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JANUARY 10 2019

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HOW WILL THE NEW AERO RULES CHANGE F1?

It's not news that elements of Formula 1's overtaking problem are the levels of downforce and turbulent wakes the cars produce. While many fans are rightly frustrated at how long it has taken for the issue to be addressed, it is at least a positive that those in the sport are finally looking into possible solutions with proper data.

So what does that mean for the 2019 regulation changes, which focus mainly on the front wing? As our investigation on page 16 shows, the tweaks are unlikely to produce a dramatic change in on-track action. Teams believe that they will slow the cars and should stop the overtaking issue getting worse but, for a significant shift, we will probably have to wait until the more-extensive rule changes scheduled to come in for '21.

Long before the definitive 2019 F1 cars hit the track and give us firmer answers, the new season will kick off this week at Autosport International at Birmingham's NEC. One of the highlights will be the World Rally Championship launch on Saturday, featuring all the stars that will be trying to stop Sebastien Ogier (who we interview on p28) winning his seventh title. Turn to our preview on p24 to see what (and who) else to look out for.

This week Autosport also says thank you and farewell to McLaren's involvement in the McLaren Autosport BRDC Award. Launched in 1989, the Award has boosted the careers of many drivers and given them their first experience of F1 machinery, thanks to the McLaren prize drive. Many of the winners give their recollections and views in our special feature on p40.

Happily, the Award will continue with a new partner, which will be announced soon, so hopefully many more British stars will be unearthed in the years to come.



Kevin Turner

KEVIN TURNER
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Motorsport Studio

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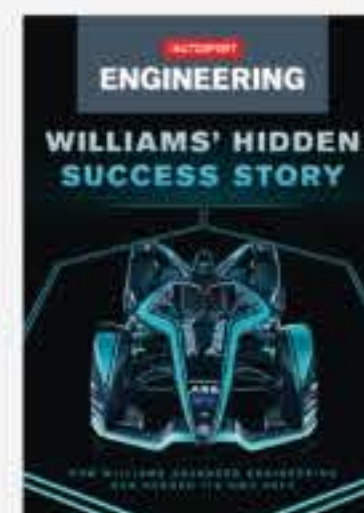
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FREE INSIDE

ENGINEERING SUPPLEMENT



The rise of Williams Advanced Engineering and how to build an F1 car on a budget are part of this month's issue.



IT'S ARRIVED *ERCI* ARRIVABENE

FORMULA 1

Maurizio Arrivabene has been replaced as team principal at Ferrari by the team's technical chief Mattia Binotto.

There had long been rumours that Binotto and Arrivabene had disagreements about the direction and approach of the team as it continues to bid to end its decade-long F1 title drought. Before the Christmas break, Arrivabene hit out at what he called "fake news" over reports that Binotto was so frustrated with the situation that he could leave the team. Now Ferrari's senior bosses have decided that its hopes of stopping Mercedes' dominance are better served with Binotto in charge.

"After four years of untiring commitment and dedication, Maurizio Arrivabene is leaving the team," read Ferrari's statement. "The decision was taken together with the company's top management after lengthy discussions related to Maurizio's long-term personal interests as well as those of the team itself."

Ferrari stalwart Binotto has been technical boss since 2016, when he stepped up to the role following the team's split with James Allison. Binotto first joined Ferrari in 1995, originally as a test-engine engineer, and then performed a similar role for the race team from 1997-2003. After a spell as chief engineer he became head of engine and KERS in '09, before stepping up to chief operating

officer of the power unit at the end of '14 and then taking overall charge of Ferrari's technical effort.

Ferrari's statement added that "all technical areas will continue to report directly" to Binotto, and it is unclear who will replace him as head of the technical department. There are suggestions that the team may hand more responsibility to aero chief Enrico Cardile and its head of engine department Corrado Iotti.

FERRARI'S DOOR REVOLVES AGAIN

In the end, Ferrari's most impressive recent season statistically counted for little for Arrivabene. As former chief Ross Brawn put it, Ferrari faces a "national question" in Italy whenever it does not win the title – something that last happened in 2008, when it claimed the constructors' crown.

Arrivabene is the man being held responsible, the latest chief who failed to produce. It means Ferrari has just one championship success to show for the 11 seasons and three different team bosses since Jean Todt officially stepped down.

**"HE OVERSAW AN
INTERNAL OVERHAUL
THAT PROVED
HIS DOWNFALL"**



AS FERRARI BOSS OUSTED

The move to replace Arrivabene has come after a season when management errors were viewed as one of the key factors in it failing to secure the world championship. Although the Ferrari was the quickest car for stages of the season, the team failed to capitalise on its opportunities as Mercedes again came out on top. The failure to deal with the issue of team orders in a clear manner triggered unnecessary flashpoints between Kimi Raikkonen and Sebastian Vettel at the German and Italian Grands Prix.

There were also strategic blunders, one of which came in Japan, when the team opted for the wrong tyres in qualifying. This prompted a remarkable outburst from Arrivabene about the approach his staff were taking. Arrivabene later switched his attention to blaming lack of progress with car development.

THE SOLUTION THAT BECAME A PROBLEM

Arrivabene had joined Ferrari after Marco Mattiacci, the figurehead of Ferrari's 2014 overhaul, did not last a year. Mattiacci had not been a complete flop – he called Fernando Alonso's bluff and cut him loose when he did not offer the necessary commitment to Ferrari, and struck a deal to sign Sebastian Vettel that left Red Bull shellshocked. He also threw his support behind Allison and was politically active, triggering the push for engine-freeze

relaxation that prompted a major battle over power unit regulations, and chasing a wider overhaul of F1.

But this also created a rift with F1 supremo Bernie Ecclestone. The suggestion was that Ferrari's political motives, not its bad results, prompted his departure, and Arrivabene was the intended solution.

A long-time Ferrari ally as part of his role with key sponsor Philip Morris, and well-known to Ecclestone for that very reason, Arrivabene was viewed as a no-nonsense operator who was well-versed in the mechanisms of F1 as someone who had sat on the F1 Commission for a long time. Unfortunately for him, he oversaw an internal overhaul that ultimately proved his downfall. It was under him (though decided by then-Ferrari president Sergio Marchionne) that Binotto was elevated to technical chief, sparking Ferrari's turnaround after a disappointing slump in 2016 and thrusting it into nearly-but-not-quite title contention in '17 and '18.

