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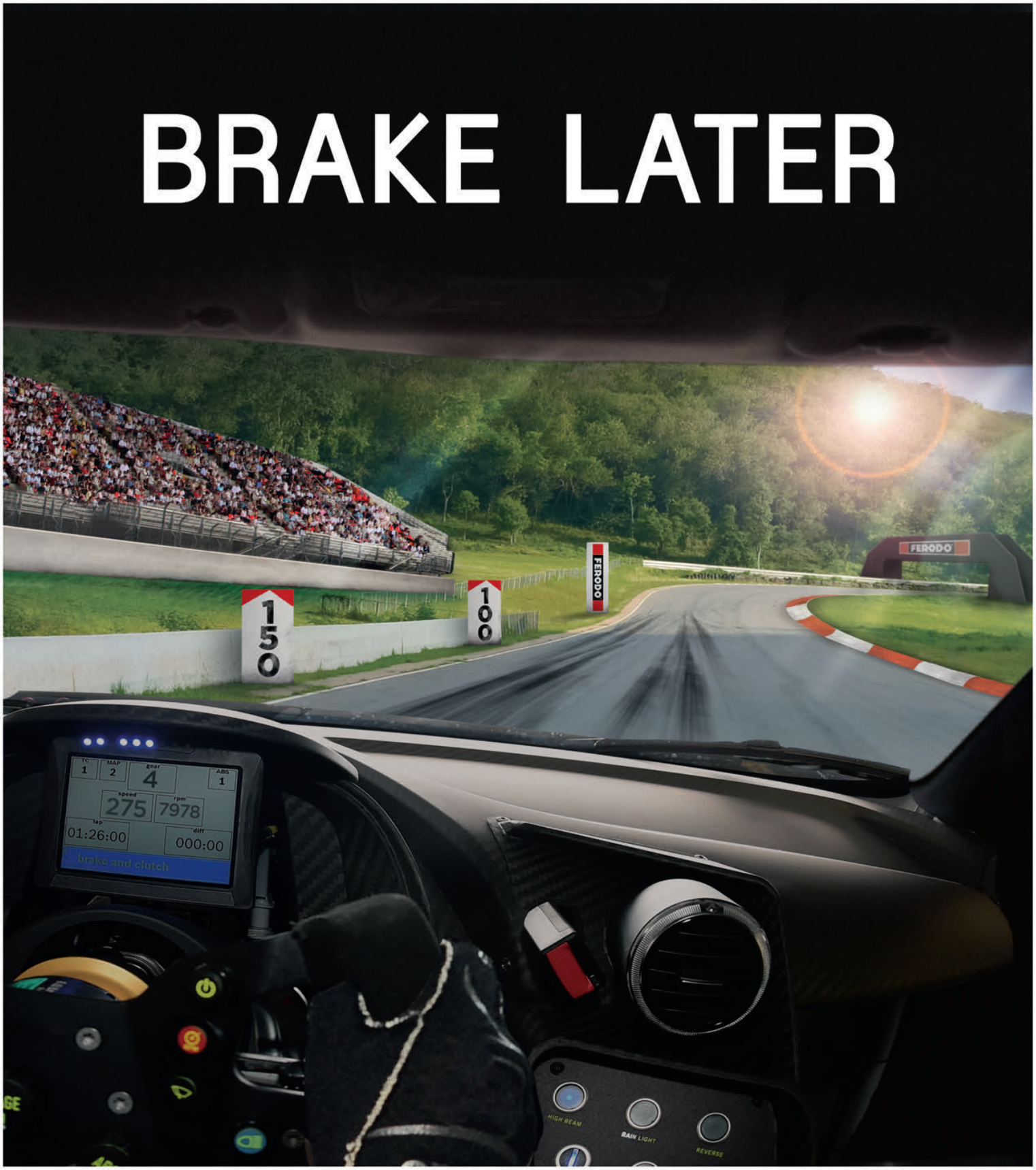

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EDITOR
William Kimberley

CONSULTANT EDITOR
Mark Skewis

DEPUTY EDITOR
Sophie Williamson-Stothert

CONTRIBUTING EDITORS
Andrew Charman

EDITORIAL ASSISTANT
Sebastian Scott

PHOTOGRAPHY
LAT

ART EDITOR
Paul Bullock

ADMINISTRATION/ SUBSCRIPTIONS
Adam Atamturk

ACCOUNTS MANAGER
Vikki Amour

SALES EXECUTIVE
Mike Norman

COMMERCIAL DIRECTOR
Maryam Lamond

MANAGING DIRECTOR
Adrian Goodsell

PUBLISHING DIRECTOR
Soheila Kimberley

841 High Road, Finchley
London N12 8PT
Tel: +44 (0) 208 446 2100
Fax: +44 (0) 208 446 2191

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COME THE REVOLUTIONS

We live in revolutionary times— politics, communications and now Formula 1. I have to confess that I never thought I would see the day when Bernie Ecclestone would hang up his hat as F1 supremo, but it has happened. It is almost a coup de grace in the way that it has happened as well. No sooner do Liberty Media take full ownership of this branch of the sport that it's adieu to BCE. Okay, he is victor ludorum or chairman emeritus or whatever Latin name he has been given, but it is the end of the road for him and the end of an era for the sport.

With the ideas and changes that have spewed out of Liberty Media in the 48 hours after taking it over, it's as if a champagne cork has popped off. Everything is on the menu, so to speak, from creating proper "events" during a Formula 1 race weekend, to acknowledging that some European races are vital to the health and heritage of the sport while also looking to increase its popularity in the US. At the same time we are talking about increasing social media.

Many of you would not necessarily know that the sport was ruled with an iron fist when it came to media rights. No moving image or sound could be broadcast anywhere, even YouTube, without some sort of dire warning or a large fee being paid. While this was good, I suppose, for the-then owners' coffers, it did nothing to spread the sport outside the core fan base — and this leads me on to the other revolution — communications.

There is no question that we are undergoing a massive revolution without many of us even being aware that it is taking place. The 'old' ways of watching programmes on television are so old school. Anyone up to their mid 20s now "Tube" it. They don't watch television, even cable or satellite, but go to their iPad or tablet or even mobile phone to stream programmes. They want to dictate what they watch and when to watch it and not be constrained by the programmers.

This is all well and good for most things but not Formula 1 such was the rigorous control. As a result, it was completely off the radar of a lot of youngsters unless they were brought up in a family that wanted to watch Formula 1 races. I have no idea if this is going to change, but with Liberty Media's background plus Chase Carey and former ESPN executive Sean Bratches — and it's worth checking out his background — running this part of the business, the prospects look very bright and positive.

Then we have Ross Brawn installed as managing director of the sporting side of the business, which is inspirational. While he knows what it takes to run a Formula 1 team with loads of resources, he knows to a certain extent the other side of the coin when he ran Brawn F1 for a year after Honda's withdrawal. While keeping the cards close to his chest, he has already made a few remarks that seem utterly sensible. It is going to take a while to wash through, but the prospects are good.

Carey has been pretty outspoken on what he has taken on as the CEO, describing what he has inherited as "somewhere between ineffective and dysfunctional", which must be pretty horrible reading for Mr Ecclestone to take. It's a bit like reading your own epitaph before you are dead, but that's the verdict although had he not done what he set out to do back in the day, there wouldn't have been such a high profile sport to take over, so respect is due for that.

Talking of passing on, so to speak, and going slightly off message, I made a promise to one of my good friends in the industry at the Autosport Show that I would bring this up. Peter Babbage — and I give his name with his express permission — the managing director of Performance Friction Europe — was supporting Prostrate Cancer UK at the show. He was doing so because he himself had a massive scare in the middle of last year when diagnosed with the disease. He was badgered by his wife to go for a check up at the doctor's, but always said he felt fine and just didn't go until he was more or less frogmarched to the surgery by his wife for a test — and it proved that he was in very urgent need of surgery. As he told me, he was lucky and is in full remission, but had he not listened to his wife, it could have been so different.

His message to me and to *Race Tech* readers was go for a check, no matter what. If like him you live a healthy lifestyle and believe that you are 100 per cent healthy, it's not necessarily so, because below the surface life-threatening dangers can lurk — and on that note I am going to finish this off and book an appointment with the doctor. RT

William Kimberley
EDITOR

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EV Rallycross series

Hal Ridge

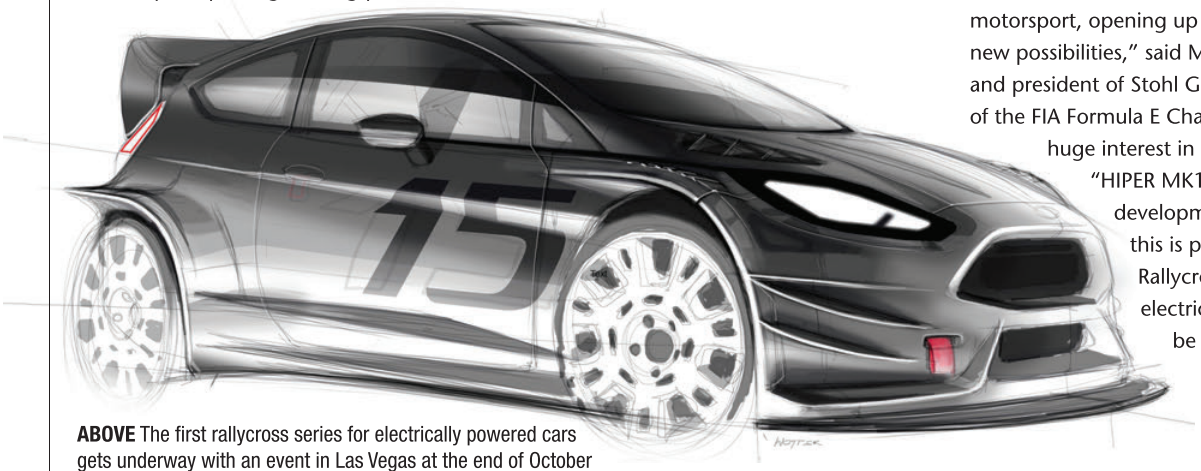
DENVER, CO: The first rallycross series for electrically powered cars is set to get underway in North America later this year. Called E/RACING, and run by Denver-based Speedleague, the new championship will use cars built by STARD – Stohl Advanced Research and Development – in Austria, the firm that has created the first ever electric rallycross car, covered in detail in RT193.

As the principal engineering partner for the series, STARD will supply cars based on a range of production models, along with providing engineering support and components. The four-wheel drive machines are set to have evolved into an independent four-motor system – referenced by STARD CEO Michael Sakowicz to *Race Tech* – as the next stage of development. The machines currently use two motors, one per axle and produce 500 kW, the equivalent of 670 horsepower.

Cars built for the E/RACING series will also include a 'push-to-pass' feature. The championship, which is being led by GRC co-founder Brian Gale, will get underway on 31 October in Las Vegas, with further inner-city events expected to take place in Los Angeles and New York, although details of the circuits that will be constructed are yet to be released.

"Besides the clear environmental and technological benefits, it's obvious that, when it comes to rallycross, electric powered race cars will provide us with a superior competition platform," said Gale. "They also make available more venue options, offering a better experience for fans."

"For the last couple of years we have believed that EV technology is the future in motorsport, opening up a huge number of new possibilities," said Manfred Stohl, owner and president of Stohl Group. "The success of the FIA Formula E Championship and the huge interest in our world's first "HIPER MK1" electric rallycross development car indicate this is proving correct. Rallycross-style racing and electric race cars seems to be a perfect match." RT



ABOVE The first rallycross series for electrically powered cars gets underway with an event in Las Vegas at the end of October

Subaru preps for Global Rallycross

Hal Ridge

COLCHESTER, VT: The Subaru WRX STI is undergoing intense development in the US to make it a leading contender in this year's Global Rallycross Championship. Performance and durability of its Boxer engine and chassis agility are the key areas that Subaru technical partner Vermont SportsCar hopes to improve on the Subaru Rally Team USA WRX Supercar ahead of the 2017 season in the US-based Global Rallycross Championship. The team recently signed ex-World Rally Championship drivers Chris Atkinson and Patrik Sandell, and has also moved lead rally engineer Jonathan Carey from Subaru's dominant Rally America programme to the rallycross side of the operation for this season.

The team will build brand new cars for 2017, but has also continued to develop the 2016 car, which may feature on events to evaluate development options through the year. "We tested before Christmas to introduce Patrik to the team and to focus on engine durability for new components intended for the 2017 car. We achieved our target durability distances and made good improvements in engine power delivery," said Carey, who says the team is also working on how the car reacts to driver inputs in the racing environment. "The WRX STI is one of the largest vehicles in GRC. This brings benefits as well as drawbacks. With a large vehicle, outright fast lap times can be achieved as we have shown. However, the larger vehicle can be harder to position when racing door-to-door. Our plan for 2017 is to further improve on our lap times while also focusing to make the car more manoeuvrable for race conditions." RT

Photo: Red Bull GRC

ABOVE Vermont SportsCar is working hard on developing the Subaru WRX STI into a leading Global Rallycross championship contender

Photo: Audi Sport

ABOVE Audi is to step up its involvement in rallycross by giving full factory support to Mattias Ekstrom's championship winning EKS team

Audi and Volkswagen in World RX

Hal Ridge

NEUBURG-HEINRICHSHEIM and HANOVER, Germany: German marques Audi and Volkswagen have both committed manufacturer support to teams in the FIA World Rallycross Championship.

Audi Sport confirmed that it has increased its support for reigning champion Mattias Ekstrom's championship winning EKS team, which has run Audi S1 Supercars for the last three years. The Swedish team has previously had access to Audi Sport's suppliers and partners, but 2017 will be the first time the German car manufacturer has had an official presence in World RX.

"We realise that it's going to be increasingly difficult for EKS to hold its own against the factory teams, so we chose to intensify our World RX commitment," said head of Audi Motorsport Dieter Gass.

"We laid a lot of groundwork as a team in the first three years, gathered important experiences and set new standards with EKS," said Ekstrom. "However, it was also clear to us that we'd need support for the future in order to be able to continue on this level. That EKS is now receiving factory backing by Audi makes me very happy. I'm convinced that rallycross has a great future, also with respect to potential electrification."

Alongside his factory-backed involvement in the FIA World Rallycross Championship, Mattias Ekström will be retained by Audi as a DTM driver as well. The Swede has extended his driver agreement, tackling his 17th DTM season in 2017. "I have good prospects in the DTM and would like to become champion for the third time," said the 2004 and 2007 DTM champion.

A week prior to the Audi Sport announcement, VW made the shock revelation that Volkswagen Motorsport would be supporting double World RX Champion Petter Solberg and new teammate Johan Kristoffersson in a pair of freshly constructed factory-built Volkswagen Polo RX Supercars. The Hanover-based outfit will also engineer the car, providing technicians and engineers for events. The team will continue to be run on a day-to-day basis by owner Solberg and his wife Pernilla, who will act as team manager.

Marklund Motorsport and Kristoffersson Motorsport have run Volkswagen Polo Supercars in World RX since 2014, but without full Volkswagen backing. The increased support, and the fact that VW is building the cars in Germany, suggests that the new brace of Polos will be the first to have transversally-mounted engines. Previous versions of the cars have used Trollspeed-built longitudinally mounted units, while Solberg's title winning Citroën DS3 used a longitudinally positioned engine from French firm Pipo.

Volkswagen is expected to use a similar 'in house' engine to that which it runs in the Andretti Autosport Volkswagen Beetle Supercars in the GRC, although that is yet to be confirmed. The tie-up also reunites Solberg and engineer Francois-Xavier Demaison, who previously worked with the Norwegian in the Subaru WRC team and his own outfit.

IndyCar shows look of its aero future

Andrew Charman

INDIANAPOLIS, IN: The Verizon IndyCar Series has released sketches showing the anticipated look of the universal aerodynamic body kit set to be introduced for the 2018 season. The series has also announced a five-year development plan, freezing work on the separate aero kits produced by engine suppliers Honda and Chevrolet for 2017, prior to returning to a single kit across the grid from 2018 and then making another significant technical overhaul, including potentially replacing the current Dallara IR-12 chassis, in 2021.

IndyCar hopes that the stability provided by the five-year development timeline, together with removing the expensive obligation of producing an aero kit from the engine manufacturers, will encourage a third manufacturer to join Honda and Chevrolet in the series.

IndyCar has long desired the entry of a third manufacturer and as well as gaining approval of the timeline from Chevrolet and Honda, consultation has taken place with OEMs not currently in the series. According to Mark Miles, CEO of IndyCar's parent company Hulman & Co, it is something that he is actively working on to achieve.

"That's something that would be very good and will we continue to work on it," he said. "I'm a commercial guy and I want to see a company come in that wants to use the series and get the most out of it, not just build a fast engine."

Among the aims of the new aero kit are to return to a more visually pleasing look, akin to the cars of the ChampCar series that was merged with IndyCar in 2008. This includes replacing the high-mounted air inlet pod behind the driver with sidepod-mounted inlets, and dispensing with additional aerodynamic devices.

IndyCar has released the sketches after completing initial wind tunnel testing of its proposed 2018 universal kit. Speaking at the Detroit Motor Show, the series' director of operations and competition Jay Frye insisted that the sketches do not represent the final design but show the direction in which the sport is going.

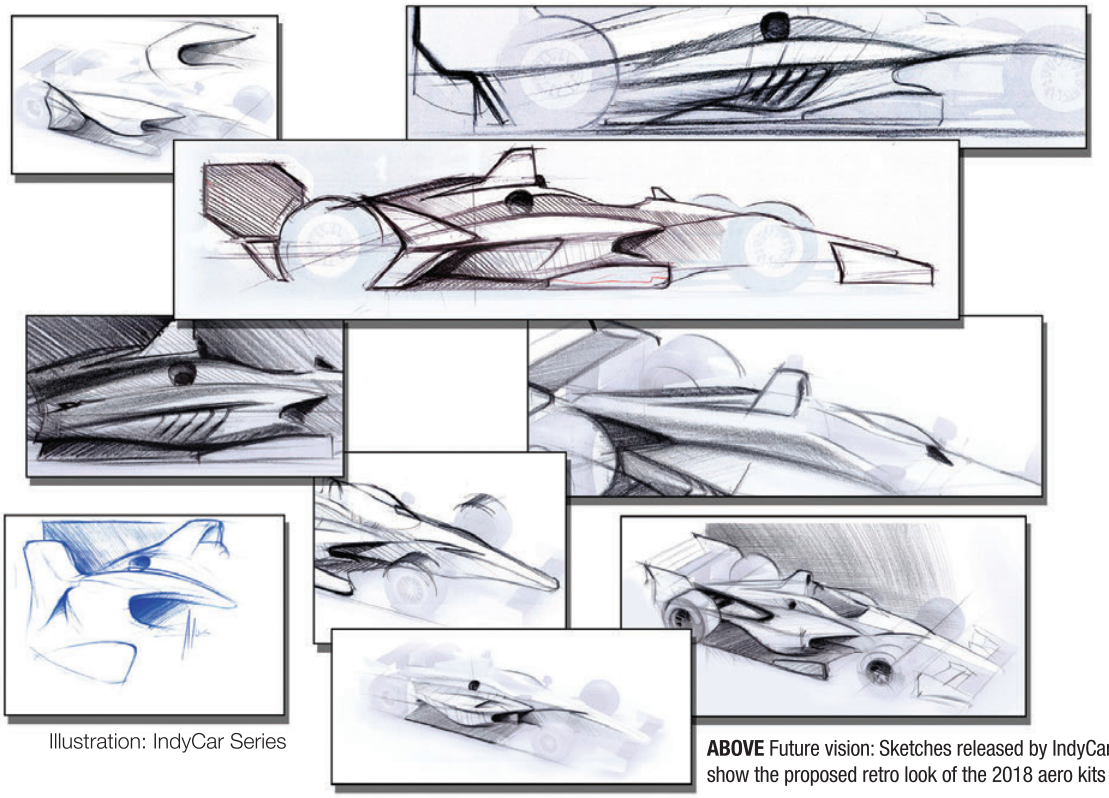


Illustration: IndyCar Series

ABOVE Future vision: Sketches released by IndyCar show the proposed retro look of the 2018 aero kits

The proposed shape of the new kit has been well received, drivers praising both its retro look and its implications for use of downforce. While the current Chevrolet and Honda kits generate most of their downforce from the top of the car, principally by means of wings and spoilers, the new kit will be far more efficient in generating ground effect under the car.

Speaking at Detroit, Andretti-Autosport driver Alexander Rossi, who won the 2016 Indianapolis 500, said that the current car is very hard to pass due to the dirty air generated when running close behind it.

"When you're relying on downforce coming from the bottom, you're not as affected by turbulence or dirty air, because the state that air is in is irrelevant when it hits the floor – that part (of the new kit) is massively encouraging," Rossi added.

The series intends to publish further development updates, and have a car wearing the new bodywork on display at the Indianapolis 500 in May.

IndyCar has also signed a contract committing Italian manufacturer Dallara, which produces the IR-12 chassis introduced in 2012, to the series through to the end of the 2020 season. Major interest is also being reported from manufacturers bidding for the contract to produce the aero kits.

One thing very unlikely to be seen on an IndyCar is the 'halo' head protection device. According to Miles, it is not suitable for the series. He believes that a windscreen would be a more favourable solution for IndyCar.

"We don't see that – the halo – having any possibility for us," he said at the North American International Auto Show. "We have banked tracks and you can't see out of the car with that, but we are very interested on developing driver head protection and continue to work hard. We are more likely to introduce a limited windscreen rather than that halo." RT

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NASCAR makes aero and safety changes

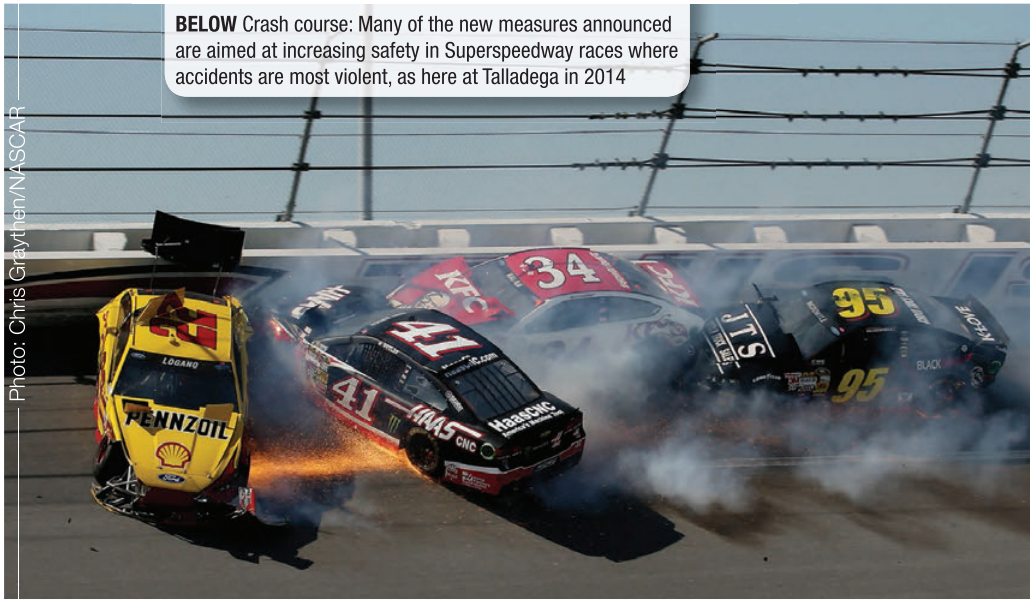
Andrew Charman

DAYTONA BEACH, FL: NASCAR has announced updates to its rule books for the 2017 season, with teams principally required to make changes for safety reasons. However, the measures also include a clarification to the 2017 aerodynamic package for the lead Monster Energy Cup, formerly the Sprint Cup.

Described in *Race Tech* 193, the new low-downforce package was tested in races at Michigan and Kentucky during the 2016 season. Its specification included a reduction in rear spoiler height from 3.5 (89 mm) to 2.5 inches (63.5 mm), and this has now been further reduced to 2.35 in (59.7 mm).

Two further measures apply to both the Monster Energy Cup and its second division sibling the Xfinity Series and focus primarily on the Superspeedway events at Daytona and Talladega. These high-speed circuits regularly produce the most violent accidents in the sport.

For 2017 all Superspeedway cars must be fitted with a driver escape hatch in the roof, and to use energy absorbing material to strengthen the toe board of the driver foot box. This measure was introduced after the accident at Daytona in 2015 in which driver Kyle Busch broke his leg, missing several races of the season. Both measures were previously optional and will remain so for non-Superspeedway races. However, NASCAR has increased the minimum weight of Cup and Xfinity cars by 20 lb to compensate for the weight the extra material will add, in the hope that teams will adopt the measures for all races.



BELOW Crash course: Many of the new measures announced are aimed at increasing safety in Superspeedway races where accidents are most violent, as here at Talladega in 2014

NASCAR has also confirmed that the size of the inlet manifold restrictor plate used at Superspeedway races will be reduced in diameter from 0.8906 inches to 0.875 inches in a bid to reduce speeds.

Drivers in Cup, Xfinity and the third-level Camping World Truck Series will also now be permitted to wear wrist-mounted biometric measuring devices in the car. They will be required to operate under their own power, not be connected to any part of the car and must not transmit any telematics data. No downloading of devices will be permitted during qualifying sessions or races.

NASCAR will maintain an approved list of such devices, though units similar in operation to those on the list will also be permitted.

Changes to tyre allocations also feature in the rule book updates. In the Cup Series, cars will now be required to start the race on the same tyres used in qualifying, while 12 races will have their tyre allocation reduced by one set, and eight others will be permitted an additional set. In the season finale at Homestead, Miami, teams will have 10 sets available, reduced by two from the 2016 allocation.

• Sources in the NASCAR pitlane suggest that the second-division Xfinity Series is to follow the lead Monster Energy Cup by adopting a lower downforce aerodynamic package in 2017. The measures could include a rear spoiler cut by three inches (76.2 mm) in height and four inches (101.6 mm) in width, and lowering the front splitter by an inch (25.4 mm). RT

Toyota Camry NASCAR

LEFT Toyota surprised Detroit Motor Show visitors on 9 January by unveiling its new NASCAR race car at the same time as revealing the 2018-specification Toyota Camry road car. The new Camry, detailed in a special feature starting on page 56, boasts significantly more dramatic styling compared to its predecessor. It will compete in this year's series while NASCAR rival Chevrolet has confirmed that 2017 will be the last season in the sport for its SS model – a new, as yet unnamed car will debut in 2018.

