thanks to a great deal of work over the past 15 years, the Bull brand has been relaunched and its future is assured with grand plans for expanding production, a key element of which is the introduction of an SUV, known as Urus.

Just over a year ago, Lamborghini also took back the reins of its past, creating the Polo Storico department to manage the historic archive, carry out restoration and to certify the originality of its cars.

"It was our customers, particularly Miura owners, who persuaded us to set up this new department," explains Paolo Gabrielli, head of after sales. "Today, we manage the restoration work ourselves, making use of approved outside suppliers, but we are finalising a workshop here in Sant'Agata and in a few months we will be able to carry out mechanical repair work.

"To this end, the Polo Storico is helped by the fact that the documentation held by the company is comprehensive, despite

problems in the decade prior to the arrival of its German owner."

Naturally a Miura had to be one of the first cars restored by Polo and in a happy coincidence for this story, the one that went 'under the knife' actually belongs to Gian Paolo Dallara.

"It's chassis number 68 and its first owner also came from Parma," says Maffeo. "By chance, this car was photographed a lot, because Pierluigi Bormioli who had acquired it was a very popular personality in the media at the time, not least because of his girlfriends, one of whom was the model and actress Tamara Baroni. Around the city, the car was known as the 'Ta-Miura!'"

Dallara handed it over to Polo Storico, where the journey began to restore it to its original beauty.

"When we got our hands on it, it was already stripped, which made the initial phase more complicated," explains Maffeo. "The stages of a restoration like this are first to take an inventory, then we remove the paint with water, then we check the chassis on a jig and make adjustments where necessary. All bodywork parts are scanned to check them against the originals and each individual mechanical component is checked to ensure it matches the technical drawings.

"Finally, the car goes to paint, which is done using a modern cataphoretic process to protect it against the elements. We estimate the whole job takes about a year."

In a few months' time, Dallara will therefore again be able to drive a masterpiece he created along with a handful of young colleagues, who were fuelled by a strong desire to experiment and a great passion for cars. And once again Dallara will get to share the sound, fury and beauty of a machine that still has the power to captivate, every time the needle moves. ►

# FEELING BULLISH

*With record car sales, motor racing gains and a move into the SUV market, Lamborghini boss Stefano Domenicali has every reason to feel optimistic about the Italian manufacturer's future*

Since February this year, Stefano Domenicali has been working as Chairman and Chief Executive Officer of Lamborghini and is already immersed in the special atmosphere that exists in Sant'Agata Bolognese, a small town that sits halfway between Bologna and Modena.

Apart from a brief interlude at Audi HQ at Ingolstadt, Domenicali has spent his entire working life in an area of a few dozen square kilometres, given that for 23 years the badge on his uniform featured a Prancing Horse. That Ferrari steed might be more suited to racing around a circuit than the Lamborghini Bull, but they both share this area of Italy as their birthplace, as does Domenicali. Hailing from the town of Imola he was brought up on the sound of racing engines at the nearby Enzo e Dino Ferrari circuit.

**Q What does the Lamborghini Miura mean to you today?**

A It's one of our datum points for the future, in the broadest sense of the concept. In its day, the Miura was revolutionary, both in terms of its technology and aesthetically. We have to maintain the same innovative approach that was used in the past for our future models. That's why, for example, we have recently reached an agreement with the Massachusetts Institute of Technology in Boston, through the MIT-Italy Program, to have ever closer links to the avant-garde in terms of innovation in order to implement it on our products in the shortest time possible, especially when it comes to the use of new materials.

We have a long tradition in this area, if you think that 30 years ago, in the era of

the Countach Quattrovalvole, our cars were being built with reinforced polymers in carbon fibre. In the last few months, we have established in Seattle the Advance Composite Structures Laboratory, to analyse the potential of this material, thanks to a collaboration with Boeing.

**Q Does the supercar still have a future, and what is its place in a world increasingly dominated by vehicles that heavily accent sustainable mobility?**

A Yes, I really believe it has a future and I don't just say that because I head up a company that produces this type of car. A supercar should continue to have exceptional qualities, as did the Miura. People need passion and fun in their lives, to enjoy the feeling of speed, and they still have a desire for affirmation on a social level through the use of special objects such as cars, which are also style icons.