As the Arrivabene solution descended into a fresh problem, Marchionne was said to be readying the axe before his death last summer. Arrivabene spent the rest of 2018 looking and sounding like a man on borrowed time as Ferrari made further mistakes and he hit out more in the media. Now Binotto is set to take the hot seat himself as the latest apparent answer to Italy's 'national question'.

SCOTT MITCHELL & JONATHAN NOBLE

FERRARI UNDER...



JEAN TODT

1993-2007

GPs	246
Wins	98 (39.8%)
Poles	85 (34.6%)
Podiums	249
Championships	6 drivers' (2000-04, '07); 7 constructors' (1999-2004, '07)



STEFANO DOMENICALI

2008-14

GPs	115
Wins	20 (17.4%)
Poles	12 (10.4%)
Podiums	75
Championships	1 constructors' 2008



MARCO MATTIACCI

2014

GPs	16
Wins	0
Poles	0
Podiums	2
Best championship finish	4th



MAURIZIO ARRIVABENE

2015-18

GPs	81
Wins	14 (17.3%)
Poles	12 (14.8%)
Podiums	71
Best championship finish	2nd





Joest Mazdas leave them trailing in test

DAYTONA 24 HOURS

While the driver spotlights at the Daytona 24 Hours test last weekend inevitably fell on Fernando Alonso – competing in Wayne Taylor Racing's Cadillac DPi-V.R prototype – and Alex Zanardi, racing a BMW M8 for the Rahal Letterman Lanigan Racing team in GT Le Mans, it was Mazda Team Joest that truly deserved the plaudits.

Ever since Joest took over running the RT24-Ps towards the end of the 2017 season, these handsome DPi cars have looked more consistent. Only driver error prevented a win at Laguna Seca last year; then the pair finished second and third at Petit Le Mans.

Since then, there has been a further leap in performance. Last weekend at Daytona, one or other of the Mazdas led four of the seven practice sessions, and when it came to (pre)qualifying to decide who gets the best pitboxes and garages, they were simply unmatched, with Oliver Jarvis pipping Harry Tincknell by 0.025 seconds in a 1-2.

But the Cadillacs remain fast and reliable. WTR won the 2017 race and team owner Wayne Taylor has been (predictably) impressed with how Toyota World Endurance stars Alonso and Kamui Kobayashi have integrated and kept pace with his already formidable line-up of son Jordan and Renger van der Zande. The #10 Caddy topped two sessions.

Action Express Racing also had its Cadillacs in the mix throughout the three days of testing, and has won this race twice in the past five seasons, including last year.

CORE Autosport's Loic Duval topped the final session, despite the team still learning the intricacies of the Nissan DPi previously run by the now-defunct ESM team. Fellow LMP2 graduate JDC-Miller Motorsports appeared to struggle more trying to find ultimate pace from its Cadillacs.

Meanwhile, IMSA newcomer Juncos Racing has unearthed a potential sportscar ace in Agustin Canapino. On his first visit to the US, the Argentinian 28-year-old – already a superstar in his home country for his achievements in Super TC2000 – set the quickest time in the team's Cadillac ahead of its first shot at Prototype glory.

TOP 6 TIMES – PROTOTYPES

POS	DRIVER (CAR)	TIME
1	Oliver Jarvis (Mazda)	1m33.398s
2	Harry Tincknell (Mazda)	1m33.423s
3	Ricky Taylor (Acura)	1m34.261s
4	Filipe Albuquerque (Cadillac)	1m34.282s
5	Felipe Nasr (Cadillac)	1m34.368s
6	Jordan Taylor (Cadillac)	1m34.431s

TOP 6 TIMES – GT LE MANS

1	Jan Magnussen (Corvette)	1m42.651s
2	Richard Westbrook (Ford)	1m42.779s
3	Joey Hand (Ford)	1m42.898s
4	Earl Bamber (Porsche)	1m42.919s
5	Nick Tandy (Porsche)	1m43.051s
6	Davide Rigon (Ferrari)	1m43.094s

Like all Prototype teams, Acura Team Penske focused on finding the best race set-ups for the new Michelin tyres (replacing Continental throughout the series), but Ricky Taylor produced a stunning lap in a qualifying sim on Sunday to go third fastest.

The GT Le Mans category saw all nine cars covered by around 0.8s in any given session, but the Ford GTs and Porsche 911 RSRs appeared to have a slight edge on ultimate pace. The Corvette C7.Rs, entering their sixth season of IMSA competition, were also strong and, with the aid of a tow from Corvette Racing team-mate Oliver Gavin, reigning champion Jan Magnussen set the top time in prequalifying.

Despite his relative lack of experience with the BMW M8 and Daytona, and the car's hand-operated braking system, two-time Indycar champion and gold medal-winning paralympian hero Zanardi was within 1.0s of his fastest team-mates.

In the four-car LMP2 class, DragonSpeed's two-car line-up appears ready to battle with PR1 Mathiasen's similar ORECA, while there are no clear favourites in the GT Daytona division. Meyer Shank Racing's Acura NSXs starred in most sessions, with Trent Hindman setting the overall best time in class. Other noteworthy performances came from the new AIM Vasser-Sullivan team, which has taken over the running of the Lexus RC F's in 2019, open-wheel rising star Victor Franzoni in Via Italia's Ferrari 488, and the Riley Motorsports Mercedes-AMG GT3.

DAVID MALSHER



Brabham in GTE Pro aim

LE MANS 24 HOURS

The relaunched Brabham marque, which stunned the world with the launch of its million-pound BT62 trackday car last year, always maintained that it would take the famous name back to racing. Now it has revealed that it is planning to be on the grid at the Le Mans 24 Hours in 2022.

David Brabham, son of marque founder Sir Jack, has announced that Brabham Automotive is shooting for a World Endurance Championship entry in time for the start of the 2021-22 season. The plan is to join the GTE Pro ranks with a new road-going model that will have its roots firmly in the BT62 (left, at Adelaide).