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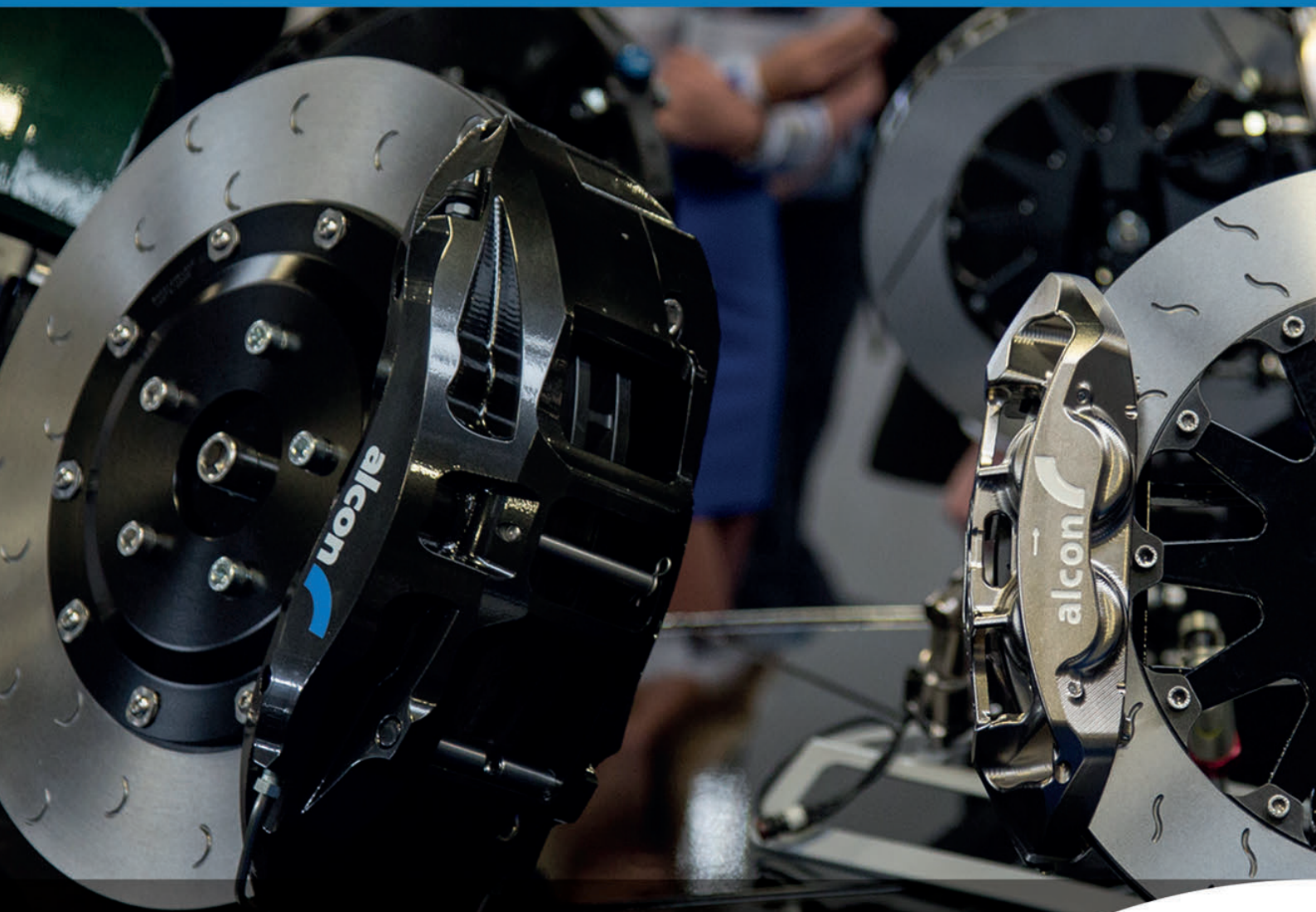

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Photo: NASCAR

ABOVE NASCAR has changed the race format of its three principal race series in an effort to juice up the action

NASCAR revises race format to enhance spectacle

DAYTONA BEACH, FL: NASCAR, has announced that it is changing the race format that will be implemented in all three of its national series — the Monster Energy NASCAR Cup Series, NASCAR XFinity Series and NASCAR Camping World Truck Series. The intention is to emphasise aggressive racing and strategy with the goal of delivering more dramatic moments over the course of a race and season.

"Simply put, this will make our great racing even better," said NASCAR chairman & CEO Brian France. "I'm proud of the unprecedented collaboration from our industry stakeholders, each of whom had a common goal — strengthening the sport for our fans. This is an enhancement fully rooted in teamwork, and the result will be an even better product every single week."

Under the new format, races will consist of three stages, with championship implications in each stage. The top-10 finishers in each stage will be awarded additional championship points. The winner of the first two stages of each race will receive one playoff point, and the race winner will receive five playoff points. Each playoff point will be added to a driver's reset total following the 26th race, if that competitor makes the playoffs.

The structure also ensures that competition will be dialled up throughout the duration of the 26-race regular season, as points for both stage winners and race winners will transfer into the post-season — and an official regular season champion will be crowned and rewarded with 15 playoff points to the driver's playoff reset of 2,000. The stage format also gives fans a pair of natural breaks in the action.

All playoff points will carry through to the end of the third round of the postseason (round of 8), with the Championship 4 racing straight-up at Homestead-Miami Speedway for the title.

Championship points following the first two stages of each race will be awarded on a descending scale, with the stage winner receiving 10 points, second earning nine points, and so on. The race winner following the final stage will receive 40 points, second-place will earn 35, third-place 34, fourth-place 33, and so on. In addition, the top-10 drivers in regular-season points also will receive playoff points with second place earning 10 points, third place getting eight points, fourth place obtaining seven points, and so on.

"These are enhancements that the NASCAR fan has long sought, and the entire industry has worked hard to develop a better racing format for our fans," said Steve O'Donnell, NASCAR executive vice president and chief racing development officer. "This format puts a premium on every victory and every in-race position over the course of the season. Each point can eventually result in winning or losing a championship." RT

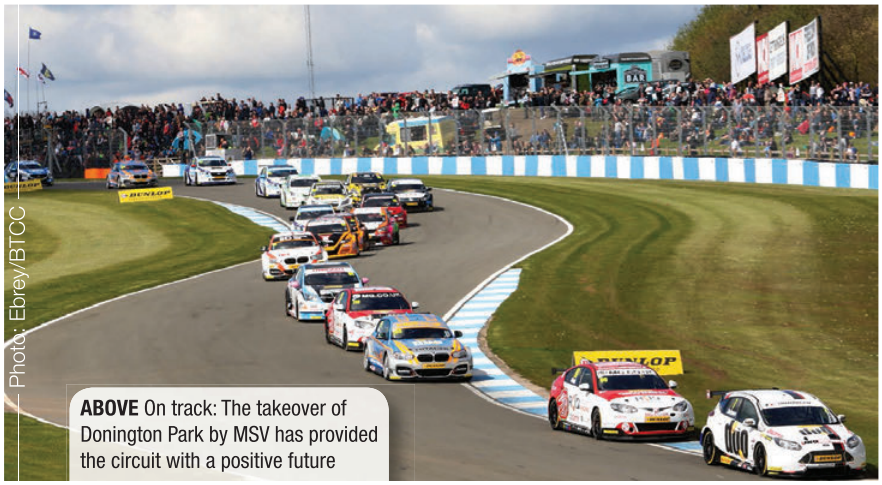
MSV adds Donington to its track portfolio

Andrew Charman

CASTLE DONINGTON, UK: Multiple UK race circuit owner MSV has taken over the Donington Park track near Derby. It will be added to the existing portfolio that includes the Brands Hatch, Cadwell Park, Oulton Park and Snetterton circuits and the Bedford Autodrome test and track-day venue. Under the agreement, MSV will run the circuit business and has also taken a 21-year initial lease on the Donington Park estate. The renowned Grand Prix Collection will also remain at Donington

MSV, owned by former F1 driver Jonathan Palmer and Sir Peter Ogden, also holds the promotional rights to the BRDC British F3 Championship and the MCE British Superbike Circuit. The company has recently expanded into Europe – it is currently developing a new large motorsport facility, the Laon Autodrome, on a former military airfield in northeast France, purchased in 2015.

"Donington is a good British circuit that deserves further investment, energy and expertise in order to make it truly outstanding, and MSV will provide this," said Palmer. "We plan a great new era for Donington, with some exciting new events and much enhanced quality of experience for all of its customers, whether spectators, competitors and track day participants, together with even better value." RT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ABOVE On track: The takeover of Donington Park by MSV has provided the circuit with a positive future

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Ginetta announces LMP1 car

ABOVE Ginetta is using some top quality designers and aerodynamicists to produce a LMP1 car that it intends to sell rather than race itself as a works entry

William Kimberley

LEEDS, UK: Ginetta announced at Autosport International that it is going to become a LMP1 chassis manufacturer for the 2018 FIA World Endurance Championship (WEC). It follows the announcement of the Automobile Club de l'Ouest's (ACO) new 2017 LMP1 rules that are now fixed for five years while also offering an open forum for design comparative to the more controlled formula of P2.

Ginetta has a longstanding relationship with the ACO, having been the founding manufacturer of the hugely successful LMP3 class in 2015. Despite its LMP2 chassis bid being unsuccessful, the Ginetta design team has remained a powerful force in prototypes, moving toward P1 spec having released the powerful G57 in 2016. With both the Ginetta LMP3 and G57 securing their position as some of the most competitive prototypes in the world, Ginetta has seized the chance to add a LMP1 car to its range.

The Ginetta LMP1 design has started from scratch, allowing the company to partner with world-class designers and supply partners to create what it believes will be an extremely competitive car. The company is in advanced talks with engine supplier Mecachrome as well as Xtrac for the drivetrain. The car will be around 60 kg lighter than a P2 and have up to 200 bhp more. Accompanied with the huge downforce that the new aerodynamic team will develop, Ginetta is confident it will be a class-leading car.

The highly talented design team behind the car include Adrian Reynard along with a newly recruited head of aerodynamics who will be named in due course that brings LMP1-H experience. Paolo Catone, who previously designed the Le Mans winning Peugeot 908, will also be heavily involved in Ginetta LMP1 design.

"This certainly appeals to my competitive nature," said Reynard. "Aerodynamics, drive-ability and fuel efficiency dominate race car performance in this category. With the highly talented team of experienced engineers that Ginetta has available, this LMP1 contender will be designed and developed to challenge at the highest level. Ginetta chairman Lawrence Tomlinson has a strong desire to create the very best LMP1 car available for the privateer and he has the commitment to deliver a production run of these."

"I'm delighted to be involved in this exciting and challenging project with Ginetta and believe the merging of different experiences, in cooperation with the technical staff in place, will generate a competitive project for the new LMP1 Privateers market," said Catone.

"I'm hugely thankful to the ACO for the opportunity to run at the front and challenge for overall podiums," said Tomlinson. "The Ginetta design team's ability has already been proven by the class dominating Ginetta LMP3 and G57. With Adrian and Paolo on board, the performance of the Ginetta LMP1 is going to be amazing. We are now offering a genuine ladder for our customers all the way from first race to Le Mans which is incredibly exciting for me."

Ginetta will not be running a factory team but will be looking to build 10 chassis to support three, two-car teams run by customers. Significant interest has already been expressed from both new and existing customers, including G57 customers PRT Racing and ARC Bratislava for their 2018 WEC campaigns.

"After competing for many years in worldwide GT racing, Ginetta gave me the opportunity to move into prototypes with its LMP3," said Miro Konopka, ARC Bratislava team owner. "We are incredibly excited about this new chassis which will allow me to expand my motorsport platforms to include the WEC and every team and driver's ambition, to compete in the 24 Hours of Le Mans." RT

Ginetta upgrades G55 GT4

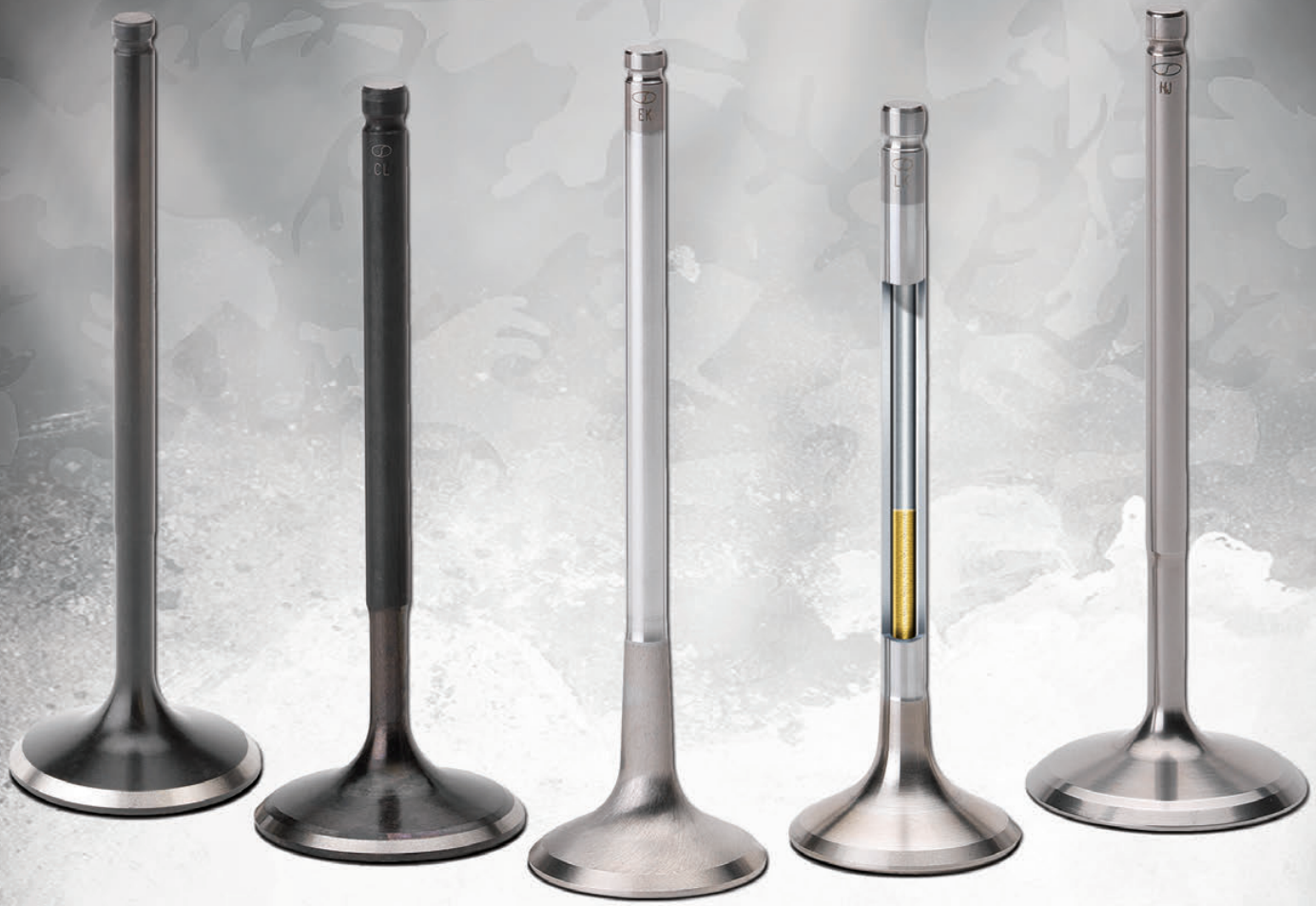
LEEDS, UK: Fresh from its fifth Dubai 24 hour class win in six years, Ginetta unveiled the new-for-2017 upgrades to the Ginetta G55 GT4 that sees an additional 33 bhp being produced by an engine power upgrade and high power side exit exhaust system. Crucially, the lap time delta between amateur and pro drivers will be reduced by the introduction of electronic traction control and an ABS anti-lock braking system. In addition, the switch from 10" front and 11" rear tyres saw lap times improve during testing whilst the introduction of centre locking wheel nuts means pit stop times will be shortened.

The G55 is Ginetta's commitment to the ongoing development which has seen the marque win the British GT4 class six times in the nine years since the class was created in 2008. RT

Photo: Ginetta

ABOVE The Ginetta G55 GT4 has undergone an upgrade for the 2017 season

SUPERTECH



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PERSONNEL

Following the takeover of Formula 1 by Liberty Media, **Chase Carey** has expanded his role to become both president and CEO, replacing **Bernie Ecclestone** in the latter role who now becomes chairman emeritus. **Ross Brawn** has been appointed as managing director, motor sports and former ESPN executive **Sean Bratches** as managing director, commercial operations.

Paddy Lowe has left his position as technical boss of Mercedes after a spell at the team that led to three drivers' and constructors' championship doubles in a row from 2014 to 2016. At the time of writing he is expected to take on a role heading the technical side of the entire Williams group, including the F1 team. He is also expected to head up the burgeoning Williams Advanced Technologies business. He will be replaced at Mercedes by former Ferrari technical director **James Allison**, whose deal was signed some months ago, according to sources, but is not yet confirmed at the time of press.

It was differences of opinion among Renault's senior management about its direction in Formula 1 that led to **Frederic Vasseur** resigning from his team principal role in early January. On announcing that he was leaving the team by 'mutual consent' Renault stated that president **Jerome Stoll** and managing director **Cyril Abiteboul** would now run the outfit together.

With the introduction of new race cars and the anticipation of expanding grids in several of its sanctioned series, International Motor Sports Association (IMSA) officials have announced some organisational changes to its competition team. **Geoff Carter**, who joined the sanctioning body as senior series manager for the IMSA WeatherTech SportsCar Championship prior to the 2015 racing season, has been promoted to senior director, technical regulations and compliance. He will continue to serve as chair of IMSA's technical committee, and now has a dedicated role as the primary technical liaison with manufacturers and teams. He is responsible for the technical management for all IMSA-sanctioned series. A search for a new WeatherTech Championship manager is under way.

Kyle Novak adds the position of race director for the IMSA Continental Tire SportsCar Challenge in 2017 to his existing race director duties for the IMSA Porsche GT3 Cup Challenge USA by Yokohama and the IMSA Ultra 94 Porsche GT3 Cup Challenge Canada by Yokohama. He originally joined IMSA's race control team in 2015 as race director for the Lamborghini Blancpain Super Trofeo North America.

Sven Behrens has joined ZF Race Engineering as director motorsports after 12 years at Bosch Engineering where he became director motorsport customer projects and application.

NASCAR organisation Chip Ganassi Racing has named **Mark McArdle** as its competition director. The widely respected engineer joins the team after two years with Roush Fenway Racing.

Scott Davies has been promoted to powertrain testing manager at McLaren Automotive's powertrain engineering team with the responsibility for testing and development. **Ciaran Branney** will lead the powertrain performance & analysis team with responsibilities for powertrain CAE. RT

Le Mans business week

LE MANS, France: The next International Business Day will take place on 14-15 June in Le Mans Technoparc in the run up to the 24 Hour race. The event is open to businesses involved in motorsport, automotive and aerospace and other industries. This year the number of 1-to-1 pre-arranged and personalised meetings has been increased as has the number of product presentations. Two additional conferences and sharing of best practices are planned during the day. Companies can also showcase their products in the small table top exhibition that runs alongside the core event. The first day also features a tour around the paddock with a visit to one or two teams.

There is a gastronomic element to the event with a gourmet dinner served at the Auberge de Mulsanne with the opportunity after dinner to view qualifying from a private location at the second chicane. The second day is back to an intense business day as three 1-to-1 sessions are planned. For more information visit www.ibdlemans.com. RT

BELOW The International Business Days at Le Mans have developed into a useful networking event over the years

IN BRIEF

KIA's new Stinger GT coupe, unveiled at the Detroit Motor Show, could form the basis of an entry into the Australian V8 Supercars Championship. Kia Motors Australia chief operating officer Damien Meredith has told Australian media that he has discussed such a programme with 'one group'. If it does enter the series, it could see the field back up to four brands after Volvo's withdrawal sees the grid down to three for 2017.

McLAREN Racing and Stratasys have announced a new four-year partnership under which Stratasys will supply McLaren Racing with a suite of 3D printing and additive manufacturing solutions, as the Official Supplier of 3D Printing Solutions to the McLaren-Honda Formula 1 team. Stratasys will work closely with the grand prix outfit as it ramps up its rapid manufacturing capacity at the McLaren Technology Centre in Woking. Under the agreement, Stratasys will supply McLaren Racing with its latest FDM and PolyJet based 3D printing solutions and cutting-edge materials for visual and functional prototyping, production tooling including composite tooling, and customised production parts – enabling their accelerated delivery while increasing performance and productivity in design and manufacturing operations.

SPECULATION that Dodge is seeking a return to NASCAR racing has been heightened by a private meeting between representatives of the manufacturer and senior NASCAR officials, including president Mike Helton, at the Detroit Motor Show on 9 January. Fiat Chrysler Automobiles CEO Sergio Marchionne, who pulled Dodge out of the sport in 2012 while rescuing Chrysler Group from bankruptcy, said on 4 December that he would like to return to the sport.

SOURCES in NASCAR are speculating that the arrival of Monster Energy as lead series sponsor will produce changes in the format of races, shortening them or more likely scheduling 'breaks', effectively turning the races into heats. Any changes would be most likely to be announced during the NASCAR media days, just after this issue goes to press.

NASCAR and IndyCar venue Texas Motor Speedway is to be resurfaced, during which the 1.5-mile track will have the banking angle in Turns 1 and 2 reduced by four degrees to 20 degrees. The track surface in these turns will also be widened from 60 to 80 feet and a major new drainage system will be installed in a bid to speed up track drying time after wet weather. The work is expected to be completed by mid-March.

ATLANTA Motor Speedway is also to be resurfaced before its 2017 NASCAR events, replacing a surface last renewed 20 years ago. The configuration and 24-degree banking of the 1.5-mile quad-oval will not be changed.

THE IndyCar Series has agreed a multi-year extension to its contract with tyre supplier Firestone. The company first supplied tyres to Indianapolis competitors in 1911, returned to the sport in 1995 and has been the series sole supplier since 2000.

VETERAN IndyCar team AJ Foyt Racing has switched to Chevrolet engines and bodies from Honda. The team last used Chevrolet in 2005 – the US manufacturer has won the last five IndyCar manufacturer titles.

INDYCAR continues to work on developing cockpit protection for its cars, but no decision has been made yet and the solutions may not be introduced in time for the 2018 season. IndyCar director of operations and competition Jay Frye has also indicated that different forms of protection could be adopted for speedway and road/street course events.

THE latest regional series to join the burgeoning TCR touring car category is TCR China. A five-meeting initial series will be held in 2017, run by Shanghai Lisheng Racing that also promotes the China Touring Car Championship. Two of the rounds will run with the existing TCR Asia series, the penultimate round will take place at Zhejiang with the TCR International Series, and there will be a non-championship invitational race in Macau on 19 November.

TEAMWORK Motorsport is set to expand its TCR programme in response to a swell of interest in the formula. A successful 2016 season featured victorious campaigns in the burgeoning TCR Asia Series, China and Hong Kong Touring Car Championships, China GT and Macau Grand Prix, but Teamwork Motorsport will wind-up its independent CTCC programme and reallocate its resources in 2017. Teamwork's CTCC drivers Sunny Wong and Alex Hui will switch their attention to the squad's TCR project, but interest in the formula is soaring and it is currently in talks with a number of other racers while deciding whether to commit to TCR Asia or China, or both.

VIKTOR Shapovalov, the Lada team principal, is understood to be trying to get a Vesta TC1 on the grid again this year as a privateer despite the team officially withdrawing as a manufacturer entry from the World Touring Car Championship. The team competed as a private entry as Russian Bears Racing in 2008, prior to becoming the Lada factory squad in 2009.

REPUBLICAN congressman Patrick McHenry has filed a bill to amend the Clean Air Act, making all racing cars exempt from federal vehicle emissions standards. Under his Recognizing the Protection of Motorsports or RPM Act, the Environmental Protection Agency would be permanently prevented from enforcing clean air legislation on amateur drivers using modified road engines for racing. RT

BRAINS AND BRAWN

F1 is preparing for life after Bernie. Our **Expert Witness** – who as an F1 insider has seen how he operates – considers Ecclestone's success and the new regime's to-do list

IT had to happen at some point. Although you sometimes wondered whether Mr Ecclestone was the only person who could do a deal so that they were able to keep their role permanently, ie immortality!

He is an original entrepreneur, always working and generating money, early on by buying and selling cars. Ecclestone has been a racing driver, then a team owner all the way to the top of motorsport, winning the F1 Drivers' World Championship with Brabham in the '80s, twice.

It is during this period that he made his critical political moves in helping establish and then lead FOCA, the Formula One Constructors Association, which represented the interests of the largely British privateer teams. Ultimately, through alternative events or race boycotts in 1980, '81 and '82, FOCA won against FISA, Jean Marie Balestre and the power of the more manufacturer teams – the foundations of today's FOA/FIA and Concorde agreements were born. Bernie, crucially, was able to recognise the financial potential and very successfully become the Commercial Rights Holder, converting Formula 1 into, in over 30 years lest we forget, a huge brand.

He is sharp, competitive, an incredible negotiator. None of the rise of this model was a coincidence or left to chance. The expression 'a victim of their own success' was certainly not the case. Occasionally, seeing the benefits, a potential rival or alternative may fleetingly have materialised, but the hold and strength of Bernie's control meant this quickly passed.

One incident that perhaps typified his approach sticks in my mind. I remember the new BAR F1 team wanting to run alternative tobacco colour schemes on its two cars in 1999. The request was declined but it chose to publicly complain and legally contest the decision. At the very next European race, its new vertically extending paddock trucks found they had been allocated a position under a bridge and the number of passes it was granted was considerably less than requested. The cars ran identical colour schemes that season, the right-hand side blue and yellow, the left red and white.

Bernie is highly respected and also feared then within F1, yes. But he has also commanded the support and backing that was at times essential, and this fact is much less known or reported.

So, what's changed? Viewing figures and ▶

ABOVE No man has better credentials to succeed Bernie Ecclestone (left) than Ross Brawn

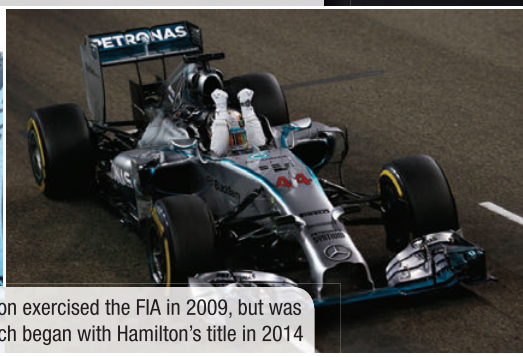
ABOVE & BELOW Poachers turned gamekeepers: Ecclestone (right) and Max Mosley rose from team owners of Brabham and March (above in 1973) to rule the sport with FOM and the FIA

ABOVE Zip it: BAR fell foul of Ecclestone in a rumpus over plans for a dual livery

Photos: LAT

Liberty Media

ABOVE The new team: Chase Carey (centre), Chairman and CEO of Formula 1, will work with Ross Brawn as Managing Director, Motor Sports, and Sean Bratches as Managing Director, Commercial Operations



ABOVE Brawn was instrumental in the success of Ferrari's Schumacher era; double diffuser innovation exercised the FIA in 2009, but was pivotal in Brawn GP winning the world title; and he built the foundations for the Merc dominance which began with Hamilton's title in 2014

therefore revenues are consistently down. Some of the direction also seems nostalgic, rather than forward-thinking: the current and rare potential new fan needs more incentives to stay or start to take F1 to their heart. Attempts to either introduce different leadership or ideas seemed to fall on deaf ears – perhaps it was all lost in the dispute about lack of engine noise?

Then, in 2016, along comes Liberty Media, an American multibillion dollar communication giant with links to sports franchises. At first it didn't register as that significant. A media company, though: not a bad start if the image and options to engage more fans appeared to be flagging; but US-based – F1 has always found that market difficult to crack, hasn't it? However, when they sit down to discuss new motorsport regulations over there, one of the first questions they normally ask is: "How are we going to make it better for the fans?"

F1 changed hands with a transaction price representing an enterprise value of $8.0 billion and an equity value of $4.4 billion. Initially it looked as if a familiar conjuring trick would be worked, with Ecclestone selling F1 but effectively retaining control.

The announcements of the last few days that Ecclestone, at 86, would be stepping down to a Chairman Emeritus role, being replaced by three men, has been a seismic change. With all due respect to Sean Bratches and Chase Carey, it was not their names that caught my eye. Ross Brawn back to F1 is the big story here.

If there is one person, perhaps the only one I can think of with the long-term strategic planning, putting the right ingredients in place, who has the respect and gravitas to put F1 back on the right path, it's Ross. Liberty you have made an essential signing and earned some serious new starter respect.

He knows F1, good and bad. His track record absolutely speaks for itself: Benetton; the Ferrari era of dominance – where he stood up to the management and stopped the 'blame game' culture; saving BAR Honda from closure; and winning the World Championships in his first year with double diffuser innovation with his name above the door. Last but not least, don't forget today's dominant F1 team had the good fortune of having him build all the pre-rule change foundations for them, before they didn't look after him in return.