**Q In the first six months of 2016, Lamborghini set a new record for sales, going over the 2000-unit mark. Do you think this level of growth can be sustained? Is there a need to limit production to retain exclusivity?**

A The sales in this second semester suggest that 2016 will be another record year. Demand is growing at a higher rate, but we want to maintain a sales volume in the supercar sector that is compatible with current production. That way, among other things, the residual value of the cars already in circulation increases at a greater rate than in the recent past.

**Q The sales figures for the Huracán are impressive, up by 87 per cent compared to its predecessor, the Gallardo. How did that come about?**

A I think the secret of the Huracán's success can be attributed to the perfect combination of a particularly elegant design and absolutely amazing performance. In addition, thanks to being part of a major group like Audi, the car is built to a very high quality level, which means it is at the pinnacle of the super-luxury sector.

**Q Recently, there has been an increase in the number of limited editions, specials and one-offs. Do you think increasing the customisation options is the way forward for small-volume manufacturers such as Lamborghini?**

A Customisation is a sign of the times and not just in the automotive market. It is getting harder all the time for a single object to represent a unique message that has meaning everywhere, with it being perceived differently according to the clientele, be it American, German or Chinese. Therefore, in one sense, it has become vital to offer products tailor-made for more personal tastes and to this end at Lamborghini we now have the 'Ad Personam' programme, which allows each customer to create 'their' car.

We have to also bear in mind that the demographic for our customers is changing, moving more towards the 30 to 45 age group, a generation that has grown up with new technologies and is therefore more used to choosing products best suited to their own requirements.

One-offs like the latest Centenario are even more extreme: it offers a select number of customers the opportunity to try an amazing driving experience at the wheel of something with the highest level of technology, thus staying true to the ideals of our founder.



PHOTOGRAPHY: THOMAS BUTLER

**Q 2016 has also been a busy year for the race programme, Lamborghini Squadra Corse. Is this motor sport involvement set to increase and what part does it play for the company?**

A I am very pleased with the success that our cars and drivers have had in the GT racing category, which is really thriving. My own past experience means I am well aware of the importance of a motor sport programme for a company that produces high-performance cars, both in terms of the technological benefits and also when it comes to customer relationships.

Lamborghini Squadra Corse is focused on these aspects and gives our customers the chance to realise their desire to race in the one-make Super Trofeo series. It is growing in popularity and we are also supplying a product that is capable of taking on the competition at a higher level with professional drivers.

In this same orbit we have the Academy programme, created to bring on young drivers, and we should not forget the efforts of the department in supplying our customers with the necessary equipment and know-how to take our cars to the limit on the track.

What does the future hold? Right now, this is what we do and it remains to be seen if we will add other elements, but that's not a discussion for today.

**Q The launch of Urus, the supersport SUV, is planned for 2018: how important is it for the future of the company? Why have you chosen to go down this route? And is there a junior Lamborghini on the horizon, destined to compete with upmarket sports cars?**

A The SUV concept doesn't go against the Lamborghini tradition if, for example, you remember the LM002. Of course the

“WE HAVE TO MAINTAIN THE SAME INNOVATIVE APPROACH”

STEFANO DOMENICALI

Urus will be an SUV *sui generis*, maintaining the design cues of the company combined with our DNA: we want it to be unique and extraordinary.

The introduction of Urus will involve a quantum leap at Lamborghini. Production will be doubled, necessitating an increase in the size of the factory, and the sales network will need restructuring. We will face demanding yet interesting challenges, especially as we want to continue as a major player in the super luxury sector. We will also continue to build one-offs, which express our desire to reach extreme levels of performance and technology.

As you can see, we have a lot of irons in the fire so that it's hard to think of taking on any other challenges.