"It is important that we return to racing, because it is in our DNA," said Brabham, who is MD of the new company. "There has been a lot of speculation about how we might do it, so we want to confirm the direction in which we are going. And that's GTE in time for the 2021-22 season."

"The car won't be the BT62, but it will be a development of what we have now."

GARY WATKINS

Formula Renault NEC bites the dust

FORMULA RENAULT NEC

European single-seater racing suffered a notable casualty just before Christmas when the Formula Renault Northern European Cup threw in the towel – and the series promoter pinned the blame on the FIA.

"The ill-conceived FIA plans for the future of formula racing has meant that over the past three years we have seen a serious decline in the young-drivers market," said Mick de Haas. "The costs are far too high for individual drivers and the marketplace is too fragmented. There is now no more room for a very effective and competitive single-seater concept like Formula Renault 2.0."

The series was born in 2006 as a merger of the German and Dutch national series, and it also mopped up the UK teams when their championship died six years later. When Renault Sport upped its Eurocup from seven rounds to 10 in '17, FR NEC suffered as those who had contested dual campaigns focused on Eurocup only. NEC limped on in '18 at Renault Sport's request, with the French giant hoping that the Eurocup's

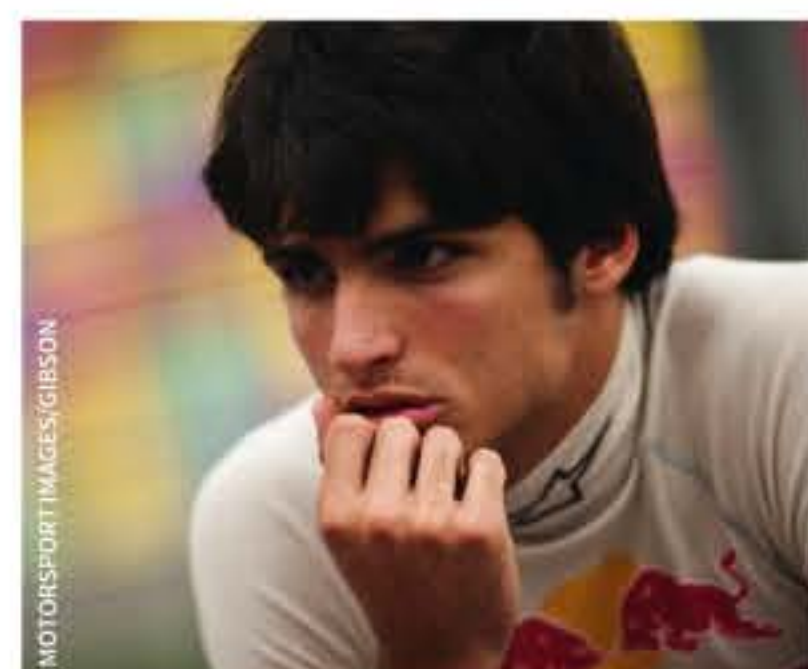
switch to Regional F3 cars for '19 would provide a new home for those continuing with older FRenault 2.0 machinery.

A lot of talent emerged from the series. Valtteri Bottas, the 2008 champion, holds the all-time wins record. The best winning percentage belongs to '07 king and future GT star Frank Kechele, whose single-seater career was then derailed by Crohn's disease.

MARCUS SIMMONS

RENAULT NEC WINNERS TABLE

	DRIVER	WINS
1	Valtteri Bottas (right, above) Antonio Felix da Costa/	14
2=	Carlos Sainz Jr (right, below)/ Louis Deletraz	10
5	Frank Kechele	8
6	Daniil Kvyat	7
7=	Steijn Schothorst/ Lando Norris	6
9=	Kevin Korjus/Stoffel Vandoorne/ Josh Hill/Matt Parry/Max Defourny	5





Glimpse offered into heroes film due for May release

STALEY
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MOTORSPORT HEROES

Motorsport Heroes, the first major feature-film commission of Motorsport Network, was given a sneak preview of its narrative and cast list last week.

Directed and produced by BAFTA and Sundance award-winning *Senna* mastermind Manish Pandey (right of pic), the film brings together two-time Formula 1 world champion Mika Hakkinen, ex-F1 star Felipe Massa, nine-time Le Mans 24 Hours winner Tom Kristensen and former World Rally heroine Michele Mouton.

"*Motorsport Heroes* puts four central protagonists together in a setting that is

conducive to recounting their incredible life stories, their successes as much as their trials and tribulations," explained Pandey. "Rather than script the story, Tom, Felipe, Michele and Mika relay their own recollections, they share their experiences. Thus the narrative we are drawing out is organic, driven by our heroes themselves.

"To frame and catalyse their stories, our 'cast' spent a weekend together in an English stately home, doing what you do in a country-house setting – sharing breakfast together, venturing out for a walk in beautiful parkland, retreating to seats around the fire. And as the group bonds and finds common experience, so the film journeys into some of

the darker reaches of their lives where each of our heroes are realised as they relate how they found the reserve of spirit to overcome challenges that would crush lesser people."

The film has formed a partnership with the Institut du Cerveau et de la Moelle Epiniere (ICM), a global powerhouse of neurological research founded by FIA president Jean Todt, seven-time F1 world champion Michael Schumacher, FIA Medical Commission president Professor Gerard Saillant and Ferrari chairman Louis Camilleri.

Motorsport Heroes is scheduled for general release in May and will also be available across Motorsport Network channels.

United commits to full-time WEC effort

WEC

The Anglo-American United Autosports squad has pushed the button on a full-time graduation to the World Endurance Championship. The team, which has never made any secret of its ambition to move up from the European Le Mans Series, will join the WEC in the LMP2 ranks for the start of the 2019-20 season in September.

United, co-owned by McLaren boss Zak Brown, will make the step up with its successful ELMS pairing of Filipe Albuquerque and Phil Hanson, winners of two rounds of the series in 2018, and a third driver who has yet to be confirmed. The duo, who will contest this year's ELMS, will continue to drive a Ligier-Gibson JSP217 on their graduation to the WEC.