Why would he come back for anything but the top job, having achieved everything else? It may not happen overnight and the new 2017 rules remain unproven, but it seems that with media experts, new opportunities and F1's most successful strategist, the future is in safe hands. RT

MONSTERS IN MONTE CARLO

Anthony Peacock ponders the lessons we learned from the start of a new era in world rallying

THE oldest and most famous rally in the world, first run in 1911, heralded a new era of the sport with faster, louder and more spectacular cars: the same general direction in which Formula 1 is going, to provide wider and more visceral fan appeal in an age of narrowing attention spans.

But apart from the fact that the cars look amazing, what else did we learn? Former F1 and Le Mans driver Mark Webber was in Monaco for the first round and he pointed out what we've all been thinking: the cars recapture the spirit of Group B with their outlandish aerodynamic appendages and obvious tendency to strain at the leash. But this conflicts with the current era of political correctness, with the sport's promoters now keen to play down that aspect, as Group B in the eyes of some were the 'killer years' of rallying. In an uncomfortable coincidence, a spectator lost his life on the first stage of the rally, when Hayden Paddon rolled his Hyundai at a slow corner.

That wasn't something that anybody wanted to see but nonetheless the inconvenient truth is that most fans are excited by the prospect (or at least the illusion of the prospect) of high-speed accidents. A cursory look at the most popular motorsport videos on YouTube, many of which are not pretty, rapidly confirms the fact.

And this is why the cars now look like monsters again. Watching them on the stages, they appear to be a real handful, which is exactly what they should be. Even four-time champion Sebastien Ogier ended up in a ditch on the first morning.

In that regard, we can say that the new cars are a success. But first, a caveat. Monte Carlo is the single most atypical event of the entire championship, which is why it's compared with monotonous regularity to the roulette wheel in the casino, by writers who think they are being original.

So it would be wrong to draw any firm conclusions based exclusively on the 'Monte'. By the same token, next up is Sweden – where temperatures can dip below minus 20 degrees centigrade – and then there's Mexico, where the engines are starved of oxygen by the 3000-metre altitude, followed by Corsica, which is a law unto itself (in every sense). So it's not actually until Argentina, at the very end of April, that we'll see anything like a level playing field.

But this doesn't mean that Monte was an exercise in futility, merely that it's an event that likes to keep people guessing. And there are already some firm trends that we can identify.

Firstly, the Hyundai i20 Coupe WRC looks like a formidable weapon. No surprise there, as it's a sensible car put together by the eminently capable Michel Nandan, with the team finishing second in both championships last year. There's only one more step to take on the ladder of improvement and they are heading in that

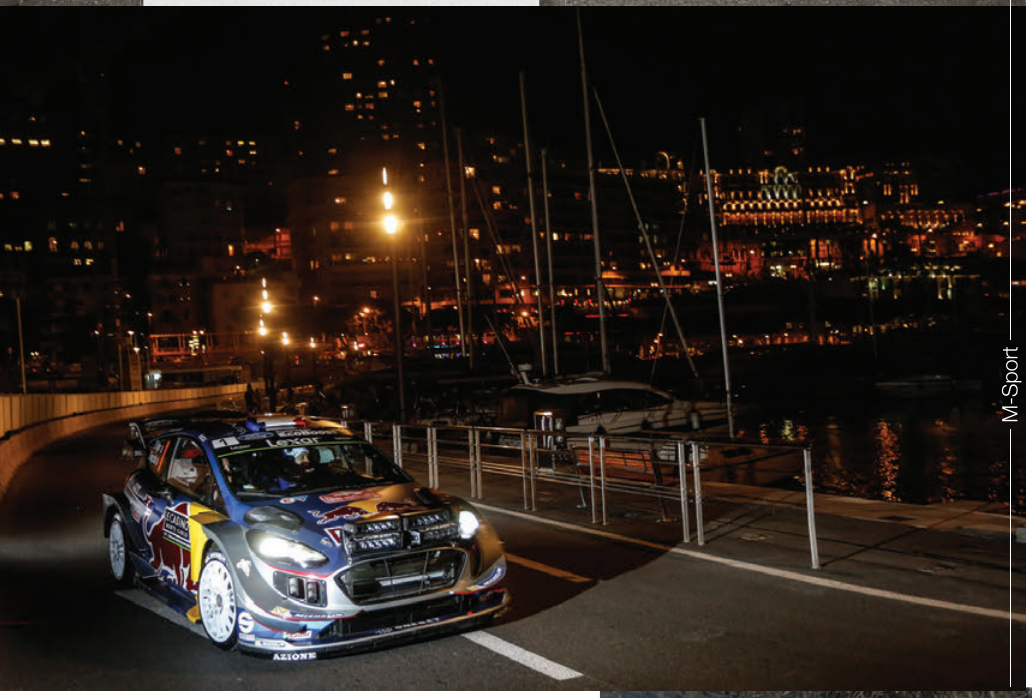
> *"The inconvenient truth is that most fans are excited by the prospect of high-speed accidents"*

M-Sport

ABOVE Monte magic: Ogier supplied M-Sport's first victory for five seasons

ABOVE & BELOW Beasts roamed Monte Carlo: the latest generation of World Rally Cars look great – but defy political correctness

McKlein/LAT



M-Sport

direction, with Thierry Neuville leading the rally comfortably before making a mistake on Saturday afternoon.

But there's no substitute for experience in rallying, and that is where the Ogier and M-Sport combination wins. Considering that Ogier had the least seat time of any 'factory' driver and that M-Sport doesn't have the same manufacturer support as its direct rivals, the win in Monte Carlo was an ominous warning shot.

At the post-event press conference, team boss Malcolm Wilson was struggling to find his seat. "It's been so long since I've been here, I've forgotten where to sit!" he quipped. "Just over there," replied Ogier. "You're going to have to get used to it again now…"

That's confidence for you. But while Hyundai will be the team to beat, a shocking weekend for Citroen doesn't mean that they can be discounted. Anecdotal evidence suggests that the C3 WRC is the fastest car, and while Monte certainly didn't reflect that (with only one fastest time for the multiple winners) just wait until we get to some more consistent surfaces. The fact that a previous-generation DS3 WRC (which is at least a second per kilometre slower) was fifth with Craig Breen – Citroen's highest finisher – and a Skoda Fabia R5 seventh with Andreas Mikkelsen underlines the fact that raw speed was absolutely no advantage on a slippery, snowy and changeable Monte, as it was impossible to use all the power.

And what of the new kids on the block, Toyota: back after 17 years with an all-Finnish line up of Jari-Matti Latvala – who was mentally destroyed by his former team-mate Ogier last season – and Juho Hanninen; a man who had not competed on a World Championship rally for two and a half years? Both drivers set top-three stage times, the car was as reliable as any other, and Latvala finished second. It was perhaps the most impressive performance of the rally, but also the hardest to read.

The rest of the season will tell its own story but one thing is clear: there's nothing fundamentally wrong with the Yaris WRC, even though it is very different from anything else. So does that mean it has the most intriguing development potential of all the cars? The rapid roads of Rally Sweden – one of the fastest rallies of the whole championship – will provide a clue. RT

ABOVE The death of a fan raised an uncomfortable spectre for a rally billed as the return of Group B – and marred an otherwise hugely encouraging event for Hyundai

Hyundai

RED LETTER DAY FOR F1

Craig Scarborough says Ferrari's letter to the FIA, requesting 'clarification' of a controversial suspension system, has sent shockwaves through the F1 paddock

THE 2017 F1 season might feature new rules, but it is likely to be dogged by familiar rancour as the complexity of suspension systems continues to cause controversy. The current issue concerns the suspension design being adapted solely to improve the aerodynamic setup of the car, rather than chasing mechanical grip through better use of the tyres.

Since active suspension was banned back in 1994, teams have sought to control the cars' attitude via mechanical and, latterly, hydraulic means. FRIC (Front and Rear InterConnected) suspension systems were banned in mid-2015 but teams still explored workarounds to achieve similar results.

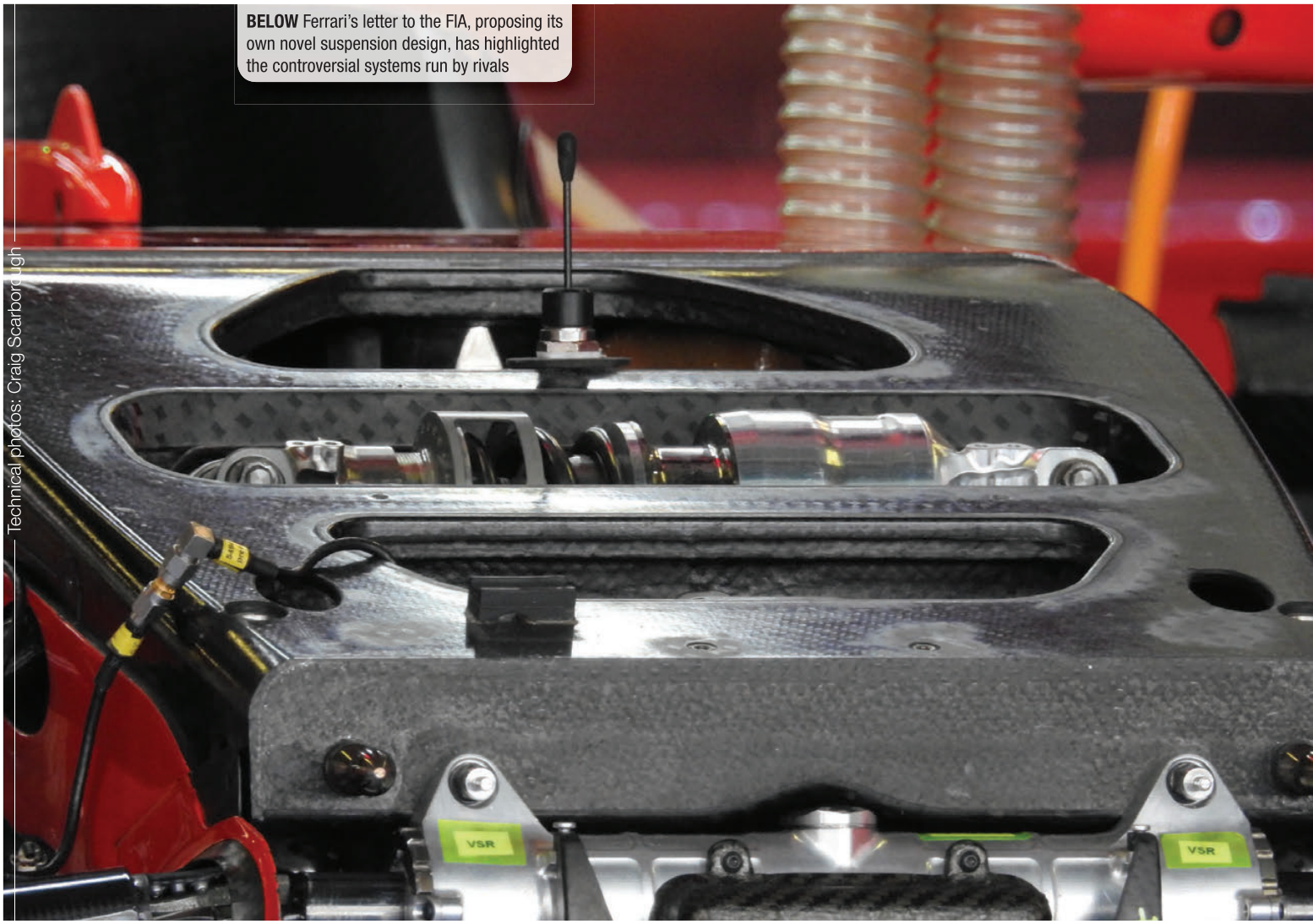
Now it has emerged that Ferrari has queried the legality of a design that sought to accumulate hydraulic pressure to be reused at a later point in the lap, the aim being to prevent pitch during braking. The FIA said this was in contravention of the rules and recent clarifications.

Rather than this being a simple request for a new system to be developed by Ferrari, it's more likely this was a ploy to get the legality of rival teams' systems queried. With it, we can start to understand how far these pitch control systems have come since FRIC was banned.

So why are these systems required in the first place? There are two scenarios.

RUNNING WITH RAKE

The first is that teams run the cars with an extreme nose-down, tail-up raked attitude.



BELOW Ferrari's letter to the FIA, proposing its own novel suspension design, has highlighted the controversial systems run by rivals

Technical photos: Craig Scarborough

Hone/LAT

ABOVE There have been no cars running on the racetrack close-season, but that hasn't stopped Ferrari's battle with Mercedes and Red Bull continuing to take centre stage

> *"Teams are playing with passive hydraulics to gain characteristics previously only available with active suspension"*

Running this setup angles the entire underfloor to the track, making its full length a part of the diffuser and expanding more airflow for more downforce, whilst also placing the front wing closer to the track to work more efficiently in ground effect. In this attitude the part of the car closest to the track is the front splitter and the leading edge of the legality plank with its skid blocks.

Although rear ride heights are at near 150 mm and front ride height down to 30 mm, teams would run more rake if they could. But the plank wearing down against the track prevents this as excessive wear will lead to disqualification. So, managing the few millimetres of front ride height under braking is important to maintain legality and the aero effect. Ideally, a stiffer suspension is required for the last few millimetres of travel, leaving a softer suspension for the rest of the travel for aiding mechanical grip and coping with track irregularities. ▶

BELOW Hydraulic Pitch Control (HPC) has been common on F1 cars since FRIC was banned

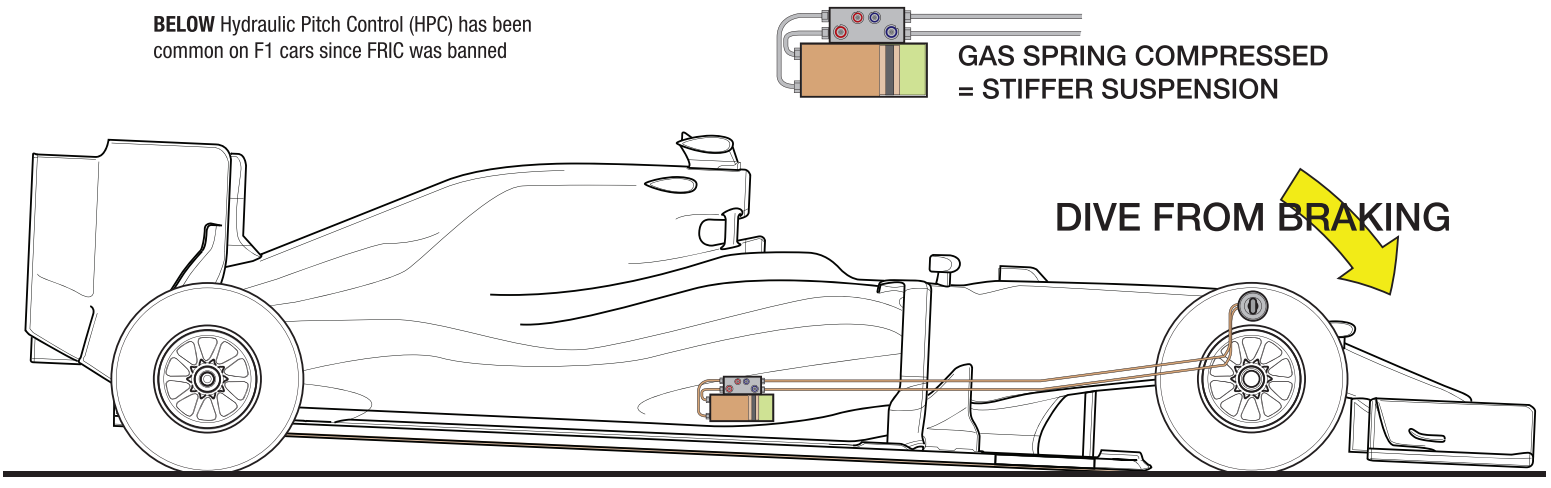
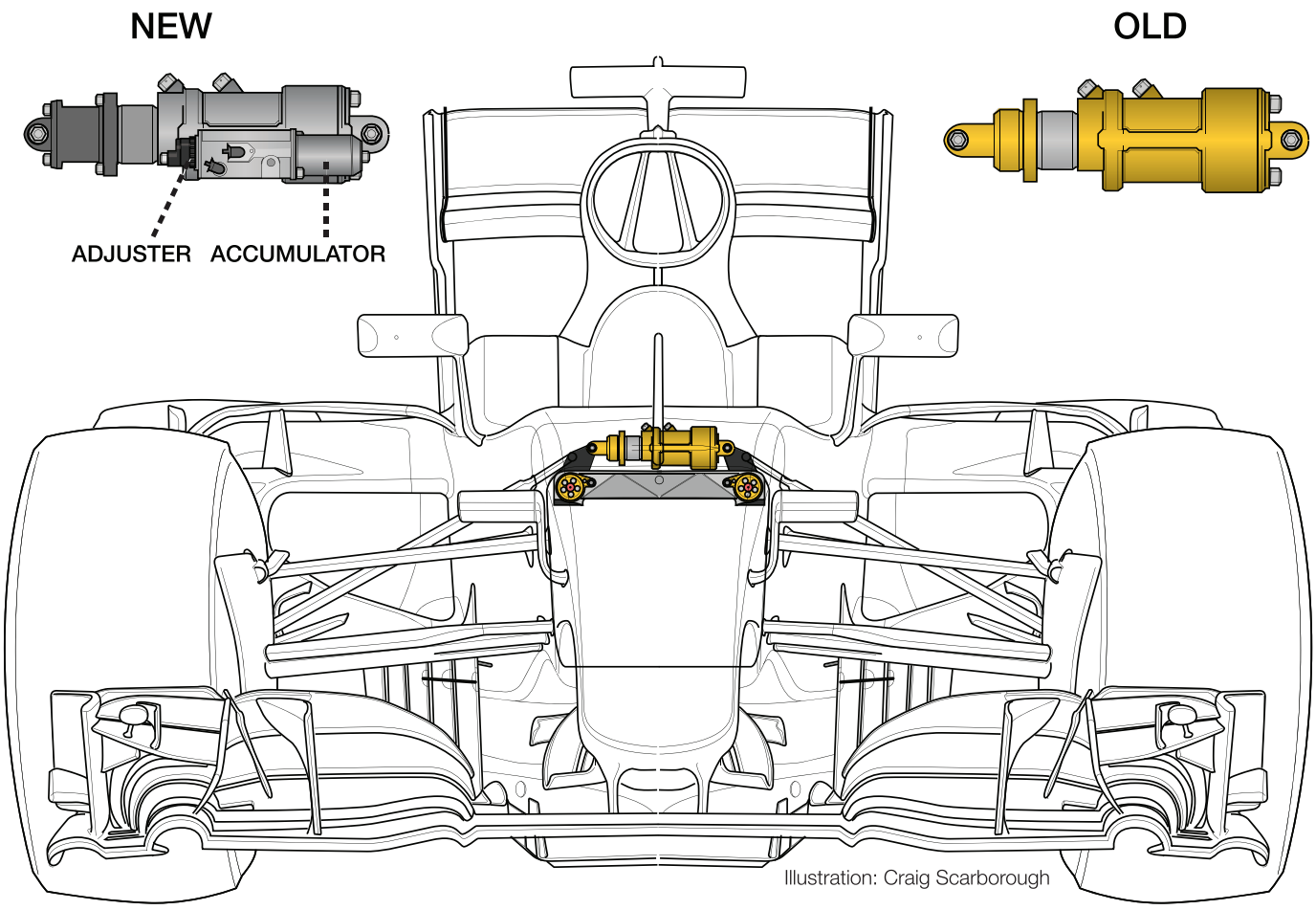


Illustration: Craig Scarborough



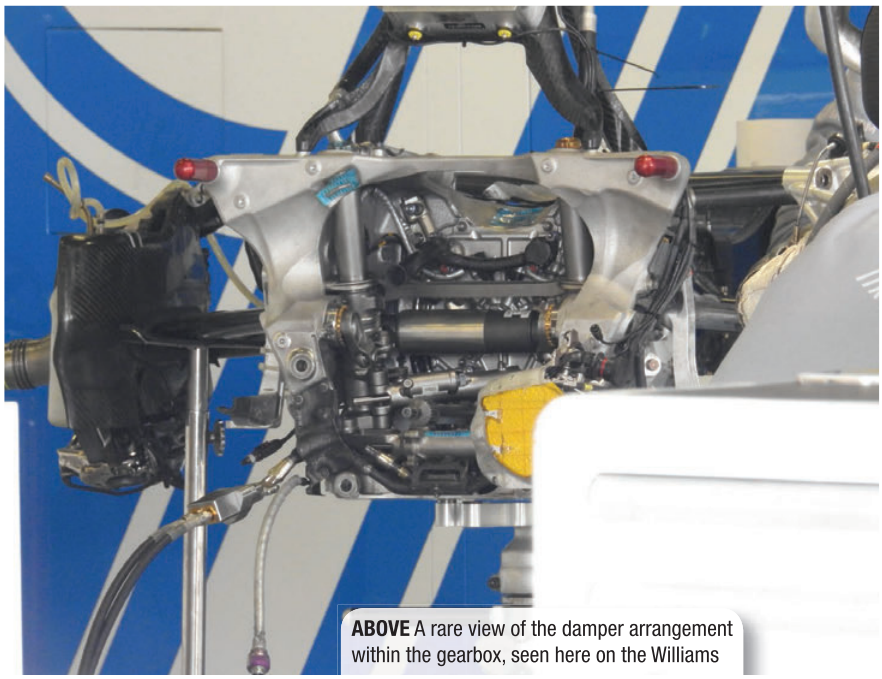
ABOVE Mercedes' change to its suspension system last season has triggered a row that threatens to run on into the new campaign

TARGETING AERO

The second scenario is less well reported and unsubstantiated, whereby teams could arrange the rear aerodynamics to stall at high speed as the rear ride height diminished under aero load. Doing this will reduce induced drag from the rear wing and boost aero efficiency for more top speed.

The potential issue with this aero arrangement is that as the rear aero stalls, the vertical load is reduced, allowing the rear suspension to rebound and put the aero back in its high downforce attitude. This would set up a cycle that leads to porpoising, seeing the rear end bob up and down as the aero and suspension fight each other. If the suspension could be prevented from rebounding for the duration of the straight, then the stalled effect could be exploited properly.

> *"A self-pumping hydraulic reactive suspension"*



ABOVE A rare view of the damper arrangement within the gearbox, seen here on the Williams

At this point it's worth pointing out that neither of these suspension modes would be beneficial for mechanical grip. The primary aim is for aerodynamic control.

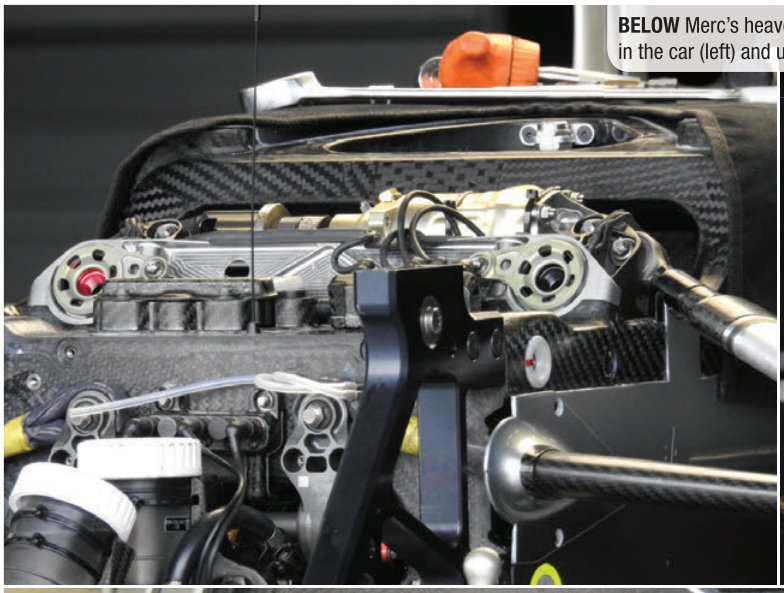
Effectively both suspension modes aim to provide extra stiffness under certain conditions, ie front suspension stiffer compression when fully compressed and rear suspension stiffer rebound when fully compressed. Having such position-sensitive non-linear suspension control is possible via a number of ways: rocker geometry; PSD bypass valves; and progressive springs. ▶

Recent F1 systems have used a remote third springing element mounted in the sidepod and operated by hydraulic lines. With either a gas or mechanical spring, the valve setup allows for a much stiffer final travel and what is known as Hydraulic Pitch Control (HPC) has been common on F1 cars since FRIC was banned. In this form the FIA has been satisfied this is legal within the current regulations.

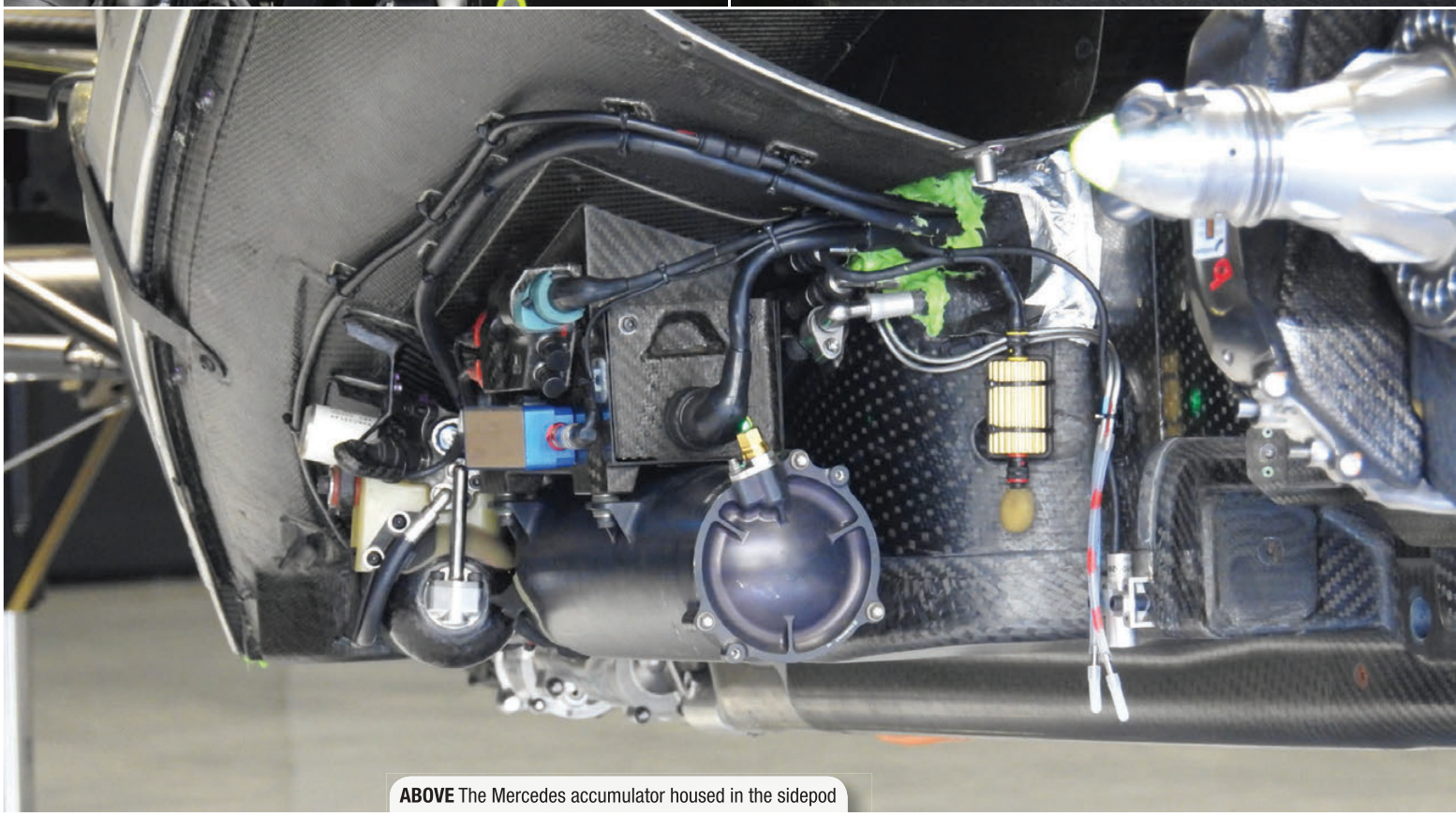
However, the FIA has been uneasy about the transparency of such systems and the purpose to which they might be employed beyond accepted suspension control. At the last GP of 2016 the governing body inspected every team's suspension setup and started to become concerned about the complexity being employed and the aerodynamic platform control they could provide. So, when Ferrari queried the legality of a system it was allegedly considering, the FIA's response was unsurprisingly negative.