**Q Where will Lamborghini be in 2026?**

A The company will still be producing cars that are exciting. We want to maintain that enthusiasm, which is almost an unconscious thing, something that [Gian Paolo] Dallara, [Paolo] Stanzani and [Marcello] Gandini had when they designed the Miura, although still with a no-nonsense approach. We want to, and we must, make a further step forward in terms of quality on top of the one Lamborghini has made in the past decade, always aiming for perfection.

That's the only way to deal with the challenges that we will face in the future. As you can imagine, we have a lot of work to do, but what I am pleased to see is the enthusiasm of our staff and their desire to make a difference. In Italy, we are an example of what can be achieved, thanks in part to our shareholders, institutions and social partners, and all of that means I look to the future with optimism. ■

AUTO GRAPH

# PRECIOUS METALS

The FIA's Driver Categorisation system aims to provide a balanced competitive environment in series that mix racers of varying standards. Here's how it works...

# 2,559

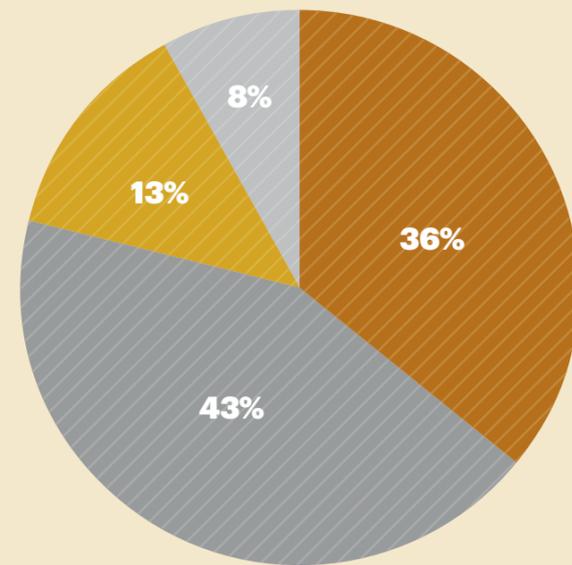
Currently, 2559 drivers are registered on the FIA Categorisation list, which ranks drivers in four bands: Platinum, Gold, Silver and Bronze.

## STATE OF THE NATIONS

The top 5 categorised racing countries are:

USA	324
GREAT BRITAIN	312
FRANCE	282
GERMANY	204
AUSTRALIA	202

Driver categorisation is regularly reviewed, with competitors moving between ranks as experience and skill grows. In 2016, some 470 new categorisation requests were received, while 100 drivers requested that existing categorisation be reviewed.



■ BRONZE ■ SILVER ■ GOLD ■ PLATINUM

## 17 SERIES AND COUNTING...

The following series totally or partially use the FIA Drivers' Categorisation system (non exhaustive list...)

- FIA World Endurance Championship
- ELMS
- Blancpain GT Series
- ADAC GT Masters
- GT Asia
- British GT
- GT Open
- WeatherTech Sportscar Championship
- Pirelli World Challenge
- Lamborghini Supertrofeo Series
- Bathurst 12 Hours
- FIA GT World Cup
- Asian Le Mans Series
- Michelin GT3 Le Mans Cup
- Intercontinental GT Challenge by SRO
- Sepang 12 Hours
- 24 H Series

## DRIVING FORCES OF CATEGORISATION

The 2016 FIA GT World Cup in Macau featured drivers from every category. They included:



**EDOARDO MORTARA**  
Audi DTM driver Edoardo Mortara from Italy is a former FIA Formula 3 Euroseries champion and a back-to-back winner of the Macau Grand Prix in 2009 and 2010. He finished second in the 2016 DTM drivers' championship.



Platinum driver Kamui Kobayashi

**ADDERLY FONG**  
Hong Kong's Adderly Fong is GT Asia driver and former GP3 racer. He took part in the first practice session for the 2014 Abu Dhabi Grand Prix for the Sauber team and tested for the Swiss squad in 2015. He won the 2013 Audi R8 LMS Cup.