"It has been the aim for

United to enter the world series for a while, but everything needed to fall into place so we could do it at the right time," said Brown. "We feel that now is the right time. We have developed a great relationship with Phil and Filipe and they make a fantastic pairing."

United has yet to confirm whether it will continue in the P2 class of the ELMS beyond the end of 2019.

GARY WATKINS



JEP
motorsport
IMAGES

IN THE HEADLINES

WEHRLEIN FERRARI ROLE

Ex-Mercedes protégé Pascal Wehrlein has joined the Ferrari Formula 1 team in a development role. Formula E newcomer Wehrlein will undertake simulator driving – the same role from which Antonio Giovinazzi and Daniil Kvyat landed full-time F1 race seats for 2019.

NANDAN = ARRIVABENE

For Maurizio Arrivabene, read Michel Nandan. The Hyundai World Rally Championship team pre-empted Ferrari in losing a world title and dumping its team boss when it ousted Nandan. The new principal is Andrea Adamo, who as head of Hyundai's customer racing department (a role in which he continues) spearheaded the marque's successful WTCR programme in 2018.

AITKEN, DELETRAZ IN F2

The Formula 2 driver-line-up jigsaw continues to fall into place. The latest to secure rides are Renault F1 junior Jack Aitken and Louis Deletraz. Aitken will drive for Campos Racing after a season with ART Grand Prix last year. Deletraz, who topped the post-season Abu Dhabi test with Carlin, joins the British team after switching from Charouz Racing System.

TICKTUM FOR ASIAN F3

Two-time Macau Grand Prix winner Dan Ticktum is to contest the three-round Asian F3 Winter Series, which kicks off at Buriram in Thailand this weekend. The Red Bull junior, who is hoping to accumulate the last few points for an F1 superlicence, will race with Hitech GP alongside Pro Mazda champion Rinus van Kalmthout, South East Asian F4 title winner Alessandro Ghiretti, and BRDC British F3 racer Pavan Ravishankar.

AUER TO NEW ZEALAND

Meanwhile, the Toyota Racing Series in New Zealand – which also gets under way this weekend – has attracted some leading names in the past couple of weeks. Mercedes DTM refugee Lucas Auer will use it as a single-seater warm-up before he heads to Japan for the Super Formula season. Ferrari F3 protégé Marcus Armstrong aims to avenge his narrow 2018 title defeat. And reigning Asian F3 champ Raoul Hyman is on the grid.



Turkington stays at BMW

BTCC

Reigning champion Colin Turkington will be back in the British Touring Car Championship in 2019, and for the first time the three-time title winner will carry the #1 on a WSR BMW 125i M Sport.

The 36-year-old Northern Irishman took his maiden crown with WSR in 2009 before leaving the BTCC to pursue other drives. He won the championship again with WSR in '14, but then carried the #1 to Team BMR to drive a Volkswagen in '15.

Turkington took just one victory in the 2018 campaign but prevailed over rival Tom Ingram by 12 points in the final reckoning. "I think we just have to look for the small gains wherever we can to push ourselves forward," said Turkington. "We will go through everything with a fine-toothed comb, and that includes the driver, to try and extract every bit of performance."

If Turkington is champion this season, he will equal Andy Rouse's all-time record of four BTCC crowns. "Winning the third title was great, but you start every year with the objective to win," said Turkington. "The fire burns strong within me. Also, what is special is that we have all three titles to try and retain, with the

drivers', manufacturer-constructors' crown and the teams' title."

Turkington and Tom Oliphant will drive the Team BMW-entered cars, and they will be joined at WSR by Andrew Jordan in a Pirtek-supported version (below). The 2013 champion remains with the squad for a third season, and thinks he can build on his work from the '18 campaign to match Turkington. "I am relaxed in the team and I work well with Colin," said Jordan. "I've learned that you can't be fastest all the time – even though it hurts because I want to be – but you have to take what you can from it and use that as an education."

"I'm really excited about the 2019 season. I think I've got my enjoyment of the sport back. I had some tough times in 2015, '16 and '17, but last year I got the spark again. I realised how much I love the job that I do."

MATT JAMES



MOTORSPORT IMAGES/JEP



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Happy New Brexit!

BY TREVOR CHARLEY

And so begins another year of racing. Autosport International is opening its doors at the NEC, Formula E is in Marrakech, the Formula 1 teams are counting down to pre-season testing in February while fans excitedly contemplate whether this is the year that we treat ourselves with a trip to the races. Perhaps the Hungaroring or Circuit de Catalunya, or maybe you might decide on the best seat in the house, feet up in front of the wide-screen TV within a Williams pitstop of the fridge. Yes, the start of the year is a favourite jumper – reliable, comfortable and with a familiar pattern. The only problem is that this year there is a stain, Brexit-shaped, with a whiff – the smell of uncertainty.

Fans considering a trip to the races and team finance directors are puzzling over the exact same conundrum, albeit on different scales. We are all straining to see what the future holds for sterling against the euro, the dollar and a basket of other currencies while trying to set a meaningful budget and a plan for the year ahead.

As it stands, the UK will leave the EU on March 29 2019, with or without an agreed Brexit departure deal. Parliament has set this in UK law, and legislation needs to be passed again for this to be changed. The UK Prime Minister, Theresa May, has negotiated terms with the EU on how the UK will leave. There is, however, one huge issue: her deal leaves the UK open to possibly remaining in the EU Customs Union, which would make the UK unable to sign its own trade deals for eternity. Having had some 117 Tory MPs vote in support of her replacement as Prime Minister, it is by no means certain that Prime Minister May will be able to get her departure deal through Parliament. The vote is currently scheduled for the week beginning Monday January 14, and we could see extreme volatility in the pound between then and March 29.

The difficulty is that there are so many Brexit permutations. The most probable outcomes include the government losing the vote by a small number (20 to 40 votes) and calling another vote quickly, with the odds suggesting that they could pass the deal. As a consequence, if that were the case, sterling could rally by 5% on the removal of Brexit uncertainty. However, this strength would probably only last until people start to worry about the trade deal that will then need to be negotiated. Secondly,

the government could lose the vote by a large margin and then try to prepare for a no-deal Brexit. This could easily produce a move lower to the psychologically important 1.2000 level for GBPUSD and 1.0750 for GBPEUR.