Ferrari's chief designer Simone Resta worded his request to FIA race director Charlie Whiting as a potential system to be run by the Scuderia. The concept would store energy from load applied to the wheel, then use this 'recovered energy' at a later point in the suspension travel and potentially in a direction opposed to the applied load. Effectively, it would be a self-pumping hydraulic reactive suspension.

Ferrari's request was unlikely to be purely for its own self-interest. Rather, it was pointed at another team's system in order for it to be assessed by the FIA and proven legal or illegal. This is a common ploy used by all the teams to prevent open ▶



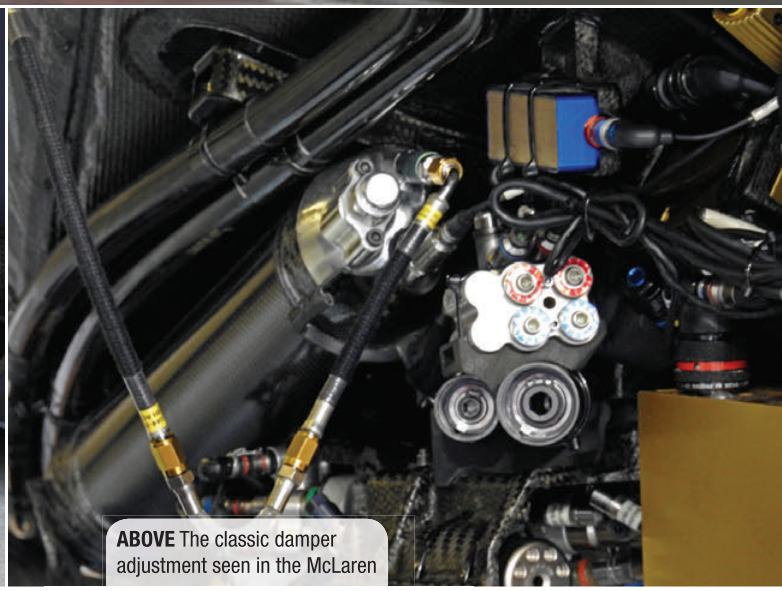
BELOW Merc's heave element shown in the car (left) and uncovered (right)



ABOVE The Mercedes accumulator housed in the sidepod

Red Bull Content Pool

ABOVE & BELOW Paddock insiders suggest Red Bull has run an energy recovery arrangement in its rear suspension in order to keep the 'tea tray' at the front of the plank from grounding at low ride height



ABOVE The classic damper adjustment seen in the McLaren

arguments and protest over rivals' systems.

The paddock rumour mill suggests this particular request was aimed at the front suspension on the Mercedes, although Red Bull's rear suspension is also believed to be using the same solution. Both teams have since maintained that they will not have to revise their suspension to meet this clarification.

What Ferrari proposes is a suspension system that uses the usual wheel movement to operate the usual springs, dampers and inerters, but also a heave element. This would act not purely to control wheel movement, but also as a hydraulic pump through one valve into an accumulator mounted in the sidepod (where there's more space). Rather than this pressure being reused immediately on the suspension cycle, it is stored for some specific conditions to be met before being released.

In the case of the front suspension, this would be used to add pressure to resist pitch under braking. This cannot be linked to electronics, sensors or the brakes themselves, but perhaps a passive valve that opens under longitudinal gravitational load – similar G-Valves have been used in F1 and Indy dampers. Or, perhaps, simply a valve in the heave element that opens at a certain point in the suspension travel? With the valve opening, the pressure would be released back into the heave element to stiffen the front suspension. With the rear suspension remaining compressed, at high speed again a position-sensitive valve would stiffen the rebound effect of the suspension.

> *"Ferrari's request was pointed at another team's system"*

It's clear the teams are increasingly able to play with passive hydraulics to gain some very specific characteristics, previously only available with active suspension. There may well be other systems yet uncovered and/or new ideas waiting for implementation in 2017. So, it's likely suspension will continue to be a talking point over the coming seasons. RT

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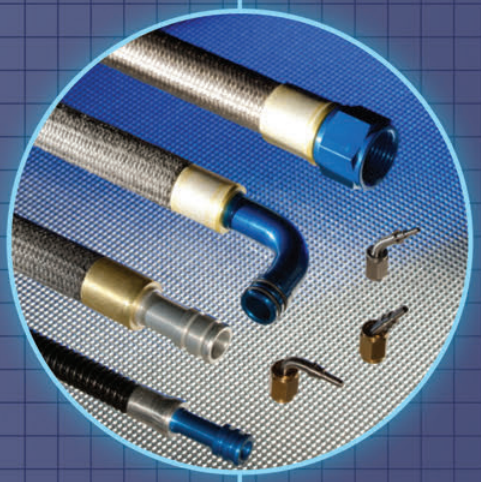

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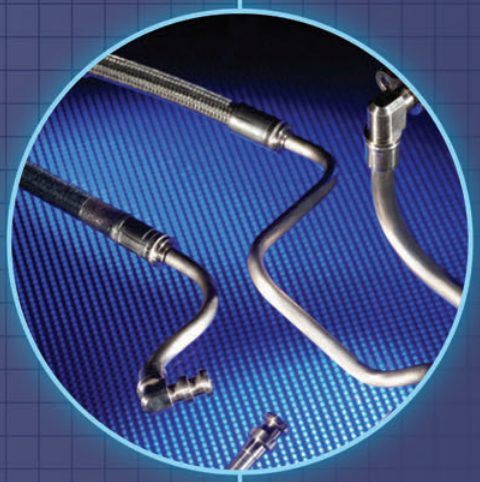

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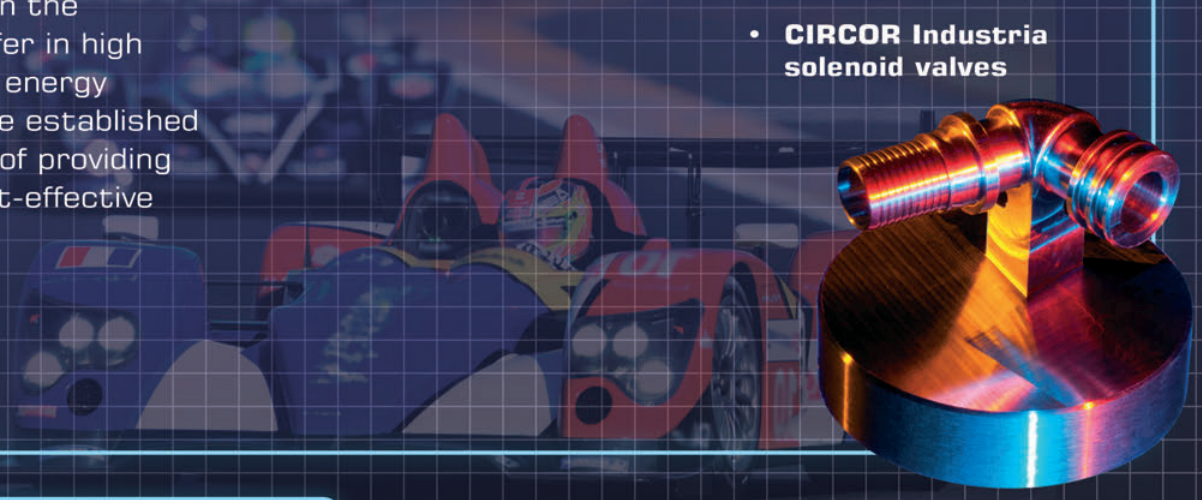

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CHANGING OF THE GUARD

The new breed of LMP2 cars are powered by dedicated race engines rather than production-based units. **Chris Pickering** examines the development of Gibson Technology's impressive V8

WHEN the flag dropped on the 2017 sportscar season at Daytona last month, it marked the biggest shake up in LMP2 since the category was introduced in 2004. Out go the old production-based engines to be replaced by a new, single-make unit from Gibson Technology.

The tender for this new 'spec' engine was released by the FIA and the ACO in June 2015. It called for a naturally aspirated V8 capable of producing at least 600 bhp (more than 100 bhp up on the contemporary LMP2 units). A capacity of between 4 and 4.6 litres was suggested in the brief and the use of direct injection was said to be preferred, although not essential. Most importantly, the engine was to be leased to the teams with an hourly cost of no more than €1300. This figure had to include not only use of the engine, but full trackside support and all scheduled rebuilds.

Gibson Technology – formerly known as Zytek – was one of five companies that tendered for the project. Work started at the company's Derbyshire HQ as soon as the requirements were announced.

Two things were decided right at the start: It would be more cost effective to use a dedicated race engine than a production-based unit like the outgoing LMP2 engines; and it made sense to build on an existing design if possible. Fortunately, Gibson has a formidable back catalogue and the resulting engine can trace its roots – albeit fairly loosely – back to the 3.4-litre ZG348 LMP2 powerplant that first appeared in 2002. This engine also spawned the ZRS03 unit used in the Formula Renault 3.5 series, now known as World Series Formula V8, which remains in production today.

"There was never realistically the option of producing a clean sheet design," explains Gibson's operations director John Manchester. "It simply wouldn't have been possible to see a return over a four-year period with the money that we were allowed to charge. Also, there's a greater element of mechanical risk with a completely new design."

The engineers began by looking at the capacity. They wanted to avoid excessive engine speeds in order to reduce the stress on the engine, so in the absence of forced

ABOVE The GK428 is the most technically advanced engine that Gibson has ever produced

induction it was decided that the capacity would have to be somewhat larger than that of the Formula Renault unit. But how much larger?

While there was no upper limit on size, Manchester and his colleagues were also mindful of fuel consumption. "Even in the WEC where all the cars will have the same theoretical fuel range you're better off completing 12 laps in a stint at Le Mans than 10 if you can do that without compromising on durability," he notes. "In IMSA that becomes more important, because we're going to be racing against different engine suppliers and we had to ensure it would be competitive under those circumstances too."

In the end, 4.2 litres was deemed to be the ideal compromise. Drawing on its ZG348 and ZRS03 heritage the new engine was to be a 90-degree V8 with a flat plane crank and four overheard camshafts.

In September 2015 it was announced that Gibson had won the tender and the company moved onto the detail design, with the aim of getting a test engine up and running as soon as possible. The first mule engine ran later that year and the parts were progressively updated until it reached full specification at the beginning of 2016, at which point, performance and durability testing could began.

In total, some 57 hours of simulated Le Mans laps were run on the dyno, using data taken from the firm's previous LMP2 programme. This equated to around 10,000 km of testing, after which the engine was completely stripped and all the parts examined, with those which had come from external suppliers sent back for inspection.

"The feedback on all the parts was very good with no issues, so we went straight into calibration, which took us another 70 or 80 hours on the dyno," comments Manchester.

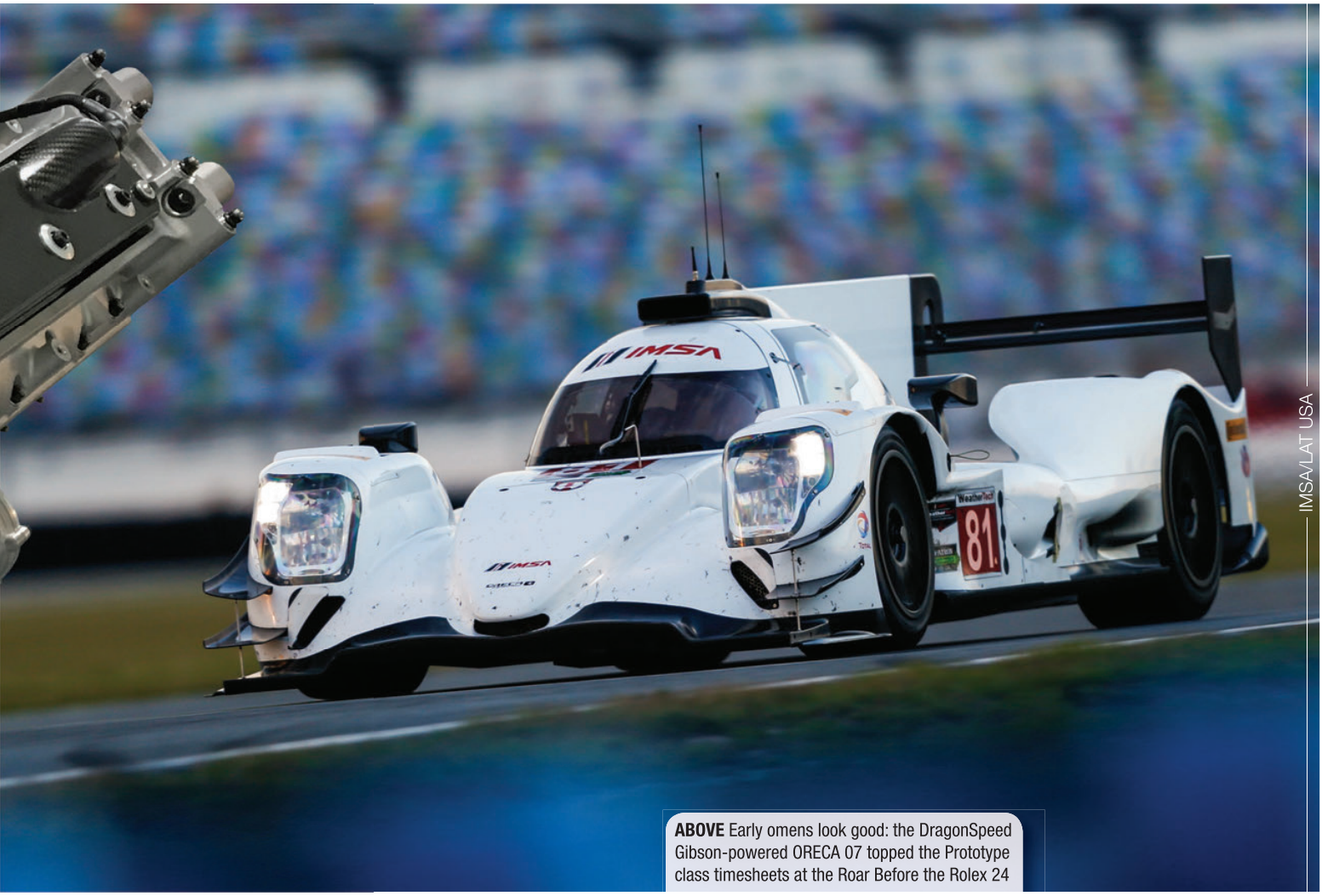
> *"Without a doubt the best engine we've produced"*

BUILT TO LAST

Right from the outset, Gibson had been involved in discussions with the four LMP2 chassis constructors (ORECA, Onroak, Dallara and Riley) to ensure compatibility. The external design of the aluminium block, cast by Grainger & Worrall, is closely related to that of the Formula Renault 3.5 unit, but the pick up points have had to be repositioned to suit the sports car layout and the oil tank is mounted direct to the engine to aid packaging.

"We supplied the dimensions of the engine and the location of the pick up points to the chassis constructors very early on, so all these cars have essentially been designed around this engine," comments Manchester. "The casting is very similar to the ZRS03, but the internal machining is quite different and there's a completely new lower crankcase, with a revised scavenging system."

The cylinder heads are also an evolutionary design, but with significant changes to the porting and combustion chambers to ▶



IMSA/LAT USA

ABOVE Early omens look good: the DragonSpeed Gibson-powered ORECA 07 topped the Prototype class timesheets at the Roar Before the Rolex 24

optimise them for an enlarged capacity and a progressive torque curve. Peak power arrives at 8,500 rpm – somewhat higher up the rev range than in the outgoing production-based engine, but 750 rpm lower than in the ZRS03. It's also usefully lighter, tipping the scales at 135 kg, as opposed to 150 kg.

In total, around 70 per cent of the parts are said to be new, with Gibson given full control of specification and supplier choice for the base engine components. Pankl supplies the pistons and conrods, while the crankshafts are made to Gibson's design by a number of different suppliers.

Like its predecessors, the new engine – dubbed the GK428 – uses a gear-driven valvetrain. At the rear of the engine, a set of gears provided by Staffordshire-based Precision Technologies is used to drive the camshafts, while a separate system fitted with a torsional damper drives the ancillaries at the front.

Being a larger engine with a considerably elongated bore-to-stroke ratio, the new parts have been designed with different mechanical loads in mind. It also has to cover substantially longer distances, Manchester points out.

"The Formula Renault 3.5 is designed to cover 5,000 km between rebuilds, but these engines are going to well over 8,000 km now. Parts that are intended to be replaced at every rebuild now need to cover 60 per cent more mileage, so a lot of thought went into the durability aspects of the design."

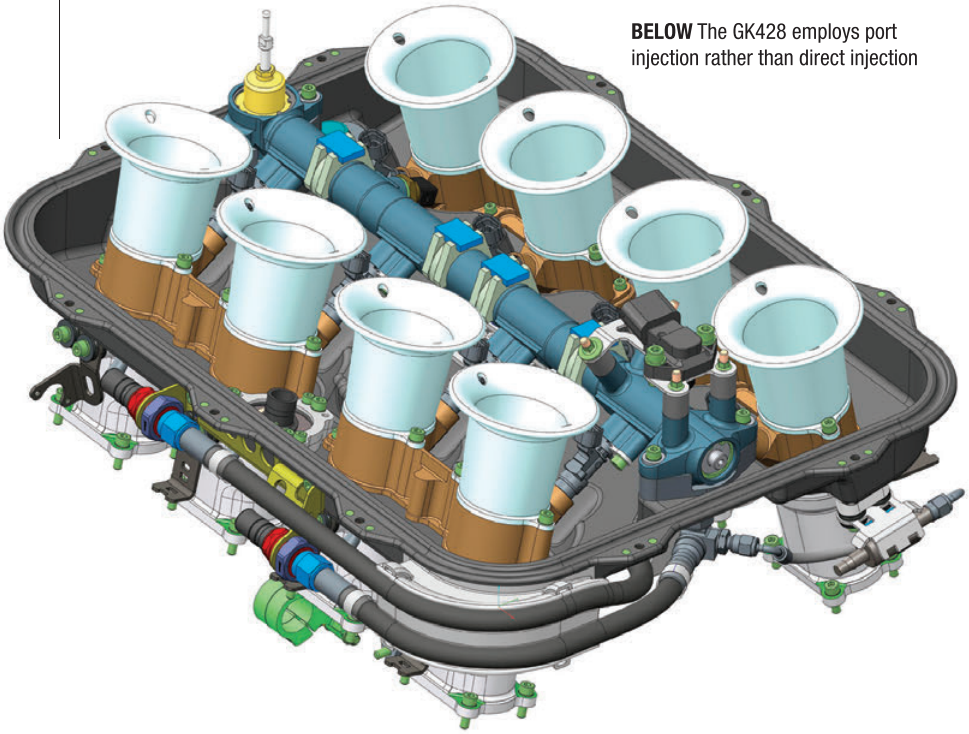
ABOVE Ready for delivery: the commitment to an initial production batch of 20 engines quickly doubled

It's not just the base engine that has to be built to last, he points out, but also the ancillary parts. The engine wiring harnesses, for instance, are all AV-mounted, with motorsport-grade sensors from Bosch, Reventec and Penny + Giles. Durability is always paramount in endurance racing, but in some respects it assumes even greater significance in a one-make engine formula, where there is no competitive advantage to be gained in power output. Gibson will only say that the engine makes 'in excess of 600 bhp' without naming an exact figure and torque is given as 555 Nm (410 lb ft) although it's possible this is also somewhat conservative.

The vehicle electronics package, including the engine ECU, was put out to a separate tender, won by Cosworth. Gibson, however, specified the fly-by-wire throttle system, which is provided by Maxon Motor UK.

A lot of racing powerplants now use direct injection, particularly in endurance racing where engine speeds are relatively low and fuel economy can be very important. For the LMP2 project, however, Gibson has eschewed this trend, and the reason lies with cost.

"Developing a direct injection system for a purpose-built race engine like this just wouldn't have been feasible within the financial constraints," says Manchester. "Also, you have to ask why you'd do it. There may be some advantages in fuel consumption, but it adds additional complexity that's simply not necessary in a one-make category."



BELOW The GK428 employs port injection rather than direct injection

BEATING THE COST CAP

Right at the beginning of the project, Manchester and his colleagues set about reviewing their production processes, looking for areas where cost – particularly through time – could be reduced without compromising on the quality of the components. In the end they succeeded in undercutting the cost cap slightly. Teams will now be charged €1250 per hour for use of the engine, which includes everything apart from fuel, oil and accident damage, with time purchased in blocks of 25 hours.

"We aimed for €1250 per hour and we had to work back from there to set our internal cost targets, which wasn't easy," he says. "Fortunately the uptake has been very good, but we didn't know exactly how many cars we would be running when we started. I think people are encouraged by the stability of the formula – it's fixed for the next four years, during which time ▶

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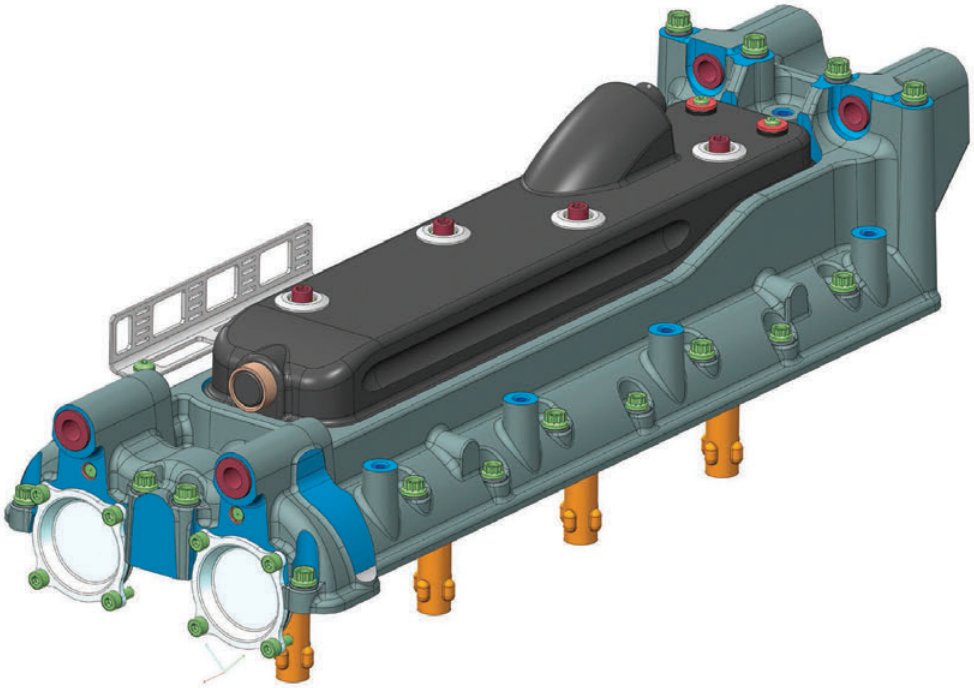
there will only be one engine and four closely-matched chassis."

Being named as the sole engine supplier has opened up certain economies of scale, he admits. Plus, it eliminates the on-going development work that adds extra cost when engine suppliers are locked in a technical battle. Nonetheless, it remains a big investment. Even with the current uptake, Manchester says he doesn't expect to see any return on the new engine for a couple of seasons.



LARGE FLEET

Gibson is something of a one-make specialist, having been producing spec engines for a variety of championships since 1996. Aside from the design and production expertise that comes with that, it means the company is equipped to handle what is – by racing standards – quite a large fleet of engines, including all the track support and servicing.

"There will be around 50 engines in the pool at any one time with identical mechanical specification and calibration. Any of those engines could end up in a WEC car or an IMSA car," says Manchester.

He says there are "certain areas" that are particularly tightly toleranced in the manufacturing and build phases to rule out any variability in the engines' performance, although he's a little coy on exactly what those are. All the engines are equipped with security seals and no one outside of Gibson is allowed to open them.

"We've put a lot of effort into ensuring that the performance of the engines is not only equal, but consistent over the course of each unit's lifetime," says Manchester. "We've had engines back for rebuilds already and they're still producing exactly the same power, so we're very pleased with that. In terms of design, manufacture and durability calibration on the dyno I'd say this is without a doubt the best engine we've produced to date."

THE ACID TEST

Alongside the LMP2 grids in the World Endurance Championship (WEC) and the European Le Mans Series (ELMS), it's thought there will be four Gibson-engined cars competing in North America this year: three are expected to contest the full WeatherTech SportsCar Championship, with one attending the blue-riband events that form the Tequila Patrón North American Endurance Cup. From 2019 it will also be the spec engine for the LMP2 category in the Asian Le Mans Series.

That's not to say every car on the LMP2 grid will necessarily run the Gibson engine. All series will offer the option of running a 'grandfathered' 2016-spec car in a separate sub-class for at least the first year after the introduction of the new engine. Whether or not anyone will actually do that is another matter, though; so far it appears all the LMP2 teams in the WEC and the ELMS will be running a 2017-spec engine and chassis.

Pre-season testing suggests this is a wise move, with several teams projecting an improvement of five to six seconds a lap at Le Mans. If that turns out to be true, it would put the new LMP2 pole at around 3:30 – potentially quicker than last year's LMP1 privateer entries.

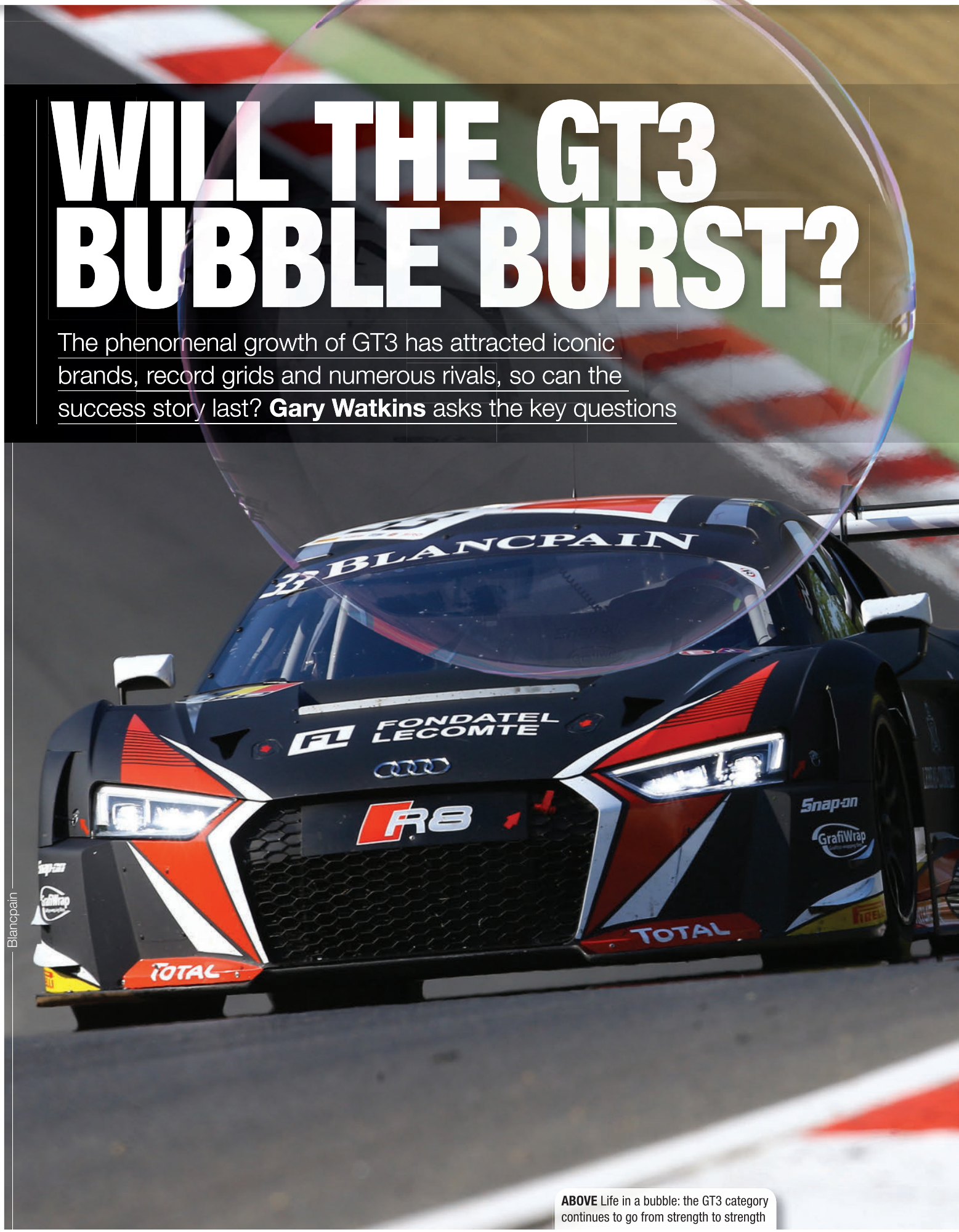
That step up in performance seems entirely appropriate for what is nothing short of a new era in LMP2. What's crucial, though, is that it also comes with consistent reliability and at a lower cost than the outgoing engines. Only time will tell if the switch to a spec engine was a wise one. But the omens so far look good. RT

ABOVE & BELOW Dimensions and pick up points were provided early on so that constructors like Onroak could design their cars around the Gibson engine

DPPI/Onroak

WILL THE GT3 BUBBLE BURST?