**RICKY CAPO**  
Driving a Modena Engineering BMW Z4 at the Macau race, former F3 Australia driver Ricky Capo raced in GT Australia in 2016, as well as taking part in the F3 Masters event at Zandvoort in Holland where he finished in 14th place.

**TOMMY TULPE**  
Germany's Tommy Tulpe races in the DMV GTC series for touring and GT cars, where he is a Class 10 Germany Cup driver. Tulpe won his category in 2016 driving an Audi R8 LMS for the Rutronik Racing squad.



## MAINTAINING THE STANDARDS

Until 2014, series and championships mixing professional and amateur drivers had their own system of categorisation.

However, the FIA's GT Commission decided to standardise the systems, and with the agreement of the FIA's Endurance Commission, merged the categorisation into a common system. A new FIA Driver Categorisation Committee was formed and this is currently composed of a member from the GT3 series in Europe (SRO), a member of WEC/ACO, a member of the International Series in the USA and of the International Series in Australia, and three from the FIA GT Commission.

First published in 2015 the system places drivers in four categories: Platinum, Gold, Silver and Bronze. Competitors are evaluated on racing record (age, career achievements) and performance (racing times) during a season.

Each series or championship using the FIA Driver Categorisation system is free to adapt it to their own constraint, in order to establish

homogeneous grids. For example, in the FIA WEC, to race in the top class, LMP1, a driver must, at the minimum, be ranked as Silver. In LMP2 a crew of two or three drivers must include at least one Silver or Bronze driver and in GTE Am a crew of two or three drivers must include at least one Bronze, as well as another Bronze or Silver.

The system aims to help drivers gain experience and progress. It also provides teams with a strategic conundrum, as finding the best racer in each category and knowing when to deploy him/her in a race can mean the difference between victory and defeat, as Bob Friend, Team Manager of 2016 European Le Mans Series champions Jota Sport explains.

"It's all about the silver driver," he says. "There are lots of platinum and gold standard drivers. It's the silver that's important. In ELMS, they've got to be really on it, as they're probably going to be racing against a platinum or a gold driver at some point during their stint. A good silver can be worth a platinum to a team."

FINAL LAP

The last word

# DRAWING SLIDE RULES

*Formula Drift President Jim Liaw on the process of regulating motor sport's fast-growing underground discipline*

**Q Where is Drifting in its evolution from underground pursuit to mainstream motor sport discipline?**

A Drifting pretty much exists in every market, in various forms. Definitely it exists in a grassroots form. There have been different spikes around the world that have escalated the sport – Formula Drift being one of them – and the next phase is to push it towards a professional level as much as we can, to bring what is still a weekend sport into something that is a championship that can be commercially feasible.

There are some series that have had degrees of success but the next step is the legitimisation of this form of motor sport in order to find a cohesive global platform. We are fragmented in different parts of the world and there are certain rules we employ that don't necessarily work in other parts of the world. That's where we are now.

**Q How difficult a process is that formalisation and in doing so is there a risk of diluting the spirit of the discipline?**

A I look at it as being similar to skateboarding, or perhaps more so to snowboarding when it first hit ski resorts and it was met with some resistance by skiers. Snowboarding then became a formalised sport and went to the Olympics. Has that made the sport too mainstream? Did it lose some of that 'street' appeal? I don't think it did but that's the fine line we have to walk.

How difficult is that process? I don't think it's very difficult, because the world is such a small place. All of the major drifting series organisers have been in contact and whether we agree or disagree at the moment

everyone is in contact. Thanks to the FIA's initiative with the Drifting Working Group that process has accelerated and has enabled everyone to have one conversation about technical regulations, vehicle safety etc.

You see it in other forms of motor sport. Once you have a common set of regulations then you can take, for example, a GT3 car and race it in various series in other parts of the world. You can buy and sell it and work with a customer programme in various places but you are in the same space.

If we can do that, at least in terms of the commercial viability for up and coming team owners and businesses investing in the sport it will no longer be a case of building a car, racing it for a couple of years and then you are done. There will be a residual value and a solid future.