Further possibilities include the government being defeated and calling an election or even a second referendum. If an election is called and a Labour government elected, considering that the markets don't trust the Labour party in its current guise, we can expect Sterling to collapse 15% to 20%. If a referendum is called this could lead to the UK possibly not even leaving the EU, which could encourage a 15% relief rally jump to 1.4500 for GBPUSD and 1.2500 GBPEUR. Parliament might take fright and ask the EU for an extension of Article 50. Interestingly, the EU has said that it will only consider an extension if the time is used for another referendum. It's worth noting that the European Union needs funding and some £39 billion would be gratefully banked.

It could be that the Brexit deal is defeated in Parliament and sterling hurtles lower, while the UK and EU conduct last-ditch negotiations. The UK and EU both have strong motivations for agreeing a deal. We could see a 5% to 10% fall in sterling's value before March 29, followed by a 10% to 15% relief bounce when a deal is agreed. On the contrary, sterling's fall could gain pace if a deal isn't agreed.

For the race fan at home we can hide behind the best seat in the house and put off difficult decisions and wait for Brexit uncertainty to pass like the Daleks. Even the best-funded teams on the grid can be caught out by currency fluctuations. Toto Wolff noted in the Mercedes team accounts that, "There had been an increase of £27.9m in operating costs mainly due to the impact of technical regulation changes and movement of foreign exchange rates." We're entering a period of unprecedented uncertainty – not just in terms of what the new aero rules will mean to the status quo on the grid, but in managing budgets at a time when there has never been more pressure on making every penny – or cent – count. The suggestion, then, is this: hedge your currency risk appropriately to manage out as much of that uncertainty as possible, allowing you to set a meaningful budget and move forward with some confidence.

GBP/USD 12 MONTHS



GBP/EUR 12 MONTHS





RANDOM HOUSE

Many fans and Formula 1 insiders want more ‘unpredictability’ in the sport – and while that’s a laudable goal, we shouldn’t introduce randomness as a shortcut

EDD STRAW

The best thing that could happen to Formula 1 in 2019 would be a genuine shock in the season-opening Australian Grand Prix. Let’s say Antonio Giovinazzi prevails for Sauber – that would be an upset right up there with the greatest in GP history.

Fans would be enthusiastic about how the formbook was turned on its head, delighted that a middling team could suddenly leap to the front. The days until the next race in Bahrain couldn’t pass quickly enough. So the unpredictable would be great for F1?

If this happened in 2019, it would be. But with so much talk about what GP racing should be and multiple ideas being chucked around in the everlasting quest to spice up the show, there’s a risk that shocks in the future could be unfulfilling.

Sometimes people express a desire for things to be more ‘random’. Usually, they are using that word as a synonym for unpredictable rather than literally, but even so F1 must be careful not to take the easy option and let randomness prevail. That would be nothing more than a shallow simulacrum of unpredictability.

The beauty of sport is that it has rules. Random factors are unavoidable and can impact the result, but over a significant sample set of sporting contests the best will usually win.

“TEAMS WANT TO ELIMINATE RANDOMNESS ENTIRELY AND CONTROL THE VARIABLES”

A good GP is not simply a case of a load of things happening, then somebody wins. That would be random, and have all the appeal of simply watching a roulette wheel spin without having staked anything on it. There need to be clear reasons for the victory; there needs to be a storyline to follow. If there isn’t, then surprise results become commonplace and cease to have meaning.

That’s why unpredictability and randomness are not the same thing. While the output might be the same – in the case of racing a wide variety of winners – the input is very different. One is entirely superficial. The other is something gloriously different.

So the objective is to increase the variables, while retaining the integrity and the sense of the racing. Often, this can look random and luck-based, but what is often presented as good fortune is often about far more than that. Take a wet qualifying session that concludes as the track is drying. Let’s say the last driver across the line takes pole position – lucky, right?

Well, maybe not. They were positioned correctly by their team to capitalise on the best conditions and the driver nailed the lap when they needed to – as well as ensuring they started that lap at the right moment, which is a skill that some struggle with.

But what if you are well-positioned and there’s a yellow flag because someone spins? Realistically, that is a risk that you take because in chasing the potential optimum conditions you narrow the window of opportunity.

An example of a truly random event would be to create a variable the competitors can do nothing about that impacts the race result. For the sake of argument, let’s say that three times a season the leader would be, at random, pulled in for a drivethrough penalty. That would certainly impact the result, but it would be an utterly preposterous thing to do. That is a random factor in the purest sense and not the right kind of unpredictability.

The other danger of random factors is that they risk rendering championships too amorphous. Sporting storylines are built on the concept of favourites and outsiders. For an upset to be worth talking about it must go against the run of play. If everyone gets a turn, that could prove almost as unpopular as domination.

Fans need to know where they stand. That means understanding the pecking order and being able to revel in the unpredictability within that. F1 teams want to eliminate randomness entirely and control the variables. The vast amounts of data analysis and the engineering might of the teams means there is less scope for going in the wrong direction with set-up or tyre use than there once was.

This is what makes ideas about cutting the amount of in-race-weekend data analysis interesting. It would make for a level playing field, and would ask more of the driver’s ability to interpret what the car is doing and the engineering team’s capacity to make changes accordingly. That’s the sort of methodology that creates the conditions for more unpredictability.

But ultimately, it all circles around to the same old problem. The most problematic limiting factor in F1 is resources. A team’s ultimate performance potential is effectively the combination of its financial resources, facilities and quality of leadership. But the most powerful predictor of performance is budget, and at best F1 looks set only to slightly mitigate the problem of the biggest teams being rewarded simply for turning up. This means it will be in the technical and sporting regulations that the show will be impacted.