The phenomenal growth of GT3 has attracted iconic brands, record grids and numerous rivals, so can the success story last? **Gary Watkins** asks the key questions



Blancpain

ABOVE Life in a bubble: the GT3 category continues to go from strength to strength

THEORIES, conspiratorial or otherwise, that the GT3 bubble is about to burst can be shot down with empirical statistics. Audi, Ferrari, Mercedes, BMW and Porsche each released a new model to customers in 2016 and have sold approaching 250 cars between them. Crisis? What crisis?

There is little to suggest that a class that celebrated its 10th birthday in 2016 is on the wane. The reverse is true, in fact. Sales of GT3 cars to customers remain buoyant, the blue-riband championship in Europe – the re-organised Blancpain GT Series – boomed last year like never before, and the reach of the category has continued to expand around the globe.

The boom shows no sign of abating, but surely nothing lasts forever in motorsport? Or does it? Stéphane Ratel, the architect of the division who still steers it together with the FIA as the most significant GT3 promoter, insists that it is immune to the boom-bust cycle so prevalent in motorsport, nowhere more so than in sportscar racing. That's because, he argues, it is based on "commercial competition and not technical competition". And any technical competition in GT3 is diluted by the Balance of Performance, the mechanism at the heart of the GT3 concept by which the cars are equalised.

"Once a manufacturer has a customer programme, its prime objective is to sell cars, and when you have commercial competition you need to be at the market price otherwise you don't sell your cars," says Ratel, chairman of the SRO Motorsports Group. "The manufacturers aren't always trying to go quicker than each other because they know that the BoP is there to stop that.

ABOVE GT3 is the brainchild of Stéphane Ratel

"I go back to what Max Mosley [who was at the helm of the FIA when GT3 was introduced in 2006] used to say: if you give a pair of scooters to two Formula 1 teams, they are going to find ways to spend €50 million to make them more competitive."

Ratel's point is that market forces, combined with the BoP, prevent the escalation in technology and therefore costs that fuels the boom-bust cycle.

ARE COSTS GETTING EXORBITANT?

The price of a car has undoubtedly increased since the creation of the class for the 2006 FIA GT3 European Championship. It is easy to forget that back then the benchmark machine was Porsche's one-make 911 Cup, a car that cost a little over €100,000 at the time. The most expensive GT3 racer today, the Ferrari 488 GT3, comes in at a shade over €550,000.

That looks like a dramatic increase, but the comparison is not as straightforward as it looks. A Ferrari always comes at a premium because, well, it's a Ferrari and the Italian manufacturer has built the most advanced GT3 yet, a car that can be converted to GTE specification.

The majority of what might be termed as the volume producers of GT3s sell their machinery for significantly under the €400,000 mark. The latest Audi R8 LMS, for example, is €369,000 and the Mercedes-AMG GT3 €372,000. Again, that looks like a colossal increase, but not, argues Ratel, when you compare it to the 2006 list price of an Aston Martin DBRS9, a machine he describes as the "first purpose-designed GT3 car".

Convert the £210,000 asking price for an Aston 11 years ago into euros at the 2006 rate, and you end up with a figure of just over €300,000. An Aston Vantage V12 GT3 today is listed at £375,000, which equates to €412,000 ▶

LAT USA

ABOVE In the US, as in Europe, big brands continue to rally to the GT3 flag because the concept relies on commercial competition rather than a technical battlefield

at post-Brexit exchange rates.

"You can't compare the price of a car today with the existing cars that we based GT3 around at the start, like the Porsche and the Dodge Viper Competition Coup," suggests Ratel. "I don't see how the idea of cars going up €100,000 in the 10 years is excessive. That's not an outrageous increase."

Running costs have inevitably gone up over the history of GT3. The big escalation happened in the early years of the category, reckons Chris Needell, commercial director of GT3 pioneer Barwell Motorsport.

"The Aston DBRS9 looks like a glorified track day car next to the GT3s of today," he explains. "It had an H-pattern gearbox with nice leather surround around the gearstick and it initially even had five-stud wheels, though that was changed before the first race at Silverstone in 2006.

"Today's cars are definitely more expensive to run. I'd say that costs have gone up 40 percent in terms of buying the cars and running them, but much of that came when what I call the second generation of GT3 cars were introduced around 2010. But since then the rate of increase has plateaued out."

The manufacturers have this decade made strides in reducing running costs. The service intervals for engines and gearboxes have gone up, while Audi, for instance, has made its body spares cheaper in some instances. The front aero section of the latest R8 LMS, for example, can now be replaced in sections.

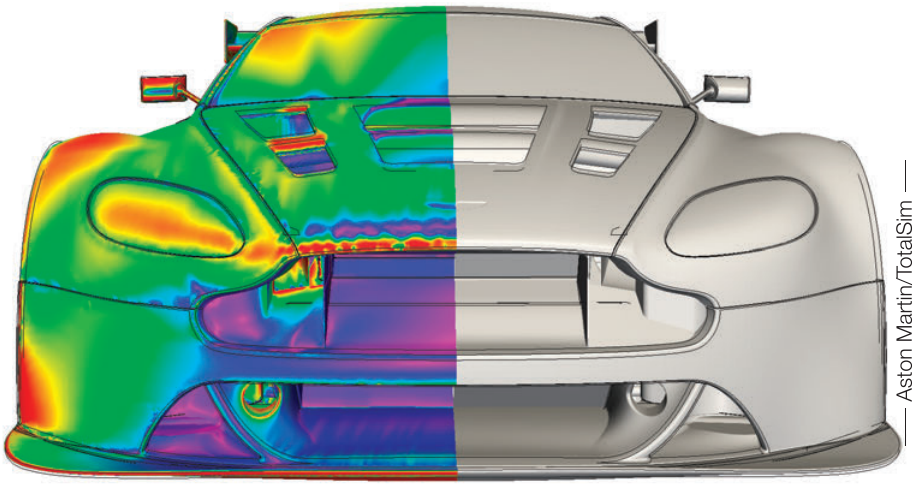
"A team running a car has to charge the running costs to someone, so there has been a big focus on reducing them," says Chris Reinke, head of customer sport at Audi. "That was very much in our minds when we conceived the current car because we know it is a crowded marketplace with so many prestige brands.

"Our engine now needs a small service at 10,000 km and a bigger one at 20,000 km, but we know of engines that have done 40,000 km when they are running in country club stuff."

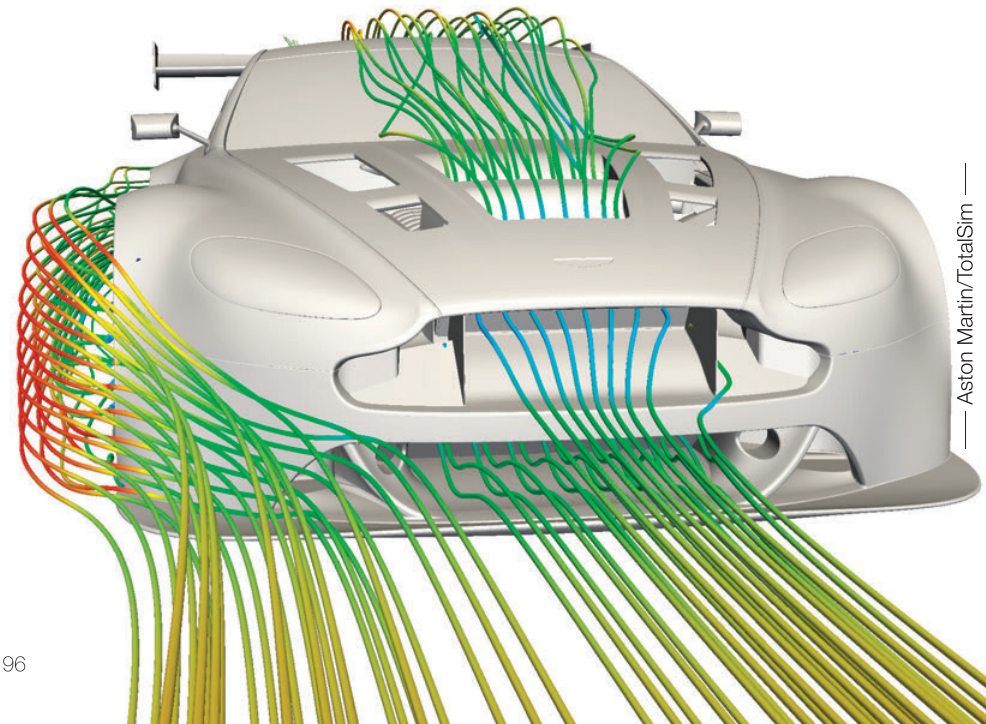
Running an Audi or any GT3 car at the highest level is a different matter. Costs are being driven up because the competition is ever fiercer and the stakes higher.

Jerome Policand, who runs the Auto Sport Promotion squad, points out that the technical resources behind a team have had to increase over the life of GT3.

"When we started out in the early days we would have one engineer for two cars," explains the former driver, whose team has run Porsches, Ferraris and, from last ▶



Aston Martin/TotalSim



Aston Martin/TotalSim

ABOVE & BELOW Balance of Performance prevents a technical arms race but starting with a better base package still confers an advantage, so cars like Aston Martin's GT3 are honed with techniques like CFD (Computational Fluid Dynamics). Above, we see surface velocity. Areas of high speed suction are in red (top of the wheel arch, panel edges, the positive curvature of the mirror, headlight and screen), and slowest flow or blockage in dark blue on the radiator, brake duct internals etc. Below, through/off-body flow is modelled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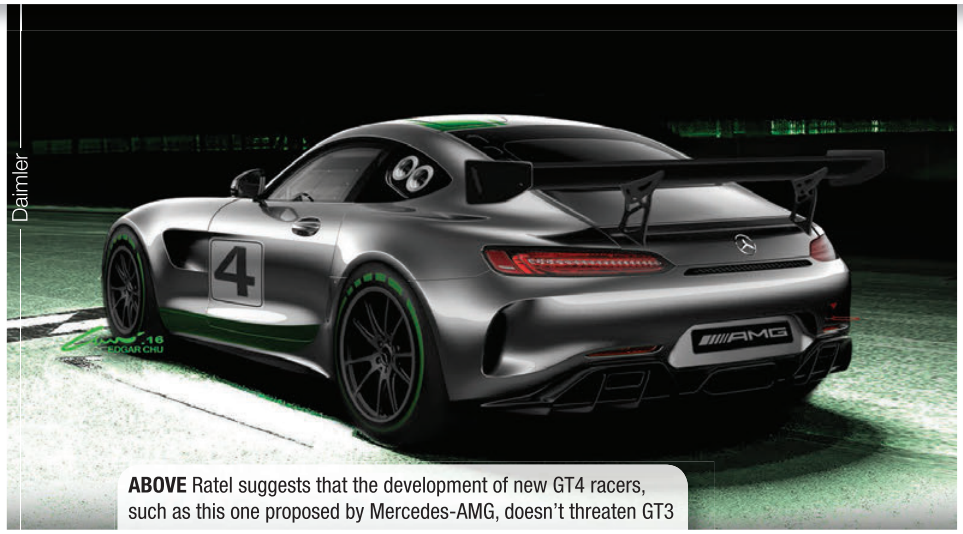
Daimler

ABOVE Ratel suggests that the development of new GT4 racers, such as this one proposed by Mercedes-AMG, doesn't threaten GT3

season, Mercedes across the life of the GT3 category. "Now we have two engineers for each car, because we need a data guy as well as a race engineer."

Ratel argues that this is only natural. "The level of competition in the top series, like the BGTS, and the big one-off races has gone up," he says. "When a team like WRT [a winner of multiple Blancpain titles with Audi] raises the bar, everyone has to follow. Increased competition always drives up the costs."

IS GT4 A THREAT?

Ratel suggests not, though he concedes that the resurgent category – cheaper and pitched at a lower level – could become the class of choice for national GT series ahead of GT3 for the simple reason that it is cheaper. The new-for-2016 McLaren 570S GT4 racer costs just £159,000 or €184,000.

"It could be that GT3 becomes continental and GT4 more national, apart from very strong national markets such as Britain, Germany and Australia," he says. "For some countries, GT4 might be the preferred option. It is better to have a 25-car GT4 grid rather than 12 GT3s. I think it was a good idea in France to have a GT4 series [which will be incorporated into the new-for-2017 GT4 European Series Northern Cup], because we do not have the resources to have a strong GT3 championship."

Ratel believes that the growth of GT4, which has now attracted Mercedes and BMW into its ranks, can only be good for GT3. He suggests that it will feed into the higher category.

"It gives access to the world of GT racing to people not previously involved," he says. "It gives a new route into GTs at a lower cost, so that can only be good.

"People say GT4 is going to replace GT3. No, it is not. We'll just see more teams coming into GT racing from formula racing and lower-level one-make cups."

WHAT ABOUT LMP3?

The growth of the Automobile Club de l'Ouest's LMP3 prototype category since a shaky start in its inaugural season in 2015 has been phenomenal. French constructor Onroak Automotive has now built in excess of 70 of its Nissan-engined JSP3s for a class that has quickly grown beyond its roots in the European Le Mans Series. That means it has shifted more P3s than Audi and Merc have sold GT3s since they introduced their latest cars.

Richard Dean, boss of the British-based United Autosports squad, has switched his team's focus from GT3 to LMP3 over the past 18 months. United won the ELMS P3 title last year and was instrumental in the creation of the LMP3 Cup Championship in ▶


Barwell Motorsport

ERA 1

ABOVE & BELOW Innocent days: GT3 pioneer Barwell Motorsport took part in the very first GT3 race, at Silverstone in 2006. Its Aston Martin DBRS9, seen here being prepared for the event, initially featured an H-pattern gear lever, complete with leather surround, and five-stud road car hubs

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ERA 2

ABOVE & BELOW In the second era of GT3 Barwell ran the Aston DBRS9 replacement, the Vantage GT3 V12, and also the BMW Z4 GT3. These next-generation cars featured better aero and were more sophisticated, now being built with 24-hour racing in mind

Barwell Motorsport

Britain for 2017 after formerly running Audis and McLarens in both the domestic and international arenas.

"LMP3 is a cost-effective alternative to GT3, and not everyone wants to drive a GT car," he says. "A Ligier costs just over £200,000 and you know it is going to be competitive for a fixed period.

"That's the big problem as a team owner with GT3. You need to have the fashionable car, because if you don't the phone stops ringing. And you can't keep chopping and changing because the depreciation on the cars is so big. If someone offered me £100,000 for the McLaren MP4-12C sitting in my workshop right now, I'd bite their hand off."

Ratel insists he is flattered by the creation of LMP3, which he describes as "the GT3 concept applied to prototypes" in the same way that TCR is effectively GT3 for touring cars.

"It is competition, but there has always been competition," he says. "But there will always be people who want to drive good-looking sportscars built by the prestigious brands."

He goes on to suggest that the LMP3 Cup Championship, which had a pilot race at Snetterton last autumn, isn't, as yet, having an effect on the SRO-run British GT Championship.

"All I know is that at the moment, I have people with GT3 cars calling me asking to reserve them a place on the grid in Britain," he explains. "As long as I have a grid of 12 to 15 GT3 cars in Britain, I am happy, because that gives us a healthy field together with the GT4s."

IS FACTORY PARTICIPATION HARMFUL?

The Endurance and Sprint Cup segments of the BGTS are attracting more and more factory involvement. Ratel, who has had an ambivalence to works participation in sportscar racing since learning harsh lessons during the first two years of the FIA GT Championship in 1997-98, reckons the level isn't too concerning.

"We can say that M-Sport with Bentley is the only true factory team and I don't think they have squeezed anyone out," he argues. "All the other teams with factory support are there because of commercial activity [either sponsorship or paying drivers]. That's the case with a top team like WRT even with the support it gets from Audi. I'm very happy with the level of factory involvement that we have right now."

Ratel regards the ability of the manufacturers to mount full-factory entries as a factor in the success of GT3, even if the category was devised as one for customer racing.

"GT3 gives the manufacturers a globally available marketing tool," he explains. "You have a car that you can take to a region in which your marketing department is interested. And you don't have to spend millions and plan years in advance.

"Look at Porsche. They have no interest in racing their 911 GT3-R in Europe because they use the World Endurance Championship as a promotion tool here, but they came with a factory team to the FIA GT World Cup in Macau [a one-off end-of-season GT3 bash on the undercard of the Formula 3 Grand Prix] and they raced at the Sepang 12 Hours [an SRO-run round of the Intercontinental GT Challenge, which links the big GT3 enduros around the world]." ▶

ABOVE The latest GT3 cars are extremely fast but electronic driver aids make them realistic for amateur racers to handle

HAVE THE CARS BECOME TOO FAST?

Some suggest so, but Ratel says that is the beauty of GT3. "Extreme speed for low cost," is how he puts it.

"The magic comes from the fact that you have these amazingly fast cars for a cost that remains reasonable," he says. "And all of the electronic driver aids means they are relatively easy for an amateur to race at a competitive level. That is why it works so well."

THE THREAT, AS RATEL SEES IT

The customer model is the strength of GT3, so the prospect of manufacturers building cars for overt factory programmes without a commitment to build customer cars is the real danger for the category. Ratel points a finger at Cadillac and its ATS-V.R programme in the Pirelli World Challenge in the USA, a series in which SRO became a shareholder last year.

He describes the Caddy as "slipping through the net". The ATS-V.R is a homologated GT3, but there has been no sign of customer cars becoming available. That, argues Ratel, makes balancing the car with its rivals problematic.

"It hasn't been an easy car to manage, because the success of the BoP depends on multiple cars in multiple championships," he explains.

Ratel suggests that manufacturers should sell cars or face the threat of not receiving homologation. He's hopeful that new entrants Lexus and Acura, which are both mounting works campaigns in the USA this year, will do just that for next season.

"Selling cars to different championships should be a prerequisite of full homologation," he argues. "What we have been discussing in the FIA GT Commission is a system whereby you get some kind of initial homologation that would enable a manufacturer to get started, develop the car and demonstrate its potential to customers. But only when deliveries to customers begin would full homologation be granted.

"I am on the FIA GT Commission and my priority is to make sure that GT3 remains customer racing at its heart," he says. "The moment we depart from that we will be in trouble." ▶

The birth of Balance of Performance

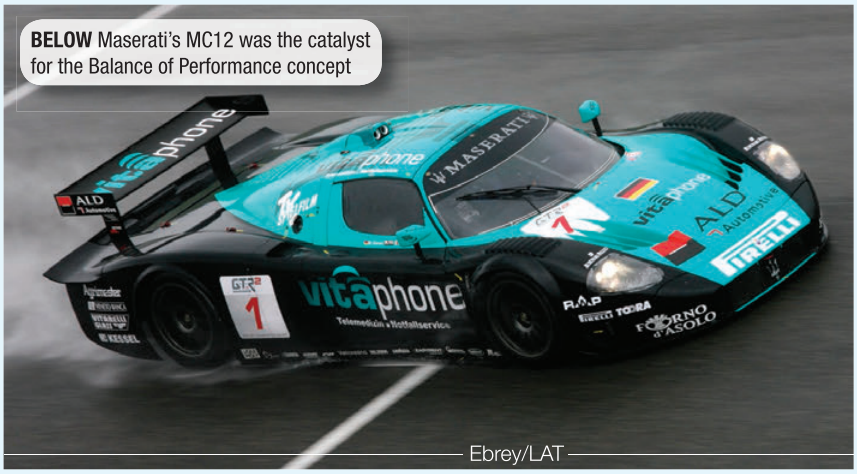
THERE'S an irony to the fact that the most extreme GT racing car of its generation paved the way for the GT3 category. When Maserati developed its MC12 GT1 contender around the core of the Ferrari Enzo in 2004, the FIA knew it had a problem. The carbon-chassis machine threatened to obsolete everything else racing in the FIA GT Championship at a stroke. The solution was the mechanism that we now call the Balance of Performance.

"I wanted to forbid the MC12," explains Stéphane Ratel. "We badly screwed up when we allowed the Porsche 911 GT1 into the Global Endurance GT Series in 1996 and that eventually destroyed GT racing. I didn't want to make the same mistake twice.

"But Max Mosley [then FIA President] said, 'Listen, refusing it will create such a storm. We are going to balance it and then everyone will realise that there is no point doing this kind of car because it will be no faster than a conventional car'."

And so the BoP was born. The Maserati, quite literally, had its wings clipped – its front and rear overhangs were reduced and it had to run a smaller rear wing – and raced on roughly equal terms with the likes of the Ferrari 550 Maranello, the Chevrolet Corvette C5-R and then the C6.R and the Aston Martin DBR9.

The concept of the BoP provided one of the key foundation stones on which Ratel based the GT3 cars. Manufacturers – and back in the early days so-called 'tuners' such as Prodrive with the 550 Maranello and Matech Concepts with the Ford GT – develop cars not to a set of regulations but to certain performance criteria. There is no rule book, just a monster homologation document for each car. The BoP is then used to tickle the performance of each car up or down to ensure a level playing field. RT



BELOW Maserati's MC12 was the catalyst for the Balance of Performance concept

Ebrey/LAT

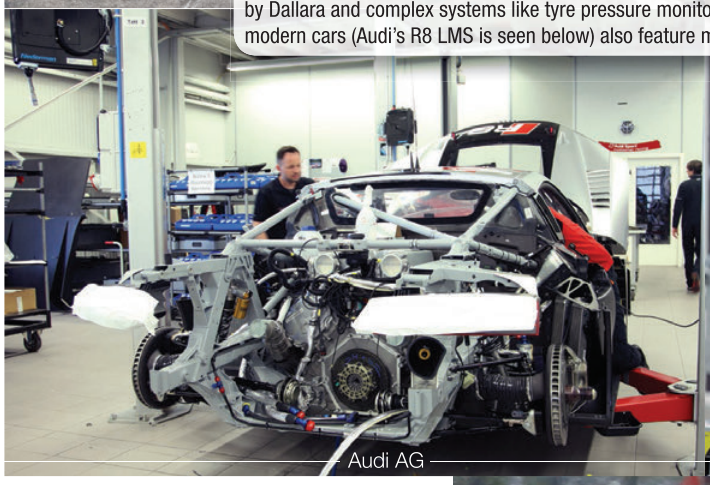
BELOW GT3's successful business model is threatened by projects like Cadillac's ATS-V.R in the Pirelli World Challenge, where no customer cars have been forthcoming

Cadillac

Barwell Motorsport

THE MODERN ERA

ABOVE & BELOW Barwell now runs Lamborghini Huracan GT3s, with aerodynamics developed by Dallara and complex systems like tyre pressure monitoring and the rear radar driver aid. These modern cars (Audi's R8 LMS is seen below) also feature more power and sophisticated suspension



Audi AG

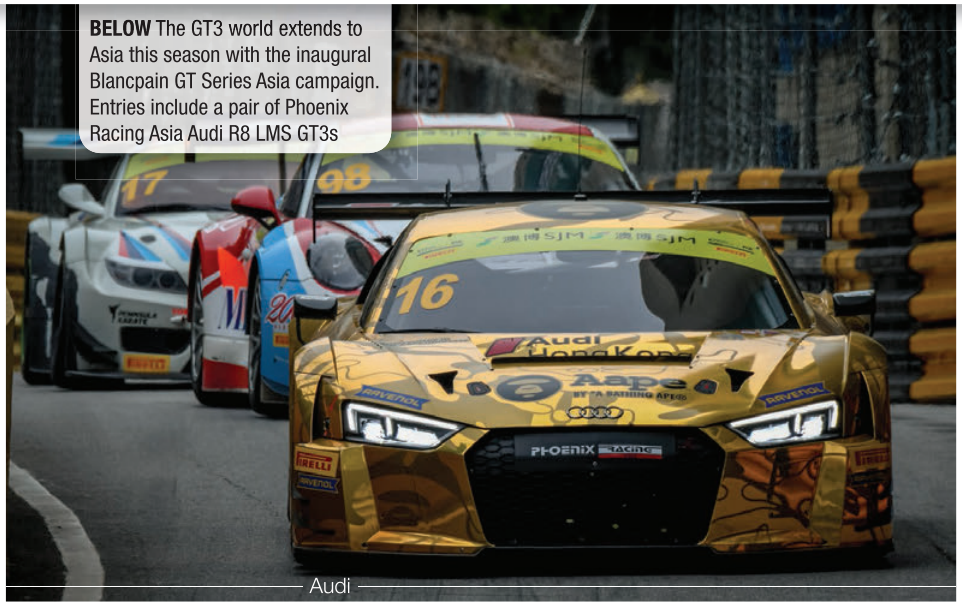
IS THE GT3 MARKET STILL EXPANDING?

Yes, according to Ratel. And he forged a relationship with the PWC and has started the new Blancpain GT Series Asia for 2017 to facilitate that expansion in two regions where he feels GT3 has been under represented. It was a strategy he formulated after the demise of the FIA GT1 Championship after just three seasons at the end of 2012.

"I made a big mistake strategically," he explains. "I should have spent the money and energy I put into GT1 World in the US and Asia. I thought about how I could correct that. In North America it was impossible to start something new, because it is a mature and busy market. That's why I was very happy to be able to partner with the PWC."

A partnership in Asia was also on the cards at one stage. Ratel looked at buying into the GT Asia Series run by old friend and associate David Sonenscher's Motorsport Asia organisation. It didn't happen for various reasons that Ratel can't go into, which is why he set out to establish what he describes as "a true pan-Asian series".

"It makes sense because Asia is a region of potential growth for GT3," explains Ratel. "I can't believe there are so few cars out there given the strength of the economies."



BELOW The GT3 world extends to Asia this season with the inaugural Blancpain GT Series Asia campaign. Entries include a pair of Phoenix Racing Asia Audi R8 LMS GT3s

Audi

ARE MORE MANUFACTURERS ON THE WAY?

Ratel doesn't see much room for further expansion in terms of new manufacturers joining the GT3 party. He'd love to see Jaguar develop the F-type, or at least lend support to the project underway at Swiss importer Emil Frey, and Maserati come with a car, but he reckons everyone who is likely to come to the table has already sat down.