**Q How important is it for Formula Drift to have this formalisation process happen?**

A It's important. Right from the beginning [formalisation] was one of our priority topics, so we are pretty up to speed on all of the latest FIA safety regulations.

FIA affiliation or global recognition for the sport will help us to get over another hurdle, which is the recognition of the sport

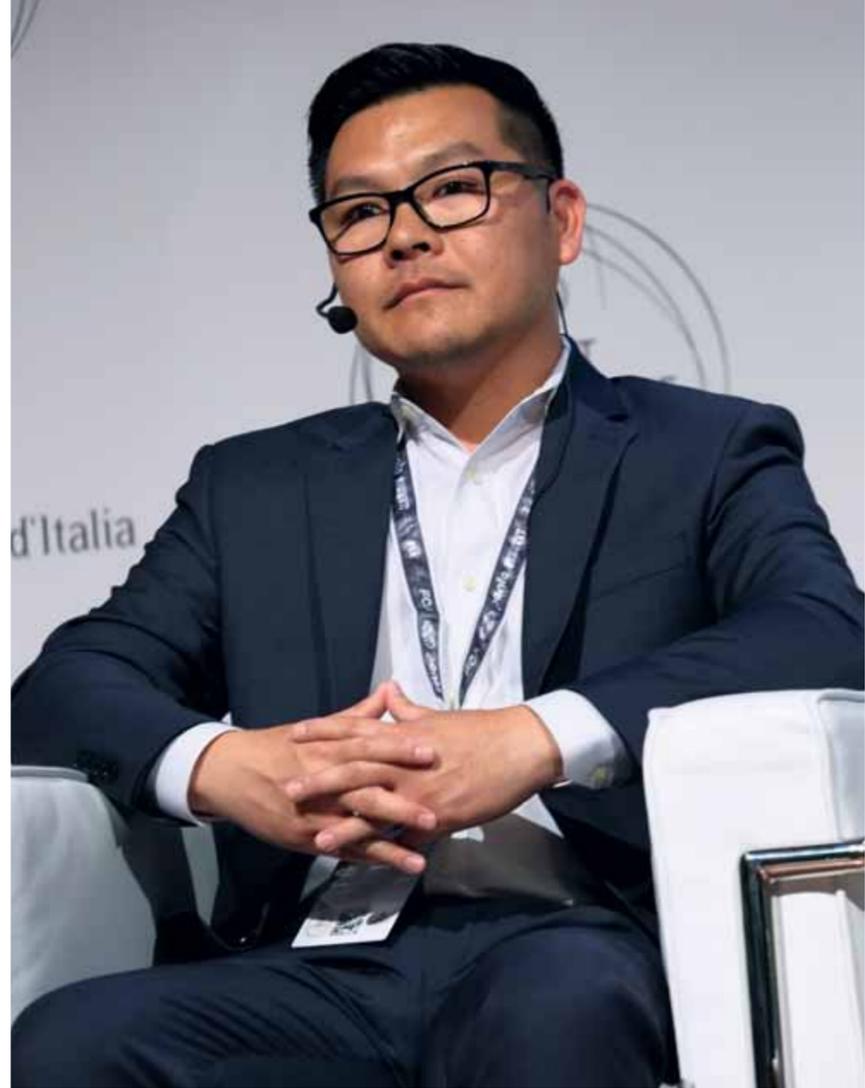
as having a place in all things motor sport. That will give the sport a more serious perspective and it will make it an attractive investment opportunity for auto makers and it would allow us to potentially have works programmes.