And when it comes to sporting regulations, it is incredibly easy to influence results by introducing randomness. But this would be unsatisfying. Generating true unpredictability, where results vary because of a multitude of variables and decisions, and teams and drivers have to navigate their way through a series of challenges that can’t necessarily be made easier by the brute force of resource, that’s a more challenging – but far more fulfilling – goal. ✎

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DOORMAT OR MATADOR?

The next batch of hot shots graduate to F1 in 2019 – but they must make all the right moves to follow in the footsteps of Verstappen rather than Vandoorne

ADAM COOPER

In 2019 the focus will be on a new generation of Formula 1 drivers, and not only because we have four rookies in Formula 2 graduates George Russell, Lando Norris, Alexander Albon and Antonio Giovinazzi. We will also watch as Charles Leclerc and Pierre Gasly – with just 21 and 26 grand prix starts respectively – are promoted to teams that are challenging for race wins and world championships.

How they all progress will be one of the main talking points of the season, especially as history suggests that things won't necessarily go to plan. Just take a look at Stoffel Vandoorne, who arrived at McLaren in 2017 with the world at his feet, and is now trying to rebuild his career in Formula E.

Consider too Daniil Kvyat, who fell from grace after being fast-tracked to Red Bull in similar circumstances to Gasly. The Russian has unexpectedly been granted yet another lifeline with Toro Rosso this season, and as such he presents another intriguing 2019 case study.

So why does it sometimes go wrong for young drivers? And what can they and their teams do to avoid the pitfalls?

Everyone is different. So what worked for Max Verstappen,

are not really guided in a very good way, then it's difficult."

Sauber team principal Fred Vasseur has worked with dozens of young drivers at ART Grand Prix in the lower categories, including Vandoorne and Lewis Hamilton. And last year he oversaw Leclerc's brilliant rookie season.

"It's very psychological, and you are always on the edge," says Vasseur of the challenges faced. "It's a strong competition, and I think when everything is going in the right direction it's quite easy to manage and have a good spiral. When it's going in the other direction... With Stoffel at McLaren they were in a tough situation, and when you are in a tough situation it's much more difficult for a young driver."

Intriguingly, Vasseur believes that success comes not so much from keeping that pressure off drivers but from helping them to manage it. "No, we *have* to keep them under pressure," he asserts. "Pressure is the essence of the business, and they will have pressure. When you have young drivers complaining about pressure it's a joke, because the more you win the more you will have. And I can imagine it's much more difficult for Hamilton and Vettel to manage the pressure than for the back of the grid. You have to speak to them, to try to understand what is their feeling, are they struggling about something? But not to protect them from the pressure, because at one stage they are alone in the car, and under pressure they will have to deliver."

Leclerc is managed by Nicolas Todt, who previously masterminded the careers of Felipe Massa and Jules Bianchi. Last year Todt added Kvyat to his stable, and so plays a key role in the Toro Rosso driver's rehabilitation process, providing support that was missing before.

"Of course you can succeed in motor racing without having a manager – you have many good examples," says Todt. "But I think that when you are well advised, when you have a good understanding, it helps. Being badly advised can be very costly. When you arrive in an environment where you don't know anybody, it's good to know who is who, to avoid making mistakes that you can make when you are very young."

The bottom line is that predicting who will sink or swim when it really matters remains something of a black art. And that makes this year's bumper rookie crop all the more intriguing.

"If you have two drivers, and one driver has been beating the other, people draw conclusions," says Todt. "But every year is a new year. You have some drivers that go slower than another one in the lower categories, and they arrive in F1 and they are faster than them. You have many factors to take into account. At the end of the day we're talking about human beings." ❧

"SUCCESS IS NOT SO MUCH ABOUT KEEPING PRESSURE OFF DRIVERS BUT HELPING THEM TO MANAGE IT"

propelled into F1 at 17 and with just a season of car racing behind him, may not work for others with different personalities and back stories. And even the mercurial Dutchman has faced some difficult times. But there are some lessons that can be applied across the board.

"We all must not forget that currently in F1, if you look to the young drivers, we are a little bit like a kindergarten," says Toro Rosso boss Franz Tost. "The guys are not as mature as we knew in F1 10 or 20 years ago. They come into F1 at 18 or 19, they did in the past nothing else but karting or racing in the junior formulas, and F1 is another level."

Tost believes that it's his responsibility to keep his charges on the correct path: "For young drivers there are so many challenges coming from all the different sides, and if they

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JOE PADGETT

Each Formula 1 era is one to savour

I used some of my down time this holiday season to ponder your question as to the best era ever in F1 (January 3). In doing so I tuned to my collection of Autocourse annuals, now 55 issues deep. What I found in combing through the rich history of our sport is that no one era is better than any other since each contains the very ingredients that keep us transfixed year after year and anxiously waiting for 2:00 (now 2:10) on Sunday afternoons.

Yes, the competitive nature of each era is different and characterised by changes in the formula, advances in technology and the understanding of science, but the fascination with machines flirting with the limits of speed coupled to the unique characteristics of the drivers and their ultra-competitive nature make each era truly special in its own way.

Look deeply and you can easily see Hamilton fighting with Fangio, Schumacher fighting with Clark, Mansell fighting with Collins or Graham Hill fighting with Senna. The pages of the calendar endlessly turn and with it come racing memories too numerous to count. Perhaps what's best about F1 is not eras past, but rather the anticipation of eras yet to come.

David C Berkey
New York

*We've had a great response – keep your replies coming.
We'll be publishing the results later in the year – ed*

Fond farewell to Fifth Column

I was sad to read that Nigel Roebuck will no longer be writing his Fifth Column. His observations and opinions were always interesting and beautifully written. He is a great motor racing journalist and I will miss him. May I, through your pages, say thank you and wish him good health and good luck?

Keith Ashley
Burton-On-Trent

Timely reminder of Schumacher's epic status

Looking over your great feature listing Michael Schumacher's greatest victories (January 3), it just goes to show how great



a driver he was and what an amazing career he had when each entry in your top 10 could have a valid case for being number one. He raised the bar in so many ways in motorsport and set a standard that many still try to match today.