"There's no sign of any new manufacturer coming," he says. "I'd love to see a Jaguar, of course I would, but we have all the other prestigious brands," he says, adding in jest "unless Rolls-Royce wants to build a GT3 car."

GT3 looks set to continue to flourish and even grow as its tentacles spread around the world. That is the cornerstone of its success, reckons Bentley motorsport boss Brian Gush.

"GT3 has such an amazing reach," says the architect of the Bentley Continental GT3 programme. "You can sell a car into almost every country in Europe, to North America, Asia, Australia, almost everywhere.

> *"The beauty of GT3 is extreme speed for low cost"*

"A team can buy a car that is homologated, they know it will be competitive because of the BoP and the cars come with a base set-up. The teams know how much they cost to run per kilometre because they are told that, so they can hit the ground running.

"Buying a GT3 car is like booking a room at a Holiday Inn: you know exactly what you are going to get." RT

ABOVE Bentley's M-Sport-run machine races Audi, BMW and a host of other top brands. What's not to like?

Blancpain

BOXING CLEVER

Toyota's new NASCAR Cup racecar has surprised both with the timing of its unveiling and its look. To discover how it came about, **Andrew Charman** speaks to Toyota Racing Development president, David Wilson

'**WIN** on Sunday, sell on Monday,' is one of the most recognisable phrases attributed to NASCAR history. It reflects the long and close involvement in the sport by car manufacturers, and the perceived close relationship, in the eyes of fans, between the cars on the track and those in the showroom.

The old phrase clearly still has great relevance today, demonstrated succinctly on January 9, press day of the North American International Auto Show. At the event in Detroit Toyota revealed the new Camry road car that will go on US sale in August – and alongside it the NASCAR version that will debut at Daytona at the end of February.

CAUGHT BY SURPRISE

The reveal of the race Camry caught most NASCAR watchers by surprise. As well as assuming equal star billing with its road sibling, the new car boasts significantly more dramatic looks than its predecessor, particularly at the nose. More importantly perhaps, the Camry is effectively the first complete change of a car in NASCAR's Generation-6 era.

The Gen-6 car was introduced for the 2013 season, the product of a development process in which the Win on Sunday phrase could have been the guiding mantra. Effectively the Gen-6 was a major update of the 'Car of Tomorrow' launched in 2008. Five years in development, the main aim of the CoT had been to significantly increase safety, but the process also created the most generic-looking machine seen in the history of the sport. While under the

ABOVE & TOP Studio views of the new 2017 NASCAR Toyota Camry, painstakingly designed to be well positioned in the performance 'box' dictated by the rules. Note in particular the more dramatic nose treatment and also the more prominent wheelarches

Photos: Toyota Racing

skin every NASCAR racecar is of similar construction, visually spectators had difficulty distinguishing a CoT Toyota from a Chevrolet, Ford or Dodge, unless they looked at the badge or the decals. In a sport where the fans display manufacturer loyalty to the same degree as driver support, this was clearly an unsatisfactory situation.

With Gen-6, NASCAR addressed the issue. While further safety measures were incorporated, the prime aim was adding more individual manufacturer identity and bringing the look of the racecars back more closely to that of their road car inspiration. Admittedly some of this distinction is still accomplished by means of decals, creating for example different-shape grille representations, but today's NASCAR racecars do boast more obvious physical distinctions, notably on their noses.

David Wilson, president of Toyota Racing Development (TRD) and ultimately responsible for the NASCAR programme, recalls that achieving the Gen-6 project saw unprecedented levels of co-operation between the competing manufacturers – the finished cars were the result of several round table sessions between the manufacturers and NASCAR.

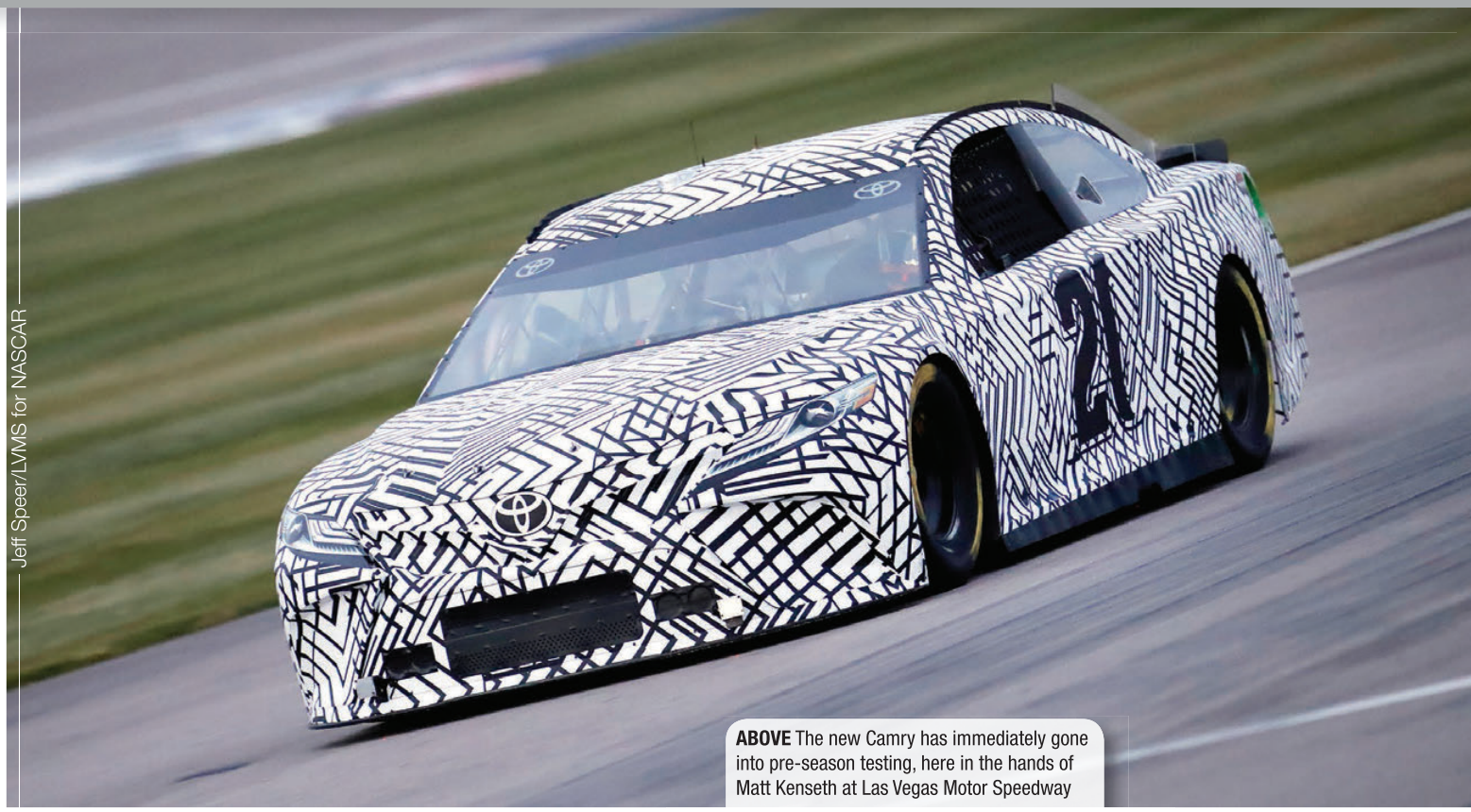
"We all as manufacturers want to build more relevancy into our racecars, so the challenge for the sanctioning body is to support that while still achieving aerodynamic parity between the three manufacturers," Wilson tells Race Tech. "Ultimately the manufacturers sat down and worked together to develop a proposal to put in front of NASCAR. We started with deciding which elements of the car we had a licence to change and to build our styles into – specific body panels on the racecar are frozen and common to all. What has resulted is effectively a box, with parameters of drag, downforce and side force. Essentially you now have to be somewhere within that box of performance."

FROM ROAD TO RACE

Toyota's Gen-6 specification was modified for the 2015 season, following a refresh of the road car. But some six months before the 2015 racecar debuted, work had started on the programme that would produce the 2017 car.

"The 2017 production Camry is a ground-up new car incorporating the TNGA architecture that Toyota is implementing across its range. The design concept for that car was produced in late 2014, and ▶

ABOVE David Wilson, president of Toyota Racing Development, has taken overall charge of developing the new Camry for NASCAR competition



Jeff Speer/LVMS for NASCAR

ABOVE The new Camry has immediately gone into pre-season testing, here in the hands of Matt Kenseth at Las Vegas Motor Speedway

that's when work started on the racecar," Wilson says.

He adds that starting so early on a programme is completely unprecedented, and represented one of the most challenging aspects of the project. But it was also a critical decision as Masato Katsumata, Toyota's chief designer of the Camry, had created a radical redesign for the eighth generation of a model that in 19 of the last 20 years has been the best-selling car in America.

YEAR-LONG SECRET

The aggressive looks and major step in the styling of the new Camry persuaded Toyota to put the car on the racetrack some six months ahead of its showroom launch, but a target of unveiling both cars in Detroit in January 2017 required keeping the project confidential for more than a year. "The correlation is so close to the street car that if photos or images of our racecar had got out to the general public it would have compromised the launch of the production car," says Wilson.

This became all the more critical when Toyota made its race team partners aware of the project in January 2016, a full year ahead of the debut. "By that time we had a fair idea of where we were heading with the car, but we had to ask all of the teams to have their members sign Non-Disclosure Agreements.

"It wasn't heavy-handed, it was to underscore the sensitivity of the project. They appreciated that and they also thought it was pretty special that we had asked them to participate at that stage, somewhat earlier than with the past two iterations of the car. We made a conscious decision to bring them in earlier, to have their aerodynamicists work shoulder to shoulder with us at TRD as ultimately we knew this would help us get a better start once we were ready to race."

As well as the teams, TRD worked alongside Calty Design Research Inc, Toyota's North American exterior design studio. The two have produced several past NASCAR projects for Toyota, notably the first Gen-6 car, the update to this model in 2015, the 2015 Camry for the second-division Xfinity Series and the 2014 Tundra competing in the Camping World Truck Series.

> *"You can do a lot of predictive analysis, CFD and in the wind tunnel, but there is a certain amount of holding your breath"*

"As racers our priority is to build a car that can be competitive, to perform on the racetrack, and you can take some liberties relative to the styling, go out of bounds of the styling on the production car," suggests Wilson. "Some of this wasn't that thought out so much when we first did this in 2013. Having a couple of data points to work from, and going through this exercise a couple more times, we've been able to refine it."

TRD knew what it was aiming for with the car's aerodynamic performance – seeking the figures that put its car within the NASCAR 'box', effectively matching the aero performance of the current Camry. But before that process could begin the look of the car had to be decided. "The box doesn't change for us, we have to kind of work backwards to that solution. At TRD we have aerodynamicists and CFD engineers, but we don't have stylists – we rely first on the same stylists that designed the production car to come up with the racecar," explains Wilson. "And what's really cool about it is they did that as they were completing the styling of the production vehicle. On some level it can only affect their eye, the way they look at design, it's a neat side effect of the process."

It was also considered important to ensure NASCAR was on board with the direction in which Toyota was going. In April 2016 representatives of the sanctioning body were welcomed to a design studio in the TRD technical centre in Ann Arbor, Michigan, where they were able to review a 40 per cent scale model of the new

ABOVE & BELOW The NASCAR Camry taking shape in CAD

car. "The intent was to show them a real model of the production car juxtaposed against our design for the racecar and to make sure we were honouring the spirit of the Gen-6 concept."

Meanwhile the aero development continued apace, with Toyota's teams adding their input – TRD has its own aerodynamicists working on a day-to-day basis alongside the in-house staff at lead team Joe Gibbs Racing. "The lines on the engineering side are blurred between TRD and JGR – we work collectively on our goals," he says.

SUPER-AGGRESSIVE NOSE

The most notable aspect of the 2017 Camry is the nose, which Wilson describes as "much more three-dimensional, super aggressive" in the spirit of being consistent with the styling of the production car. In the process it also presented a much more complex aerodynamic issue: "We had to make some changes and adjustments on the aero side, some of the front fascia on the production car goes deeper than what we employ on the racecar – we have to balance styling against performance.

"You don't want to create pockets of ▶

Toyota Racing

ABOVE The 2017 NASCAR Camry compared with its road sibling. While the vast majority of the grille area on the racecar is represented by decals, it still looks a great deal more three-dimensional than its predecessor

Nigel Kinrade/LAT for NASCAR

BELOW Toyota entered NASCAR in 2007 but not until 2015 did Kyle Busch claim the drivers' championship, here celebrating at Homestead. Last season Toyota added the manufacturers' crown to its trophy room, taking its Cup race wins to 95 over 10 years

drag or pressure differentials – when our colleagues at Ford made their first change to the Gen-6 car, rolled out in 2015, it was to a very pronounced area of the nose that had become a trash collector. It was an area of low pressure that proved a magnet to hot dog wrappers, blocking the radiator grille.

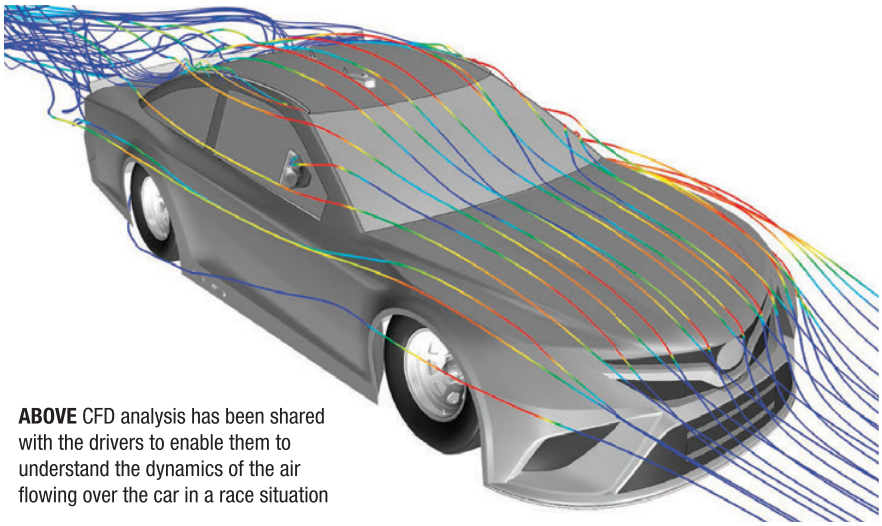
"You can do a lot of predictive analysis, CFD and in the wind tunnel, but there is a certain amount of holding your breath and getting to the racetrack, analysing the performance of one car, with five or six or with 40 cars," Wilson says.

However he adds that CFD studies focusing on two, three or four cars and moving them around has produced usefully accurate analysis of the air around the cars: "It's really been effective – we've gone so far as to sit down with our drivers, go through the studies with them and help them understand how the air works around the car, how for example pulling up close behind another car's left-rear quarter panel they might have to be careful because of the effect it has on the air flowing over their car."

GETTING THE GREEN LIGHT

The crunch point came in July, when the 2017 Camry was put in the wind tunnel for its aerodynamic parameters to gain the approval of NASCAR. "There is a master car run in the tunnel first to validate the numbers, where they are on a given day, and then we run our car and NASCAR allocates us a certain amount of time to effectively 'pass' the test," explains Wilson.

TRD had been carrying out extensive wind tunnel runs prior to the test to ensure it would comply: "But ideally you want to be in the most favourable corner of that box – with the least drag and highest downforce, but still in the box. The challenge is that the wind tunnel is just a tool and there



ABOVE CFD analysis has been shared with the drivers to enable them to understand the dynamics of the air flowing over the car in a race situation

is variability day to day, week to week – you have to go there with a measure of confidence that you are going to succeed."

Adding an extra element to the NASCAR test programme was the fact that it was conducted in the presence of rival manufacturers Ford and Chevrolet, part of the overall understanding agreed between the OEMs at the start of the Gen-6 era. "This underscores the level of professional respect and trust that we have amongst ourselves – but it is quite unnatural and counter-intuitive to be standing next to a brand new not just race but production car and two of the first people that see it are your competitors from Ford and Chevrolet – a good six to eight months before we go racing…"

As the development of the car reached its climax, NASCAR was working on its own aero programme, seeking to reduce the downforce of Cup cars in a bid to improve racing. This has been carried out principally through dimensional changes to the splitter, spoiler and radiator pan and according to Wilson has caused few difficulties to the Toyota programme: "It had an effect to some extent because we had to work within parameters that were changing, but we had a pretty good idea of where it would end up – these were bolt-on considerations, with some impact but not a major one."

REALLY UPSET

Underneath the body, the 2017 Camry remains mechanically identical to the 2016 car, the only changes being NASCAR-mandated safety updates. But many mechanical components will be subject to continual development through the season – those affected by airflow under the body.

"The fans have no idea just how much work is done on the parts of the car they never see," Wilson says. "We get really upset when one of our cars gets airborne in an accident – all the manufacturers employ photographers with high-speed cameras at every race simply to photograph all the cars. They relish the opportunity when a car gets upside down and we get to see its underpinnings."

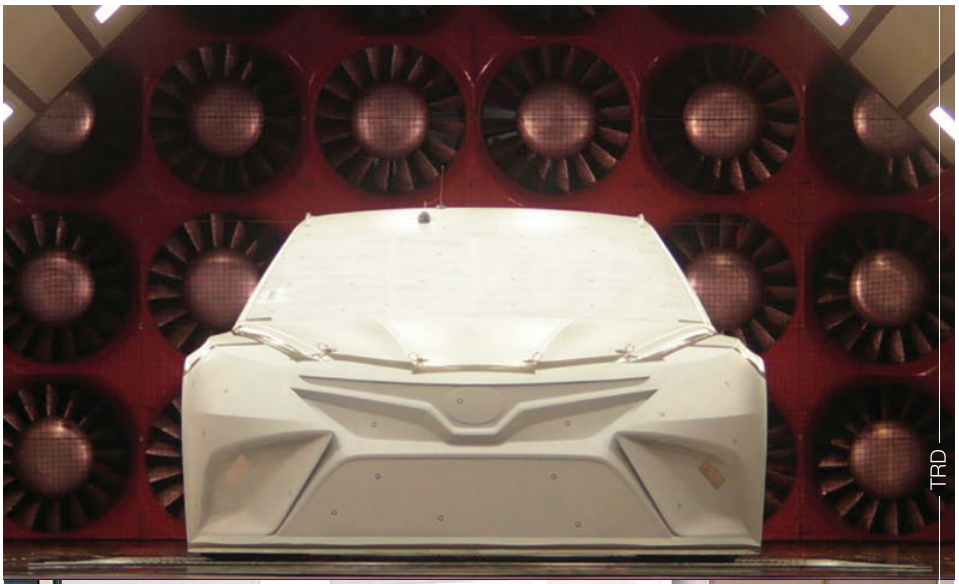
The day after the 2017 Camry Cup car debuted at the Detroit show, it was testing on the 1.5-mile Las Vegas tri-oval, and before the end of January further tests were scheduled at the one-mile Phoenix International Raceway. Wilson admits that such testing is not that informative: "In a test environment with a track full of cars running various agendas, mainly tyre tests for Goodyear, you don't really learn a lot about the behaviour of your car in traffic.

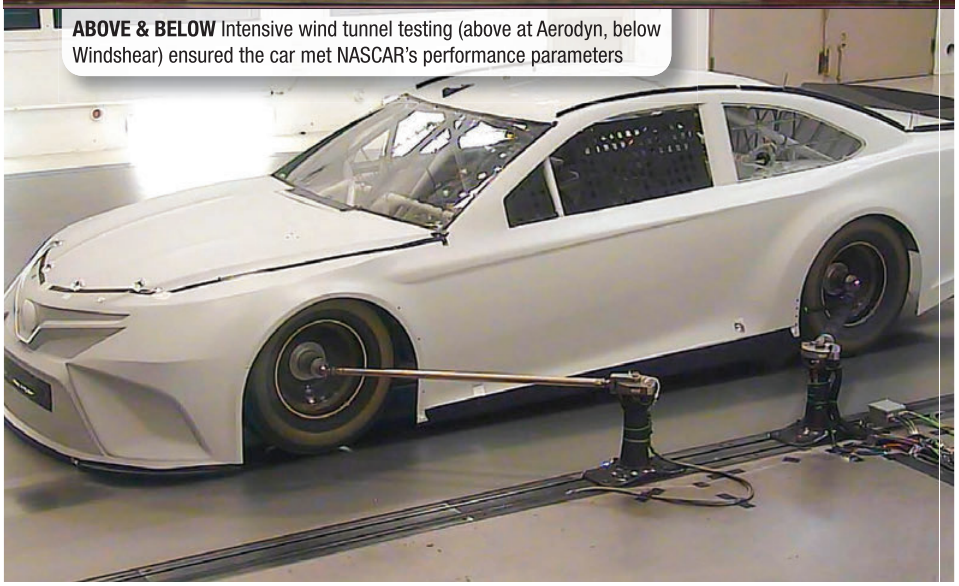
> *"Fans have no idea just how much work is done on the parts of the car they never see"*

"I don't think we will have a full understanding until we go to Daytona for the first race at the end of February and particularly to Atlanta for round two. The Daytona 500 is a very prestigious race but I'm more concerned about Atlanta as it's an intermediate track, when you look at how many of those are on the schedule they are our bread and butter."

The 2016 Camry is now very much history – every Toyota on the Cup grids in 2017 will be wearing the new look. "It's part of the commitment and the regulations we signed up for – once we change it has to be across the board. That's not so easy for some teams who are resource-constrained, but we try and help in that regard with some body parts," he notes.

By the time the first customers drive their new Camry out of a Toyota showroom in August, the car will already be familiar, with potentially NASCAR Cup wins already to its name. And the pace of development in NASCAR continues – Chevrolet has already announced that it intends to replace its current SS model at the end of 2017. So no doubt David Wilson and his colleagues from Ford will be guests at a very secret wind tunnel session in the summer… RT





ABOVE & BELOW Intensive wind tunnel testing (above at Aerodyn, below Windshear) ensured the car met NASCAR's performance parameters

Photos: Hal Ridge

ABOVE The changeable nature of the ice makes the Andros Trophy an engineer's dream – or nightmare!

"F1 ON ICE"

Hal Ridge joins the stream of engineering talent heading for ice racing in the Alps – and finds out how a forklift was the inspiration for technical innovation

ESCARGOTS, or snails as they are called on the northern side of the English Channel, are widely regarded as a French delicacy. Similarly, while the majority of the motorsport world is working behind closed doors over the winter months, another French specialisation is at play, as drivers, teams and engineers from across the motor racing spectrum meet in the Alps for the Andros Trophy (Trophee Andros) ice racing series each year.

Made for television, specifically on prime-time Friday and Saturday evening slots, the Andros Trophy is one of the most viewed motor racing disciplines in France. While the cars *are* as sideways as they appear when viewing on the 'box', wildly out of control they are not.

The cars in the main categories – Elite Pro for professionals and Elite for gentleman drivers – are spaceframe silhouette chassis with mid-mounted V6 engines and sequential transmissions. This year's crop features the rather unlikely mix of Renault Clio, Mini Countryman, BMW M2, Mazda 3 and Audi A1. While the chassis itself cannot be altered, the regulations are reasonably open regarding the design of the suspension geometry and components.

The level of competitiveness is one of the major draws for the former Formula 1 stars and their peers – Haas F1's Romain Grosjean is among this season's winners – attracted to compete. That lure extends to teams and technical personnel too, with cars run by top level rally, rallycross and GT squads and engineers from as far afield as the DTM.

Points are scored throughout each event, with two four-lap qualifying sessions determining positions for the 'super pole' shootout, followed by an eight-lap final. The tracks start the weekend as deep ice, but with 250 studs per tyre on the four-wheel drive machines digging their way into the surface, it is different each time the cars head onto the circuit.

While the conditions – arguably the most changeable of any motorsport discipline – are a headache for the competitors, it's an engineer's dream, for they are constantly having to adapt the car's setup to suit the environment.

"I've been doing Andros since 1998. I like to do it in the winter. It's a very nice challenge, and very difficult with a lot of parameters, especially the track, which is changing quite a lot from time to time," says successful DTM and World Rallycross engineer Laurent Fedacou, who works for the Mazda France team run by Sainteloc Racing.

"There are three types of chassis. Most [in the series] are two different types done by Tork Engineering in Paris. V1 was done 10 years ago, V2 is the new generation introduced two years ago. At Mazda for example we have two V1 and one V2 chassis. They are pretty much the same, but there are some changes to the kinematic bushes." Early versions of the chassis were constructed by Xagon Engineering.

"The big thing is that you have to be very careful with the state of the ice, with the temperature changing quite a lot over the race," cautions Fedacou. "So you have to change your setup, your tyre pressures and the vertical stiffness to adapt to the grip from the track, like in rallycross. The regulations are quite tight about body shape and the

differential ratios from front to rear, but for the kinematics the rules are quite open, which makes things very interesting. The parameters of what you can change are huge: you have the front diff, rear diff, a lot of geometry, the dampers and anti-roll bar."

FOUR-WHEEL STEERING

"One big variable in Andros compared to other racing series is the steering," explains Fedacou. "We have front and rear steering. It's really important to adapt that to the track changes – it keeps you busy."

While the concept of four-wheel steering has been sparingly implemented in the past in road cars, it isn't commonly used in motorsport. Formula 1 has tried it. Michael Schumacher and Benetton tested a hydraulically-operated version in 1993, but it was never raced. In Andros Trophy, every car uses steering on the rear as well as the front. This was the brainchild of one of France's most successful hillclimb drivers, Marcel Tarres, back in 1992.

Having begun participating in Andros Trophy, Tarres needed to find a way of taking on the rally drivers more used to rotating a car on corner entry on loose surfaces. "The cars were much less complicated [then], and the most difficult thing was the tight turns; we had a lot of understeer," he explains. "We needed to find a solution to have good turning in the tight corners and stability in the long corners. When I was young, I worked in a company with a forklift and I liked the idea that it was very easy to turn using the rear wheels, so I thought it would be a good idea to test on the Andros car. Peugeot used something similar on its 405 Pikes Peak car."

ABOVE Side wipers are among the unique features of an Andros Trophy car

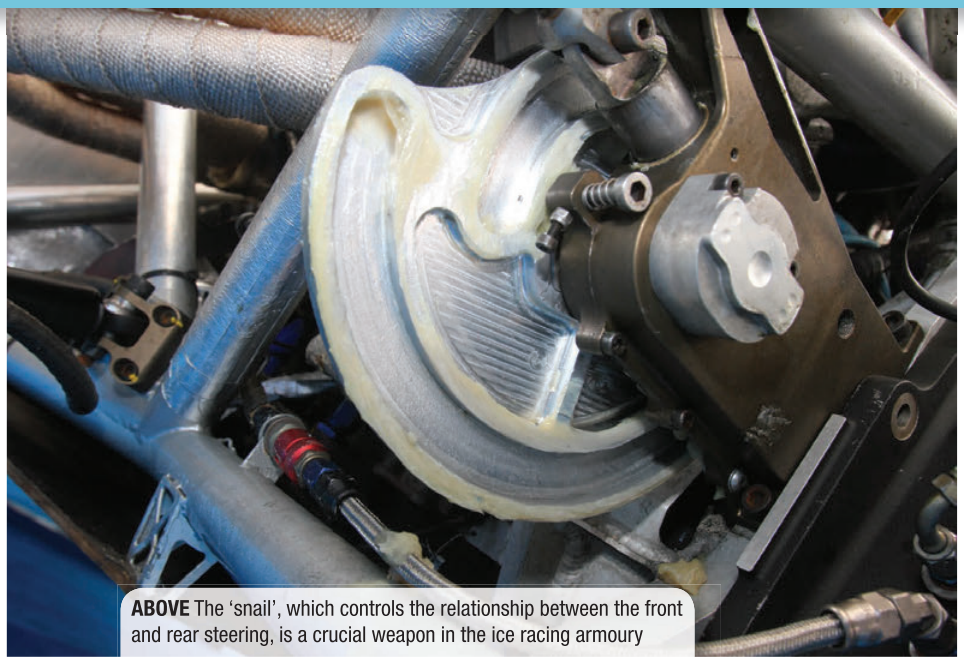
The concept was first tried during pre-event testing for the Isola 2000 round of the series, and was found to improve lap times by over a second. Two races later, the entire paddock had embraced the concept, works-funded teams improving on the controversial system. Some drivers tried to have the concept banned, believing it took away their advantage, but series directors allowed it to stay and today it's a major factor in setting up an Andros Trophy racer.