**Q You speak about making the category attractive to manufacturers. Does that carry a danger that affordability of entry – which has always been central to the spirit of drifting – will be undermined?**

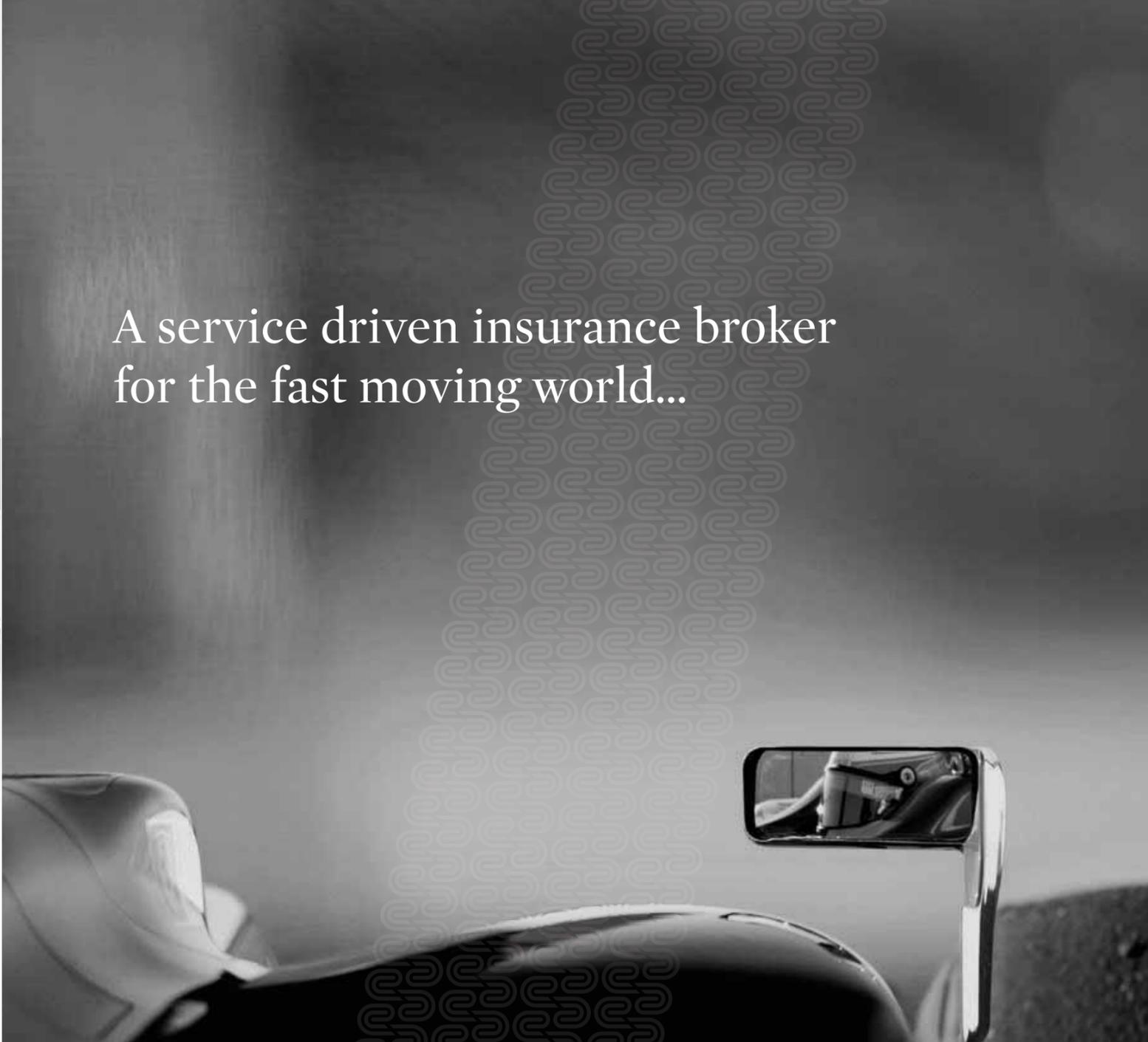
A I don't think it will. It's like any sport. The aspirational element – as in Formula 1 – has to be there and then there is a trickle-down effect to grassroots level.

If the pinnacle of a particular sport is not high enough then the amateur level may not expand. We want commercial success, we want works teams, we want young drivers to feel that there is progress to be made, that there is a career path, something to aspire to.

We want that a young driver is able to go to a track with a \$10,000 car and win and then that he or she can see further potential to progress. We want teams to see potential in that driver and for there to be multiple steps on a ladder that will take them to that pinnacle.



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