Joe Padgett
By email

Variety would spice up BTCC support races

Following the announcement of the end of the Renault Clio Cup (Club Autosport, January 3), I would like to make a plea for a multi-make replacement. This would also be an ideal opportunity to showcase the variety of classes that many of the BTCC crowd may not have seen before. Guest races for Formula Junior, 750MC or even VSCC cars would provide a breath of fresh air.

On another subject, I was at Brands Hatch when Supervan 3 (Top five rehomed race engines, January 3) was being tested by Michael Vergers. When he hit the brakes for Paddock the rear wheels would lift... scary!

Ian Page
Haslemere, Surrey

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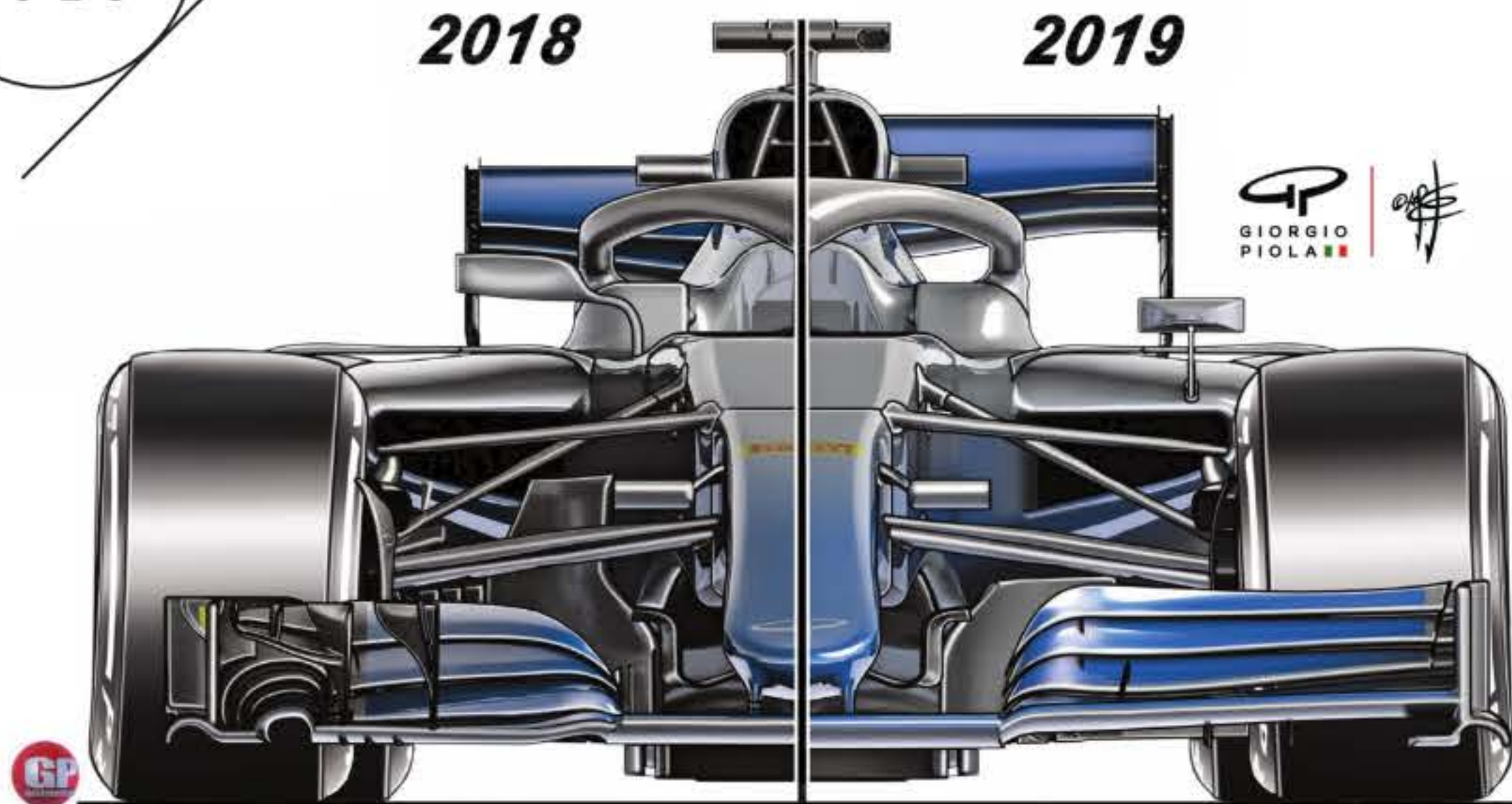

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WHY THE FIA HAS CHANGED THE GAME FOR F1 2019

Just two years after new aerodynamic regulations came in, the teams have more tweaks to contend with, but this time the aims are different

EDD STRAW

Another year, another rule change. Given Formula 1's hit-and-miss record for 'improving the show' with new regulations, you'd be forgiven for shrugging your shoulders and asking why the changes to the front and rear wing, brake ducts and bargeboards in 2019 matter, especially given that they will not definitely eliminate the problem of cars not being able to follow each other closely. But there's a wider context to this year's step that makes it more than just another change, since it's effectively the first manifestation – a preview, if you like – of F1's new approach to tackling its problems.

But first it's crucial to manage your expectations. The tweaks will not allow drivers to sit under the rear wing of the car ahead without any trouble and launch audacious passing moves, but they should slightly mitigate the problem. What matters is that this represents an attempt by the FIA to apply some of the findings of the research conducted by F1 that will underpin the far more substantial rule changes currently scheduled for 2021.

Nikolas Tombazis, the former chief designer at Ferrari, joined the FIA in March last year as head of single-seater technical matters. Almost immediately, he threw himself into the task of evaluating what measures planned for F1's long-term rules could be brought forward to this year.

"The 2017 regulations achieved the chief objective of increasing

lap performance but made the ability of the cars to follow each other worse compared with '16," says Tombazis. "So we were faced with four years of a worsening trend until '20 and hoping for a big solution in '21. So soon after I joined the FIA, in discussing it with the president [Jean Todt], we decided that we couldn't really wait four years before we do something. Time was quite short to act on it, and the amount of intervention was not massive.