"Originally it was just a column, then the steering rack was attached to another rack at the rear by a chain," says Tarres. "It was just a linear ratio. Now the system has improved a lot and we can choose what kind of curve we can have with regards to front vs rear."

The relationship between the front and rear steering is crucial on the bespoke ice-racers. The car uses a 'normal' steering column, connected to a hydraulically-operated rack at the front, which is then linked to a further column by way of a 90-degree joint, sending the steering input to the rear, at the same ratio. There a machined aluminium cam that has a grooved track within it – referred to as the escargot (snail) – controls the steering ratio and the angle at which the wheels start to turn (in relation to the front).

"We have a data sheet and we record the start angle all the time, in relation to everything else. We have a lot of different snails; we maybe design one or two more each year," explains reigning champion DA Racing's lead engineer, Sebastien Breuil. "We can have a curve that changes two or three times in one movement, to suit the ice conditions, each track, the driver and in relation to the rest of the setup: the pre-load in the diff, springs, roll ▶

ABOVE Sideways to victory: the Andros Trophy has captured a place in French hearts – and a prime-time TV slot with it



ABOVE The 'snail', which controls the relationship between the front and rear steering, is a crucial weapon in the ice racing armoury

bars and other things.

"This is really a big part of the setup. For instance, for the final race of the day we have it so it steers very early, to make it easy to turn the car [to enable overtaking more easily]. Generally, the rear wheels start to turn at about 60 degrees compared to the front if it's early, and 100-110 degrees if it's later."

Data acquisition is a major part of the setup of Andros Trophy cars, with no restrictions as to what sensors the engineers can employ. That helps hugely with making setup adjustments between each session to move with the track conditions. "We have brake sensors front and rear, clutch, steering, dampers, wheel speed and the engine side. We can look at everything," says Breuil.

Independent twin A-arm suspension is used at each corner, with a latest generation Öhlins TTX44 four-way adjustable damper and spring. "We can adjust low speed and high speed bump, rebound and CSC (an offset between the bump and rebound) and it is a very reactive way of changing the car setup," says Breuil. "We don't have lots of adjustable rose joints, but we change the shims to adjust the anti-lift and anti-dive for instance, depending on if the track is flat or bumpy. We can do whatever we want [with the suspension], it's just a cost problem.

"We have about 150 mm of travel in the dampers and 180 mm at the wheel. It's quite different to rally or rallycross – there you have a big bump and you need to have a very good rebound, but here the most important thing is the undulation in the track, because when all the cars take the same line there is a rut and you have to just absorb it, but there are no jumps or anything."

There's a mixture of opinion in the Andros paddock with regards to anti-roll bars. Some teams don't run any at all, but DA Racing does, and is investigating what Breuil describes as a 'secret' development, alongside the usual variables of diameter and ratio. "We're working on having even more adjustment," he says. "These kind of regulations are very interesting, because you can change everything. You need to be very vigilant because you can get lost very easily with all the setup potentials if you are not careful."

The braking is provided by discs borrowed from a motorcycle. The same motorcycle four-pot callipers are used all round, with a balance of 56% to the front and 44% to the rear. "We don't need big brakes because the track is very short," says Breuil. "We have the power from the diameter, but in terms of endurance we are doing only four or eight laps, so that is no problem. The [single skin] discs are about 300 mm, a bit more on the front and less on the rear. We just need them to be very light. It's important to get the unsprung weight as low as possible, so we only use one centre wheel nut too."

ABOVE Haas F1 pilot Romain Grosjean is one of the series' converts, winning a race before Christmas

The car has no handbrake, unlike other off-road racers, the rotation of the vehicle being achieved with the four-wheel steering and inertia of the car.

Skinny 10/65 16 Yokohama tyres, each encompassing 250 studs to find grip on the ice, are used on each wheel. Tyre degradation and management is another critical area of competition in the Andros Trophy. Each 'pro' driver gets eight tyres for the two events run over two days, allotted randomly. With the largest proportion of each event's point haul at the end of the qualifying stages, keeping good tyres to run in both the following final and the next day's competition is high on each team's agenda.

MOVING TARGET

"You have to be very vigilant to protect the studs," stresses Breuil. "They go very quickly when there is a lot of tarmac, so the pressure is very important. We start from 0.8 bar and go to 2.5 bar – the range is really impressive. We manage the tyres a lot. It's complicated but the same for everybody. You have to get the stud into the ice, with big tyre pressure and stiff springs; if not, you don't have traction. But, when the tarmac starts to come through, the job changes. It's between the car setup and the driver to manage wheelspin. At the start of the weekend the ice is really strong, maybe 10 cm thick all around the track, but you get places after quali where you get a lot of wheel spinning and you can see tarmac. You have to adapt or you will destroy the tyre."

During the summer season Breuil works as an engineer for accomplished Belgian-based GT outfit WRT (which also has an ice racing team). He says that although Andros Trophy cars are "just another race car," the challenge of the amount of setup variables is hugely enjoyable: "You have four wheels and one driver inside. But GT3, for instance, is quite easy compared to this. In GT3 you can maybe play with the pre-load in the diff, the camber and three springs. Here you have many things – you just have to be clear about ▶

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BELOW DA Racing's lead driver, Jean-Baptiste Dubourg, is the reigning champion

where you are in your head."

Another of the adjustments made more often than not between each session is to the differentials. The longitudinal rear-mounted six-speed gearbox is a common part across all cars, geared to a maximum of 150 kph, that can't be adjusted. Under past regulations differentials were free, allowing engineers to change the balance of the car to get more traction, but now strict rules surrounding the diff ratio front-to-rear have to be adhered to. But ramp angles, friction discs and pre-load are all changed between each run.

"I look at the wheelspeed data to see what is happening, and using that we decide what to change, depending what we want in the acceleration or braking," notes Breuil. "We can play with up to between four and six friction discs (two per side) and the pre-load with a bevel shim. It's a big part of the tuning." Driveshafts and CVs are standardised parts and, like the differential, come from Sadev. Although the gearbox is sequential, because the wheels are constantly spinning, the driver is required to use the paddle-clutch with every change.

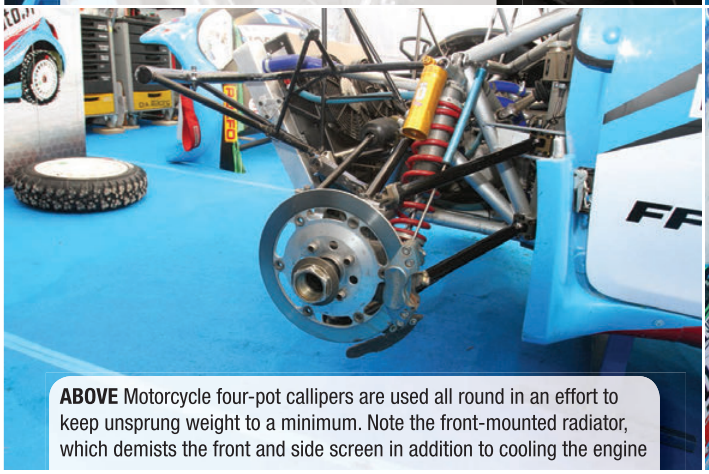
With so many areas of the car constantly changing, one consistent factor is the glorious sound from the mid-mounted V6 24v 3.0-litre engine. The unit responsible for making the Alps sing with the sound of naturally aspirated joy on race weekends is built by ORECA. DA Racing uses an Audi-based motor, while there are also Lexus and Nissan units employed in the series. Revs are limited to 8000 rpm with a maximum capacity of 3.0 litres.

"We are quite limited with the engine. There some changes but nothing out of the ordinary," says Breuil. "It has upgraded components inside, like the crankshaft, conrods and pistons, but they are changed for reliability not performance really. We have 360 horsepower, nothing more. We do play with the torque curve: when you have thick ice you need power at high revs because the wheels are always spinning, but where there is tarmac you have to avoid that. We have worked on having a big torque curve from low revs. Two seasons ago we changed the exhaust system, the length and diameter, to get big torque at low revs."

The air intake for the individual throttle bodies on top of the V6 unit is from a duct in the car's roof, while the engine is cooled by a large front-mounted radiator, with piping connected to a heater in the cockpit to avoid fogging. The heater is also directed to the ▶

ABOVE Spot the missing item, usually found in rally cockpits. The correct answer was: 'handbrake'

ABOVE & BELOW Tyre management is a crucial skill



ABOVE Motorcycle four-pot callipers are used all round in an effort to keep unsprung weight to a minimum. Note the front-mounted radiator, which demists the front and side screen in addition to cooling the engine

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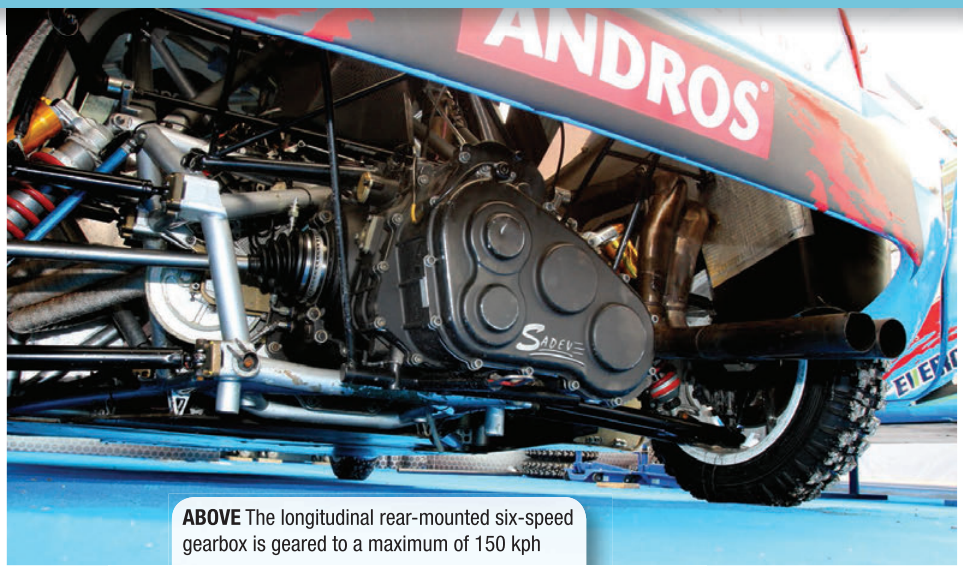


ABOVE The longitudinal rear-mounted six-speed gearbox is geared to a maximum of 150 kph

side widows, which house one of the unique features of an Andros Trophy car – side widow wipers, donated to the cause by the rear screen of a production hatchback. "That's very special because we are going sideways a lot. The driver needs to see through the side window," says Breuil, in a nonchalant manner.

Like the rest of the car's bodyshell and panels, the doors are fibreglass. Carbon fibre is banned from anywhere but the interior.

"That is one area we could improve," explains Breuil, referring to the bodywork. "We have some problems with this car [the Renault Clio Mk3] because it [the bodywork] is a bit heavy compared to the others and we catch a lot of snow behind the wheels. We finish sometimes with 20-25 kgs more than when we started." The success penalty ballast for the top three finishers for the following event is 60, 40, 20 kilograms. "When you are on the ice, 60 kgs is a much bigger penalty than in circuit racing," he says. "The weight limit is 1030 kgs with driver but we are below that so our balance is pretty good (48 front/52 rear).

FRESH SNAILS

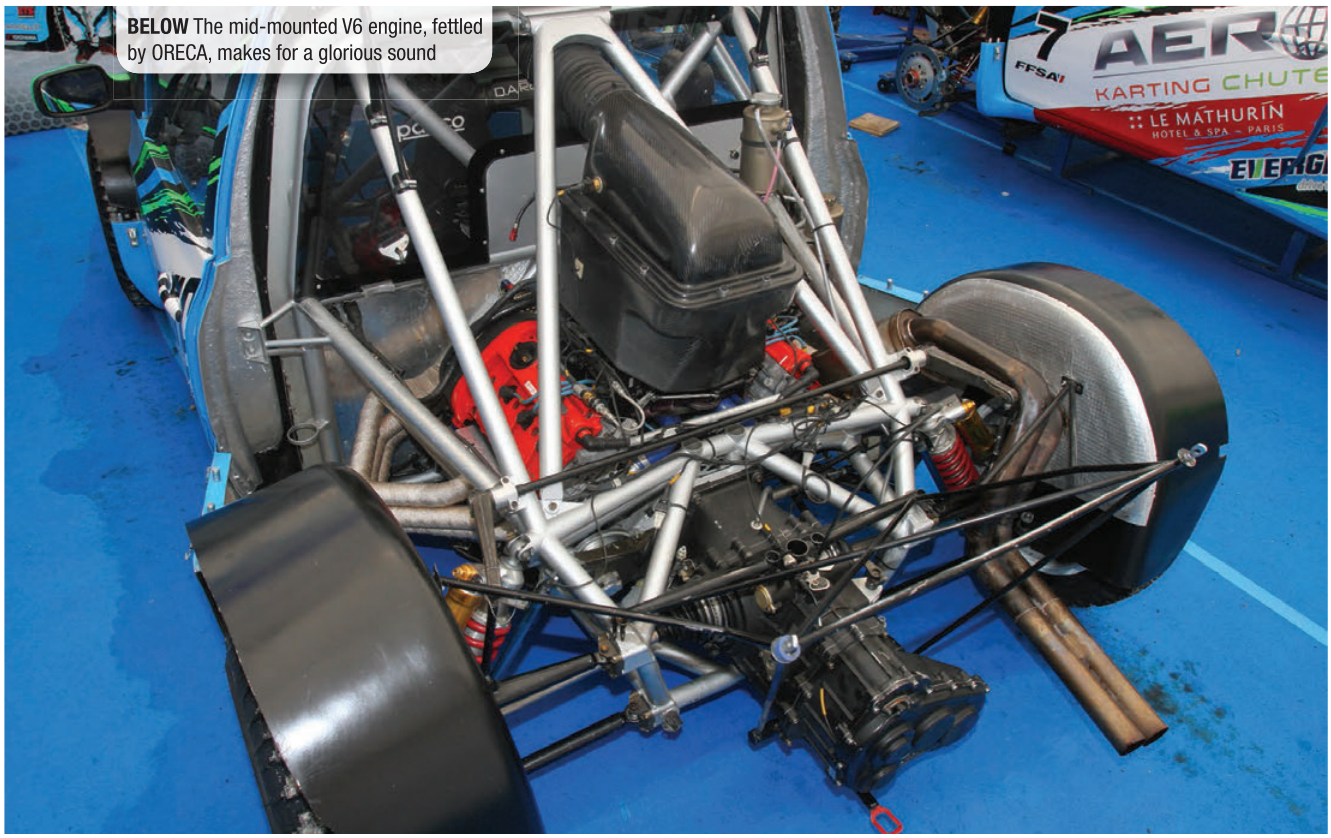
Developments for the 2017 season have included valving inside the dampers and steering geometry with the addition of new and differently machined escargots to enable DA Racing to challenge for a second straight title. Breuil says the ideal scenario for coming years would be to have the opportunity to test and perfect base setups further.

"The Yokohama is a nice consistent tyre, different to what we have used in the past, but we need to test," he comments. And the ice required for testing isn't available pre-season.

"I would like to try different things for anti-lift, anti-dive and spring rates, but at races time is very short. The regulations are free in terms of development – it would be really good to test for next year with a manufacturer pushing hard with a good budget. But, I think we do well and Andros is very enjoyable. The level is very, very high. In France we say that Andros Trophy is like Formula 1 for the ice; it's a specific category with specific cars."

The winter series has attracted drivers from many disciplines over the years, notably Alain Prost. One former GP winner who is trying to conquer 'Formula 1 on ice' is Olivier Panis. "It's really a lot of fun to drive. I came for fun, but I came to win too and it's really tough. The most difficult thing is to use the tyres on the right moment. It's a real strategy, but it's the same for everyone," says the 1996 Monaco Grand Prix winner.

"Technically you have a lot to do with the differential and suspension. For me the most difficult thing to understand is the track changes. You need to change your driving style; sometimes flat out, sometimes like in a formula car. To win to be honest it's like Formula 1; I tell you, it's really tough. For me it's one of the most difficult things I've done."



BELOW The mid-mounted V6 engine, fettled by ORECA, makes for a glorious sound

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TEMPERATURES LOW, CONFIDENCE HIGH

William Kimberley, **Sophie Williamson-Stothert** and **Seb Scott** report on new products found at the recent Autosport International Show, the traditional season starter that takes place at the NEC in Birmingham

COMING as it does at the start of the year and for many exhibiting companies the third of three motorsport exhibitions, there can be a sense of show fatigue, but that was not evident at this year's Autosport International. While it perhaps did not have the full-on buzz of the pre-Christmas Performance Racing Industry exhibition in Indianapolis, it was certainly more upbeat than the slightly downbeat Professional Motorsport World exhibition in Cologne in November. Furthermore, there were still new products to be found in the various halls.

Perhaps one of the most exciting products to be seen at the show was something that took even its boss by surprise as it had been secretly developed in the company's 'skunkworks' by Mike Broadbent, the marketing co-ordinator at **Racelogic**.

This company has long been at the cutting edge of technology on a variety of fronts with its range of VBOX products, LabSat GPS simulators and Circuit Tools, but what it showed at the show has the potential to revolutionise motorsport all the way down to grassroots level. Company founder Julian Thomas is an out-an-out racer, successfully campaigning a lightweight E-Type Jaguar in historic racing. Used to driving different race cars he thought nothing of it when asked to complete a few laps at Silverstone in a Porsche Cayman GT4, which, of course, was kitted out with Racelogic equipment.

In order to prepare for the test, he practised on his home simulator, nothing too sophisticated, but what he didn't know was that his colleagues had inserted some software that recorded his every moment on the track. It was to his astonishment at the show when, on a dual screen on the stand, he saw next to the video feed from driving the Cayman around the track was a video feed of his ▶

ABOVE & BELOW Racelogic's 'skunkworks' expertise, which took even the boss by surprise, enables comparison between the live and simulated driving

ABOVE Race Technology launched RT Live

simulated test from his home computer.

Apart from the live and simulated video feeds on the two screens that allowed a comparison between the live driving and the simulated one, the captured data enabled a huge number of things to be explored. They included braking points, lines through corners, speed at any given point, sector times, steering angles, throttle angles and much, much more with the live and simulated graphics being overlaid on each other to allow a visual comparison. As Thomas himself said, when the data showed that he was braking far later into a corner in the simulated version than when driving the actual car, he could then bring up the visuals to show it as well.

This technology will not be news to high-end race teams, but as Thomas points out, the Racelogic software that collects all the data and the video in the background that imports directly into Racelogic's Circuit Tools package, its standard industry analysis software, could well cost below £50 and for the sake of a £200+ steering wheel, you could have such a basic system.

"It means you can hone your skills on a simulator and maximise your time at the track when you get there, thereby saving a lot of money as running at a track is expensive," said Thomas.

Meanwhile **Race Technology** launched RT Live, a very interesting new product whereby the new data logger records data directly to a cloud server over a wireless 3G internet connection. This means that all telemetry data, which can include everything from track position to ECU data, is available in real time on a PC or mobile device while the vehicle is still on the track.

Race Technology is targeting individual racers that would like Formula 1-style telemetry, as well as race series that want the technology to be able to manage an entire grid. The data logger features automatic lap timing, allowing users to monitor lap times, sector times and live time slip based on the GPS data. When paired with a Race Technology dashboard display, there is also the ability to send messages from the pits to the driver, which then appear on the display.

The hardware is compact and easy to use, just requiring power from the vehicle battery and an antenna positioned on the vehicle roof. It has an internal GPS, accelerometers, a 3G radio system, a SIM card and a battery. As soon as movement is detected, RT Live starts to log data, and stops when it detects the vehicle is stationary. Data from the cloud server is available to download immediately at the end of the session without ever having to directly access the unit in the car. For more complex applications, it has a range of data ports and inputs so it can be connected to a wide range of displays, data loggers, ECUs and sensors.

TE Connectivity - Deutsch was showing the next generation of hermetic connector as specifically used for fuel cell applications that creates a clean break between the fuel cell and the outside atmosphere. "Previous generations have been based around the stainless steel component," said Brad Scott-Thorburn, TE Connectivity's autosport sales engineer. "It's very reliable and very robust, chemically resistant but very heavy. The ones we've been developing are based on aluminium that give a 60 per cent weight saving that allows us to use a higher conductivity contact as well."

They are primarily for use in Formula 1, the World Endurance Championship and the higher end motorsport market, and their price reflects that as they are made in smaller ▶

ABOVE TE Connectivity – Deutsch showed its next generation aluminium hermetic connector

ABOVE KA Sensors' ASUH Series Hybrid Pressure Transducer is optimised for extreme installations

batches and are technically challenging to produce. "For those people looking for the ultimate in light weight versus cost, then they fit the bill," said Scott-Thorburn. "We are looking at making double density versions of it as well with more pins and are also looking at other ranges, but it depends on what the customers require and what we can sell to other markets as well."

Edouard Tonussi, EMEA product manager, Hermetic Connectors also confirmed that the company was working on a double density hermetic connector for a leading Formula 1 team: "We are developing this particular connector, the same shell but with 23 contacts, gauge 24, the first time we've done 24 contacts in a hermetic connector. It's currently in development so that it can be installed on the 2018 cars."

KA Sensors was showing three new innovative products added to its line-up in 2017. It included the RHL4 miniature laser ride height sensor that is designed to withstand harsh environments. On-board compensation ensures that different track colours and surfaces are correctly measured without error.

"The sensor has a small diameter visible laser which is reflected off the track surface to a precision CCD detector that determines the height from the ground," explained managing director Peter Trevor. "Supplied with a standard measurement range of 200 mm (60-260 mm), the RHL4 is ideal for use on all types of vehicles from single-seaters to karts."

Next on the new product list was a miniaturised pressure sensor that utilises miniaturised hybrid components to allow savings in size and weight. The transducer has an enhanced performance at elevated temperature and is optimised for extreme installations such as on-engine or transmissions.

According to Trevor, the ASUH series is born from "demand of customers to shrink the size of the sensors for use in high-end competition cars. For applications in a world where size and weight are absolutely critical, these sensors can be used to monitor all pressures on a race car, including fuel, oil and water."

The third new product was the new CAN8 signal acquisition module that integrates a multi-channel data acquisition system micro-controller and CAN interface to provide access to external analogue sensors. "The module offers an array of configuration options in terms of analogue input conditioning and CAN output formats," said Trevor. "In addition, for maximum flexibility, a number of application layer configurations are available including CANOpen, J1939 and a fully customisable proprietary protocol."

Cartek Motorsport Electronics was showing a full redesign of its bespoke fully customisable power control panel that is scheduled to be released this spring. It has 16 channels with selectable current ratings of 8 or 16 amps, while combining two channels that will allow outputs to increase to 24 or 32 amps. Each one features full over-current and short circuit protection and a status LED that will flash if an error has been detected.

As well as changing the amperage of each channel, a variety of functions are also user-selectable, including momentary, latching, latching with memory, and flashing along with many others. Each power distribution panel also comes with a dedicated wiper module that allows slow and fast speed wiper control ▶

BELOW Cartek has redesigned its Power Distribution Panel

and park position input. The configuration process is achieved through the front switch panel, meaning no laptop is needed.

The power distribution panel also comes with 16 external inputs that allow all channels to be activated by steering wheel-mounted switches, or Cartek's wireless control system. ECU inputs can also be accepted to take control of any of the 16 channels. This new power distribution panel is also compatible with Cartek's new XR battery isolator. Each one can also be backlit and comes with a label pack to allow the user to fully customise the front panel layout.

Another new product at the show was ZircoFlex Gold from heat management specialist **Zircotec** that offers increased reflectivity over existing ZircoFlex materials and provides even greater levels of thermal protection. The material, which is available in several thicknesses on an aluminium substrate, can be self-supporting or supplied with a self-adhesive backing, capable of withstanding temperatures up to 500°C.

ZircoFlex flexible ceramic heat shield material is the culmination of more than five years' intensive research and development, using a new technology in which the ceramic material is sprayed in the form of thousands of individual 'platelets' onto the surface of the backing foil. While these platelets are close-packed to provide comprehensive heat protection, their structure coupled with the forming processes allows the foil to be flexible and easily manipulated and bent to shape.

"Our patented range of technologies and products has grown steadily over the years with new applications and ZircoFlex Gold being the latest example of this," said Terry Graham Zircotec's group managing director.

"Coatings is a service. Customers have to send us parts that we coat and return which can be a logistical challenge for some but ZircoFlex is something that we can produce and it's a product that we sell. The original product is ceramic with an aluminium backing that comes in various forms and can be bonded together to make two or three layers and is a very high-performance heat shield material. We were surprised how well it sold without masses of marketing and as we've moved more into automotive and general industry, we decided that we would develop our heat shield offering.

"So last year we launched ZircoFlex Form, which is a stainless steel cord heat shield material and this year we've launched ZircoFlex Gold, which is a reflective surface that improves the performance of standard ZircoFlex. It still comes in single, double and triple layers but with a gold reflective surface on the top. Does it improve the performance? From a heat management point of view, if it's conductive heat, then it doesn't change it. If it's protection from the radiant heat source, then the gold reflects more of the radiant heat than the surface of the aluminium."

ZircoFlex Gold comes in sheet form in different widths and sizes so that customers can buy the size they need and it is also self fitting as there is an offering with an adhesive back. It is also very flexible and so can be moulded around things. Typical uses are on air inlet systems, inlet manifolds and so on. ▶

ABOVE Zircotec's ZircoFlex Gold, seen here in the engine bay, provides even greater thermal management

ABOVE Lifeline's Zero 3620 Firemarshal was on show in the UK for the first time

On show in the UK for the first time was **Lifeline**'s new Zero 3620 Firemarshal – a further development of the successful Zero 3620 fire suppression system – designed to meet an increase in demand as more categories are required to use systems approved to the FIA8865 fire suppression standard. The system offers exceptional performance, but shows a significant cost reduction when compared with the current generation of FIA8865 approved systems. Zero 3620 Firemarshal has been homologated by the FIA and has been tested and developed for use with unleaded petrol, diesel and E85 fuels.

Racetech Seats collaborated with two of its UK dealers to show its latest products. Found on the **OBP Motorsport** stand was the wide and tall RT9119WTHR seat that potential customers could try for fit and height. Meanwhile on the **Revival Race Shop** stand was the RT9129THR carbon/Kevlar seat that is supplied to the majority of BTCC teams that uses the latest Racetech six-point GT harness with quick adjusters, and the RT9119HRW as fitted in a Fun Cup Evo 3 spaceframe chassis. Building upon the successful 129 series, it offers the same ergonomic form and feature set but in a lighter and more affordable package, is compatible with the latest HANS head restraint technology and weighs as little as 4.4 kg.

As has been reported in previous issues of *Race Tech* **Ferodo Racing** has spent the last couple of years researching processes for both motorcycles and cars. Last year it took a more fundamental look at the structure of a brake pad and its composition, stripping it back to basics and rebuilding it to see if any preconceptions about it were correct. "Our aim was to develop something a little bit better than we have at the moment because we weren't present in some of the top levels of motorsport, particularly GT racing," said Edward Little, Ferodo Racing's technical and product manager. "It's a process that hasn't yet been completed although we're around 80 per cent of the way through it. We are at the point where we've identified the core chemical set that we want to use and we're into the optimisation phase. We already have a material that we believe is better than our best currently marketed material.

"The other thing we were doing was trying to take a step away and understand if there were chemicals that were not traditionally thought of as brake pad components – often due to their price – that we could evaluate because we're not restricted by cost as much as the original equipment world. To my surprise, we have found something that's quite an exotic chemical that's had quite a startling effect on the performance, which we are now following up on.

"It means we currently have two development strands. One is making something that is in the style of our existing materials, but better, and something which is a little bit different in style, mostly in terms of having a very, very high coefficient of friction. This might actually fit in well with the current heavy duty racing market requirements, which we see as somewhat divided in two at the moment: cars that have ABS and those that don't.

"For those that do have ABS, the overall output of the brake pad isn't super-important but the way that the brake pad ▶

FORMULA 1 2015/2016 Technical Analysis

Giorgio Piola

Size: 24,3x27 - Pages: 128 - Photos: over 400 technical drawings in colour
- Softbound with jacket - Text: English
ISBN: 978-88-7911-656-5 - Price: £32.00 + plus post and packaging

AS with previous years, 2015 was one in which Mercedes-Benz dominated both the drivers' and constructors' championships. The German manufacturer confirmed the technical advantage it had derived from the introduction of the revolutionary power unit, which first appeared in 2014. In place of Red Bull, which fell into disgrace after a media conflict with engine supplier Renault, it was Ferrari that attempted to stand up to the Silver Arrows. Side issues were the stories of a Williams wanting to come back and battle for the title; McLaren with a new but not very effective Honda engine, which touched the lowest point in the Japanese manufacturer's long history in F1; and the other leading teams of a season that ended with the official announcement of Renault's return, having acquired Lotus.

Offering a precise analysis of this latest F1 championship, especially from the technical point of view, there is once again Giorgio Piola. A hundred or so all-colour illustrations document the development of the various cars throughout the Formula 1 World Championship, and offer - as always - a wealth of information anticipating the 2016 season.

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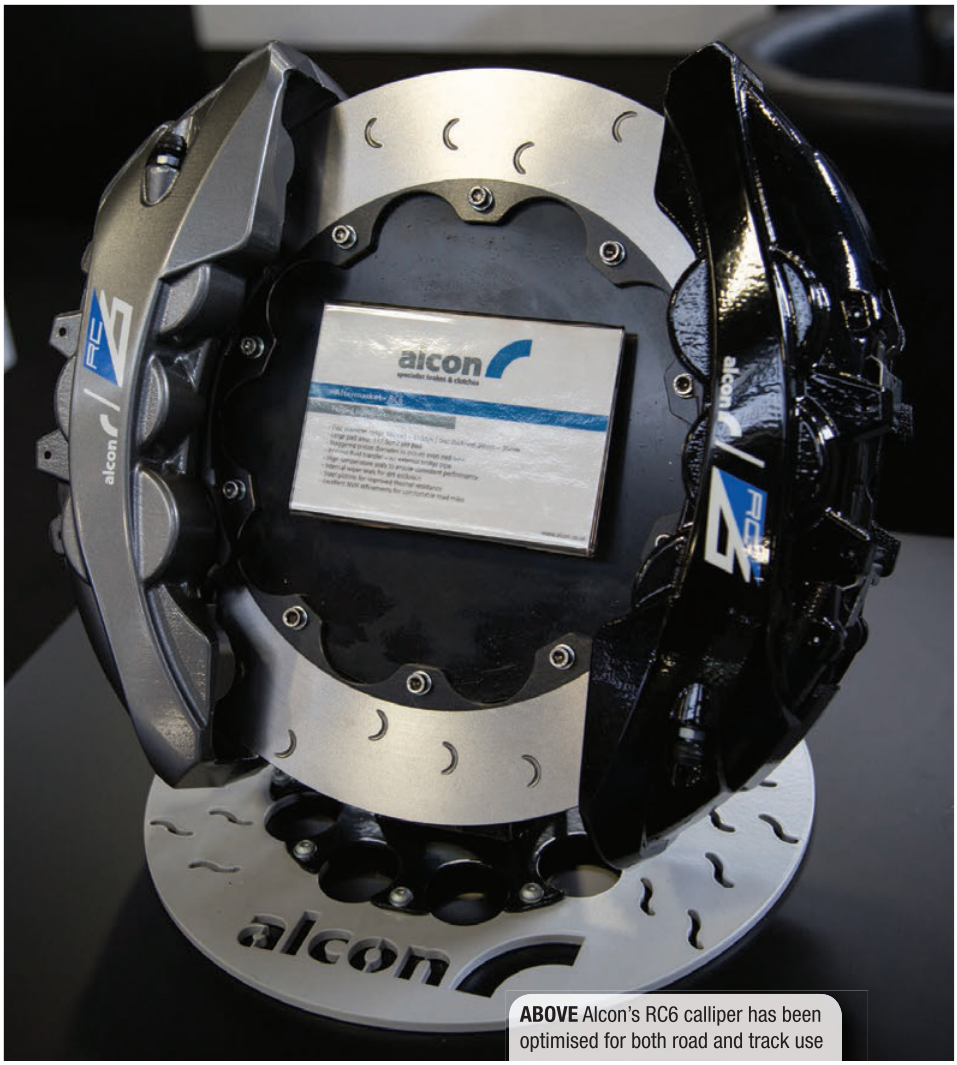
introduces the ABS is critical. Conversely for those cars that don't have ABS, such as touring cars, friction coefficient is very important. So it might be that we end up marketing two materials – one with medium high friction and a long life that's suitable for ABS cars and then another material with high output for non-ABS actuated braking.

"We are now at the stage of evaluating these compounds in the closed season with the hope of marketing something in the first half of this year."

As mentioned in the January issue (194), **Alcon** was showing its two new six-piston RC6 and four-piston RC4 callipers at the show. The design of the RC6 means that it's suitable for fitment with a wide variety of discs and it will have no problem swallowing those with a diameter of between 380 mm and 410 mm, and with a width of between 34 mm and 36 mm. The RC4 is similar in form, albeit on a smaller scale. It can accommodate discs with a diameter of between 330 mm and 360 mm, and with thicknesses of between 28 mm and 32 mm. Both have been developed to give optimum braking in all conditions and so feature truly massive pad areas, a not inconsiderable 117.5cm² per pad in the case of the former; a still impressive 66.1cm² for the latter.

Despite the differences associated with their crop of pistons, both the RC6 and RC4 have much in common. Both feature staggered pistons in order to ensure even pad wear, while said pistons are made from steel in both applications, a material known for having exemplary thermal resistance when utilised in braking applications. Other design traits intended to help both callipers weather the extreme temperatures generated by hard braking include specialist seals, and an internal fluid passageway that negates the need for an external bridging pipe.

While the RC4 and RC6 represent considerable jumps in terms of stopping ability for all but the most high-performance of cars, they have also been optimised for both road and track use, meaning that fitting either to a road-bound car will not compromise everyday usability. Both have been specified with internal wiper seals to keep road grime at bay, and both have been extensively tested to ensure that they have excellent Noise Vibration and Harshness (NVH) characteristics on all types of road surface.



ABOVE Alcon's RC6 calliper has been optimised for both road and track use

Like every year, **Quaife Engineering** had a bustling stand with a plethora of gearboxes available to view including some aesthetically pleasing cross-sectional units. "We have a range of new motorsport gear kits that utilise the existing bell-housing," said technical sales supervisor Adrian Nash. "It's a complete bolt-on kit that's a direct fitment and replacement for the standard one. They are generally designed with the same mounting mounts so that it's a straight bolt-in using the same diff to make it as user-friendly as possible."

The new kit has been designed as a 5 or 6-speed gearbox with a range of ratios to choose from that allows a great range of customisability depending on the applications. "They are primarily different ratios," said Nash, "with a sequential mechanism as opposed to a standard H-pattern to allow for faster gearchanges.

"We have a range of them for the Honda B-series, the K20, the Honda FK2, Ford IB5 and we've just realised a new Mk III Focus gear kit and a new kit for the Volkswagen 02M/02Q and two and four-wheel drive. We don't offer any kind of rating for the gearbox, primarily due to limiting factors such as shaft centres, but we have had customers running the K20 gearboxes to the tune of 800-900 horsepower."

Last year **Questmead** informed *Race Tech* about its then work-in-progress project – a brake disc and pad bedding in machine. The concept was simple, saving on costs by bedding-in brake discs and pads without having to turn a wheel on track. Due to the rising costs of track time, teams now try to complete much of their setup and preparation away from the circuit. However, there are some parts of a vehicle that need to be prepared in a dynamic environment, such as bedding-in a fresh set of brake pads and discs.

Questmead's latest service is able to replicate such a dynamic environment at a fraction of the cost and time. The machine is essentially a dynamometer that puts a brand-new brake disc through a heat cycle ▶

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over four to five minutes and gets up to between five and seven hundred degrees depending on the type of pad being bedded in.

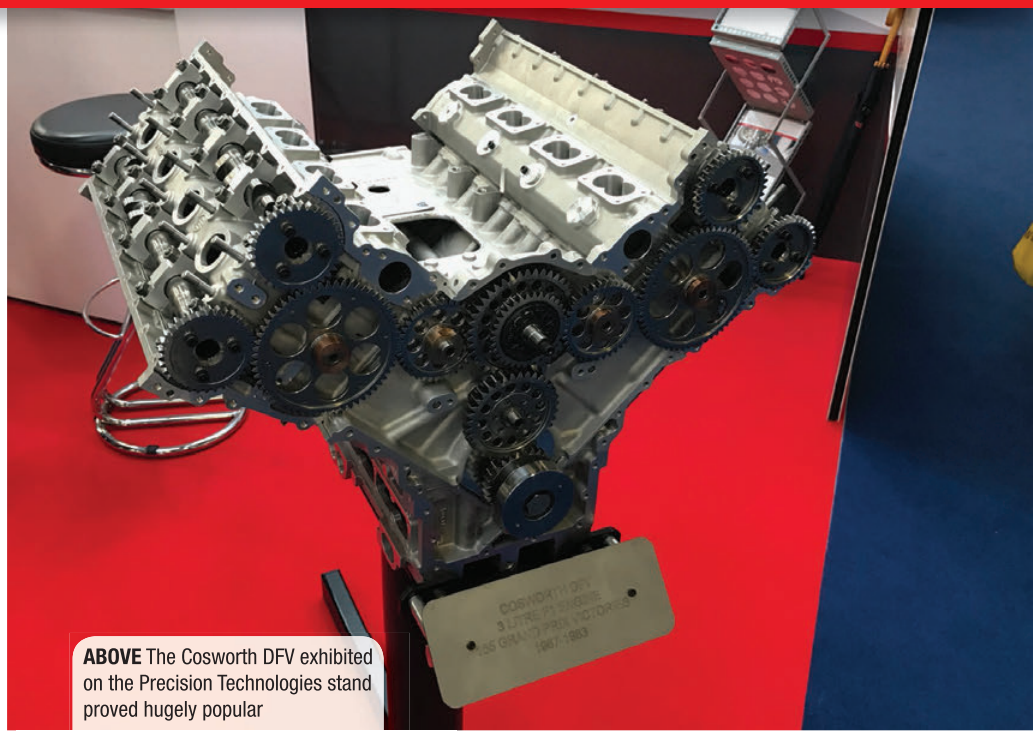
Highlighting the effectiveness of Questmead's innovation, a test was conducted between two drivers with differing styles. Both were supplied with exactly the same discs on the same programme and when the test concluded, according to Questmead, both drivers were very enthusiastic. As a result of the test, the drivers passed the message on to their engineers that they would never bed their own discs and pads in again.

For Martin Tagliavini, marketing manager at **Supertech Performance**, the Autosport International show had been spectacularly good for his business. "We saw some new clients as well as catching up with existing ones," he reported. "We've always been strong in niche markets and came in at the right time in the 4 and 6-cylinder market when the demand grew for smaller engines with manufacturers downsizing from the V8, so we were well prepared in terms of product and knowledge. Our valves are consequently in high demand in Europe and other markets where 4 and 6-cylinder engines dominate."

As part of a concerted marketing campaign to gain a higher profile across the motorsport industry, **Precision Technologies** had a highlighted presence at this year's show. "One of our exhibits this year was a Cosworth DFV engine using gears supplied by Precision Technologies and built by longstanding customer Geoff Richardson," said technical sales director Colin Palin. "The DFV is such an iconic engine that virtually everyone walking past had to stop and take a close look. It was a tremendous ice-breaker."

In addition to the two trade days at the show, Precision Technologies also attended the annual Motorsport Industry Association awards dinner. The excitement was heightened for the British-based engineering firm as it was shortlisted for the Business of the Year award for businesses with under five million pounds of sales.

"I enjoy awards ceremonies as they are always good fun," said Kevin Parkin, managing director at Precision Technologies, "swapping stories with old friends and meeting new ones. It's always a great way to meet influential people from across our industry and this year was no exception. On this occasion, we were pipped to the post for the main award, but it is an honour to be shortlisted and we will try again next year."



ABOVE The Cosworth DFV exhibited on the Precision Technologies stand proved hugely popular

"We had a good couple of days and made some new contacts and some old ones too," said company chairman Clive Austin. "I was pleased that people were so positive about the rebranding we implemented during 2016 which is really starting to pay dividends."

It was also a good show for **ARP**, according to specialty products director Chris Brown. "It's been a great opportunity to meet up face-to-face with customers that you talk to and email throughout the year as well as the opportunity to meet new customers," he said.

"The other good thing about the show is that it gives us feedback on what we need to be working on next, and we've had a lot of that. It's about talking to the end users, the distributors and capturing information from their database and customer base about what there's a demand for."

King Engine Bearings was showcasing a new approach to coated bearings. In contrast to today's coating material, the pMaxKote is a non-sacrificial layer that results in maximising performance and reliability for competition engines while also minimising seizure. It contains ceramic nano-composite particles that act as a fourth layer, providing build protection and wear resistance against metal-to-metal contact, without changing the bearing's original precision wall thickness dimension. The coating also offers protection from the erosive effects of cavitation.

"The intensive research and testing of different polymer-based coating materials has led to the development of this ideal coating formula for extreme race conditions," said Ron Sledge, King and Engine Parts UK's performance and technical manager. ▶

ABOVE Ceramic nano-composite particles are used in King Engine Bearings' new coating material

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The **Anglo American Oil Company** was displaying the latest race fuels from **Sunoco** and race oils from **Driven Racing Oil** plus the new range of engine coolant products from **Freezetone**.

Sunoco's vice president of performance products Rob Marro was on hand to launch the new FIM-conformant Sunoco APEX race fuel specially developed for motorcycles and high revving applications. Its base of faster burning single-bonded hydrocarbons and selected oxygen carriers result in extremely clean combustion chambers maximising engine power and rapid engine acceleration. Sunoco APEX will be the new spec fuel of MotoAmerica in 2017 and onwards.

Also on hand was certified lubricants expert Lake Speed Jr to oversee the introduction of a range of Driven Racing Oil products. This includes a new mineral GL4 synchromesh gearbox oil for the historic market as it has been proved that synthetic base oils are too slippery for most historic applications even though they are GL4 rated.

US brand Freezetone has a wide range of track-approved coolant additives that increases the heat transfer of water at the same time as it protects the engine and cooling system from corrosion. Freezetone also has a waterless coolant liquid that totally replaces water and protects the coolant system from freezing and corrosion. However, as with other similar products on the market, waterless coolants are not suitable for racing but very good for classic vehicles.

On the stand Ssangyoung showed off its new one-make pickup championship that is mainly aimed at youngsters coming directly from karting. To reinforce Ssangyoung's green credentials Anglo American will provide the championship with a 100% bio-degradable GTL – gas-to-liquid – diesel that is proven to reduce carbon monoxide emissions by up to 60% and to reduce NOX just short of 40%.

Anglo has also supported European racers for the last eight years with two high-value prize drives in the US. The Sunoco Whelen Challenge is available to pro-Racers in British GT, the UK LMP3 Prototype Championship and the European Radical Masters Championship. This year's winner is 21-year-old Bentley British GT racer Seb Morris. Having starred on his maiden appearance at the world-famous Florida track a couple of weeks before Christmas with an excellent showing at the wheel of the Cadillac DPi-VR prototype, the Sunoco Whelen Challenge winner was, as we went to press, due to join Mike Conway, Eric Curran and Dane Cameron in the Action Express Cadillac at the Rolex 24 at Daytona. The best result so far for a Sunoco Challenge winner was in 2012 when 2016 Sauber F1 driver Felipe Nasr finished third overall with Mike Shank Racing.

However, Anglo American is not just giving high profile racers the chance to race at Daytona. Mini Challenge Cooper champion Max Bladon was also due to make his endurance racing debut in a 4.7-litre Aston Martin V8 Vantage GT4 having won the Sunoco Challenge contest. He beat off competition from 166 drivers competing across 11 other UK categories to win the Sunoco Challenge, which rewards the highest-scoring driver over the season with a fully funded race outing in the four-hour support race at the 24 Hours. The 20-year-old scored 14 race wins in a dominant run to the Cooper class title with Excelr8 Motorsport last season. RT

ABOVE & BELOW Anglo American Oil Company displayed the latest race fuels, oils and engine coolants

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BROADENING HORIZONS

From grassroots to world series level, the National Motorsport Academy is helping people upskill while maintaining their presence in the industry. **Seb Scott** reports

GAINING first time employment in motorsport engineering today almost definitely requires a degree, predominantly in engineering, maths or a specific science. It is possible to obtain a start out job in engineering without an engineering degree, however the odds aren't particularly in your favour. Experience is obviously a bonus and often claimed to be "essential". There are a high number of those working in the industry though, who simply have experience and no qualifications. For such individuals, obtaining a promotion at another company or within the same company can be difficult and with technology developing so rapidly "upskilling" or training is often essential.

Taking three years out of work to go to university is hardly feasible for many, and part-time engineering degrees are either few and far between or held at unreasonable times. The National Motorsport Academy is able to cater for those working seeking to upskill while maintaining their presence in the industry.

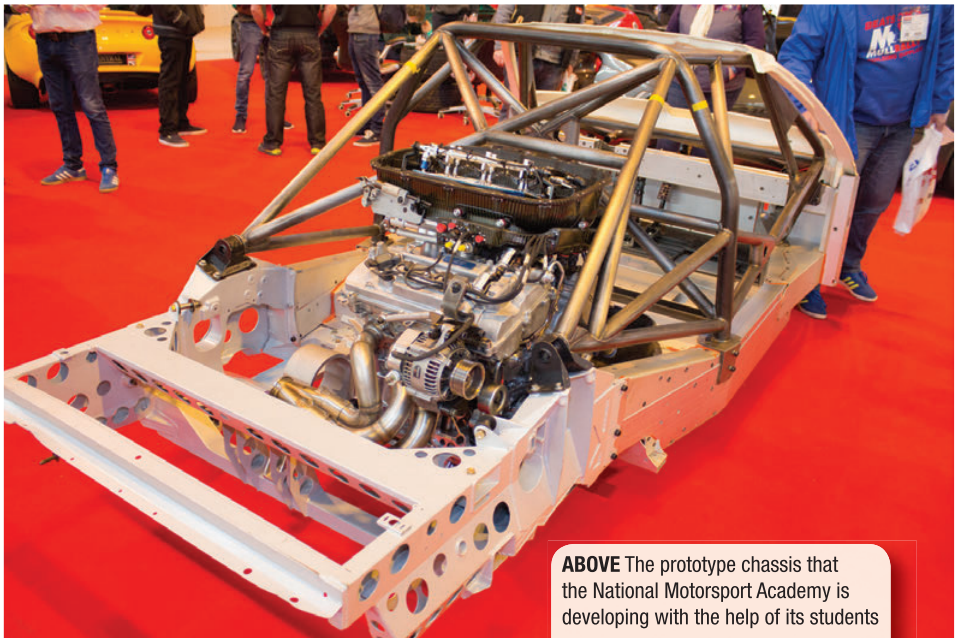
"We first exhibited at Autosport International two years ago," says Kieran Reeves, director of studies for National Motorsport Academy. "At that time we were rolling the brand out and the concept of online learning to our industry and nobody knew what the National Motorsport Academy was. Last year was much better where people started to recognise the brand and what we were about and this year we have gone from strength to strength.

"I think we are getting the message across to the industry now. The first thing people see is 'online', and they used to ask 'how do you deliver something that is practical online?'

"Now people understand we are delivering solely to the industry which means all of the practical side is covered in the workplace and people are upskilling with us to get a degree. That message is now quite clear to people. We are not looking for young students who are leaving college and going to university. That is not our target market at all. We have students from grassroots all the way up to the elite world race series."

Reeves says that the initial goal was for the industry to become familiar with and recognise the National Motorsport Academy – something he feels has happened despite being established only two years ago.

"We are actually only a year old with respect to having students online. I feel in this first year of delivery we have started to become recognised. Over the next year, we will definitely become an accepted brand in the industry and more people will tie into us. The five-year plan is to be recognised worldwide."



ABOVE The prototype chassis that the National Motorsport Academy is developing with the help of its students

INTERNATIONAL ASPIRATIONS

The worldwide vision for the National Motorsport Academy is already underway as the online based university exhibited at the 2016 PRI show in Indianapolis. "There will be new developments this year," says Reeves, "we are already in a few countries in Europe so we get students from quite a few countries there. We have a two students based in Australia now, we had two from the US as well as one from Canada from no advertising.

"We went to Indianapolis as we thought there may have been something there for us. It was our first time there and it was really just about putting the feelers out to see what the market was like. We received really positive feedback from universities, industry insiders and people at the show and have enrolled several additional students from that show.

"We are now going to start developing some plans to really push into the US this year. The main thing that we will be doing is slightly changing the content more to allow for things like NASCAR and drag racing but the modules will stay the same. That is one element. We will also be looking to bring on an American tutor as well so some of the modules are delivered with an American accent just to make it nicer. There are also plans to create the programme in several languages in the future."

With plans to expand across the Atlantic already in the pipeline, the National Motorsport Academy prides itself on the quality of its content which Reeves details

BELOW National Motorsport Academy Lotus Evora GTE GT Cup

is one of its core aims. "One of our main focuses is that we make sure that all of our lecturers work in the industry. We run our own race team, we are all there, we are at the coal face doing it day in, day out and we make sure that every module has guest lectures from big names in the industry. We have got people like former Formula 1 aerodynamicist Willem Toet and Danny Nowlan who owns ChassisSim and works a lot in the Australian motorsport scene.

REAL-WORLD PROJECTS

"We also have staff from big recognised brands giving technical lectures in such things as oils, race fuels and data acquisition. We have got big names like those guest lecturing on all of the modules making sure our students are getting current technology delivered to them alongside using all Industry standard software packages."

For those that have already enrolled on the programme, Reeves explains that the academy has a real-world project for students to contribute to and able to have it count towards their studies. "The main news this year is that we are developing a new vehicle. The Evora GTE that we have holds historic value as it competed at Le Mans in 2011 as a Lotus works car. It has got to a point now where we have enough spares from when we bought the car to develop three more vehicles.

"We are also developing a new car so we can eventually build three, but the first one will be a prototype. The plan is to develop them more to our series. We will be going for a supercharger this year so that we have more power output for the vehicle.

"We have a new and full aerodynamic development package with our students for their dissertation and final year project. Because we have links to the company Competitive Carbon Composites, the students can design things in CAD in their modules, run their models through CFD and then we can go across to the onsite composites company and have the preferred components produced. Those parts are all made in-house and then the students can see their product on our vehicle."

Despite being an online only course and catering for those already working in the industry, Reeves does raise his concerns about educating future engineers in the UK. "As we know there is a great need for engineers in the UK, the main thing is that schools need to start buying into the STEM — science, technology, engineering and mathematics — subjects more and more. Some schools are doing a great job but others need to start pushing in maths and science again to make schoolchildren understand the importance of those subjects. I think it's important that schools get on board with the STEM subjects and that we generate great engineers working in our industry who hopefully after their Level 3 studies will then want to carry out Higher Education Engineering work-based studies with the NMA." RT

ABOVE The National Motorsport Academy tutors from left to right: curriculum leader Wayne Gater, director of motorsport Kieran Reeves and NMA tutor Roger Grimshaw

ABOVE Is Formula E's venture into e-Sports a glimpse of motorsport's future direction?

MOTORSPORT'S IDENTITY CRISIS

Sergio Rinland asks whether motorsport is leading, or following, the automotive industry?

IN the 1970s, psychologist Erik Erikson called 'Identity Crisis' the failure, mainly of adolescents, to achieve their own identity. Erikson also believed that identity crisis can occur to a wider demographic – anyone at any stage in their lives: "Identity is something that shifts and grows throughout life as people confront new challenges and tackle different experiences."

People with identity crisis often seem to have no idea of who or what they are, where they belong or where they want to go.

Does this sound familiar? Is motorsport going through it? I believe it is.

Motorsport, as an activity, went through adolescence a long time ago; it has had its ups and downs over the last 120 years of existence. We have so far had several 'golden eras', where motorsport was hugely popular – it served its masters and actors in many ways: it developed technologies; it created true heroes; and it promoted industries and countries.

The late '60s and early '70s rank among these times (coinciding with Erikson's theory). We had fantastic F1 cars, great sports cars and Can-Am (my favourite). Cars, tyres, fuels, materials and aerodynamics saw great advances and those companies achieved immense promotion and development of their products through motorsport. Drivers and car companies proudly represented their countries, creating huge popularity around the world. From that era sprung what is today a multi-billion industry in the UK and around the world.

That enormous development meant that costs sky rocketed over the last few decades, inspiring people to find 'solutions' to curb those costs, as well as increasing speeds. On the positive side, we had great advances in safety – both in the cars and circuits' infrastructure.

Now, with hindsight, we realise that those 'solutions' achieved very little, particularly where costs are concerned. Some of those people saw the 'cost issue' as a business opportunity, creating single-make or controlled formulas where only very few benefited, but costs kept rising and the motorsport industry suffered.

The positive side of that situation is that now many motorsport companies are diversifying into aerospace, automotive and sports goods, to name just a few. On the other hand, the top of motorsport, namely F1, LM prototypes and to some extent IndyCar and NASCAR, seems to be lost in a sea of high technology, not knowing how to sustain their business models. They are going through an identity crisis where they do not know who to serve or how to attract fans.

BELOW Many motorsport companies have diversified into aerospace. This is Audi's lunar quattro

One day they shape the rules to attract OEMs to the detriment of privateers. As soon as one of those OEMs leaves the sport (as they usually do after serving their purpose), the powers that be go on panic mode, trying to attract those privateers that they neglected only a short time ago, to keep the grids supplied with the number of cars to make races. They are trapped in an eternal quest of reinventing themselves.

Therefore, we have two situations: on one hand, we have the junior feeder series acting to control the cars (the contributor of less than 20-25% of the budgets), damaging the industry which otherwise would develop and grow to serve the big boys. The same happened to technicians and engineers: they cannot learn enough on the lower steps of the ladder, affecting later the technology development of the big players.

On the other hand, we have the top series, which go back and forth, not knowing if they should be a vehicle for technology development. Should they follow, or lead, the automotive industry to help their development? They don't know what technologies to tackle to attract the fans who will feed them in the future.

Every year we go to this magazine's World Motorsport Symposium. The last few years we tried to identify our identity as an activity, but even if great ideas are put forward, not many are followed. We have Formula E's new venture into e-Sports, for instance: is this the correct direction?

The automotive industry is still suffering with 'growing pains' when it comes to low carbon emission technologies – are battery Electric Vehicles the answer? Is the hydrogen fuel cell the answer? The mainstream industry is not sure, and yet motorsport is trying to follow its trend!

Motorsport series have to understand who or what they are, where they belong and where they want to go. Once we identify the answers to those questions, then we will be in a strong position to draw technical and sporting regulations that reflect those answers. Until then, it is window dressing with a 'trial and error' system which sometimes seems like a 'death wish'. RT

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-James Clay, President,
bimmerworld

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