"We had to obey the process for rule changes so needed a fair degree of support from the teams, and we had to achieve it before April 30, after which we would have needed unanimity from the teams, which would have been virtually impossible."

This was the political angle. Despite some dissent, notably from Red Bull, the proposals were agreed by the majority.

The primary objective is to mitigate the 'outwash' aerodynamics, whereby the teams turn airflow outside of the front wheels to reduce drag. This became *de rigueur* when the 2009 regulations increased the width of the front wing, and teams then had to be more aggressive when the front wing was narrowed by 150mm in the '14 regulations. The precise changes are explained in our diagrams, but comprise an increase in front-wing width from 1800mm to 2000mm (the full width of the wheels), plus a 25mm increase in the depth and endplate height. There's also a reduction



“FLOW REACHING THE REAR WING CAN BECOME ENTRAINED IN THE STRONG TRAILING VORTICES”

to the number of elements on each side to five, with the number of strakes under the front wing limited to two on each side. The geometries allowed are also more restricted, to reduce outwash, and the brake ducts simplified. The bargeboards have been lowered by 150mm (an incidental change unrelated to this process, designed to increase sponsor visibility), and also moved forward 100mm. At the rear of the car, the rear wing has been raised by 50mm, and been made 100mm wider and 20mm deeper.

“One of the key things aerodynamicists try to do is move the wake of the front wheel outwards,” says Tombazis (above). “So good teams maybe make it clear of the rear wheel to some extent, and not to go under the car and screw up the performance of the bargeboards and diffuser and so on. Control of this wheel wake is achieved with a multitude of vortices that come off the various devices – the endplates, the front-wing furniture, the various devices on the brake duct and so on.

“All of these together create a very complicated flow structure that pushes the wake outwards. This is a good thing for performance, but a bad thing for the following car.

“On the other hand, flow reaching the longitudinal position of the rear wing can become entrained in the very strong trailing vortices, and from there get pushed inwards and upwards.

“This creates a sort of mushroom. This mushroom is a good thing since it does take a lot of the dirty airflow sitting in the middle and low down and pushes it quite high up. This void is filled in by fresh flow from the outside, so when the car behind reaches it, it encounters a much cleaner airflow.

“Part of what was found out for 2021 was that if this wheel wake was further in, it would be dragged into the mushroom more effectively. And if it was quite far outboard, it would be pulled in but not pushed up. So the remains of this wake would have a negative effect.

“The key thing we tried to do for 2019 was to reduce the authority of the front wing to control this parameter, to control the wake and reduce the chance for the brake-duct area to do the same thing, and to empower the rear wing to have a stronger vortex, moved to a slightly better position to pull this wake in a better way. >>



"Initially, teams were quite negative. We presented the rules that would massively simplify this area, improve how the wake of the wing is handled and the Y250 vortex [the high-energy vortex created by the transition between the FIA-mandated neutral section in the middle of the front wing and the outboard section]. They were quite reluctant to support it, so just after the Bahrain Grand Prix in April 2018 we offered the teams the chance to do some investigations on this phenomenon on a voluntary basis to see for themselves whether this was a valid hypothesis. Eight out of 10 teams participated and sent us a report. Broadly speaking, they all more or less confirmed those trends."

The increase in front-wing dimensions seems counter-intuitive. Making the front wing the full width of the wheels means the airflow needs to be turned less to achieve outwash, which is counter to the objectives, but some concessions were made to ensure overall downforce levels and aero balance were within acceptable windows.

"We did go for a slight increase in the wing dimensions, just because we couldn't predict exactly how powerful the front wing would be and whether the car would be balanced enough," says Tombazis. "You fundamentally want cars to be able to develop approximately 46-48% aero balance and you don't want that to be too marginal or even unachievable. So, it is better to have a wing that is slightly overpowerful than to have a wing that's underpowerful."

All of this sounds rational, but also perhaps very similar to what's been said in the past. What's crucial here is the level of research that's gone into the rules. Even though this set of changes only represents cherry-picked and modest ideas that are driving the 2021 research, it is underpinned by rigorous analysis. It is this that also means the impact will be limited, because this is a long way from the full story. Some teams suggest the reduction in outwash will only be small and perhaps even negligible.

"All the rule changes that have taken place in the past have had less aerodynamic research done, with the exception of the 2009

regulation change," says Tombazis. "That rules package had considerably more time than we had and worked at reasonably decent solutions but failed because the rules were overpermissive. The Overtaking Working Group came up with a perceived shape of endplate and certain areas where it should lie, but didn't tackle the shape of the devices, thus permitting very complex geometries to evolve. It was easy for teams to make endplates that were very curved, multi-element, extremely loaded devices that weren't helping these phenomena. That coincided with a period where there was huge progress in CFD and the ability to see these flow features in detail compared with the rather ignorant past of aerodynamics in the late 1990s. In 2009 the intention was right, but the way the rules were implemented to achieve that goal was insufficient."

"The challenge we had this time round was to try and create sufficient detail. In the old days, rules were just "exclusion" or "inclusion" boxes describing the volumes within which bodywork may or may not lie. Since 2009, it has started to become about shapes, curvatures and protected areas. The '19 regulations are an extra step in that direction. So we started talking about the orientation of surfaces. For example, there is reference to the normal vector to the endplate surfaces not being able to be beyond a certain angle, there is a reference to the surface of the wing profiles not being able to be beyond a certain orientation. All of this is to ensure the front-wing endplate is only lightly curved and not as much as they are now, and that the main plane flaps don't have sudden discontinuities and changes of section that would create vortices to enable engineers to recover these effects."

To everyone's surprise, the rules did get majority approval in time. But then began a long process of rule-wording refinement, clarification and optimisation. Recently, tweaks have been made to prevent front-wing flap adjusters being positioned and shaped to help outwash, such is the detail being explored to prevent teams regaining the same effects.

"Teams have known since April 30 the fundamental design and nothing has changed in the concept," says Tombazis. "But a lot has changed in the wording, detail and there have been clarifications, which has been very time-consuming. I have to say, I'm very pleased with how the teams have behaved in that process. They have been constructive, even if it hasn't always been plain sailing, and have been keen to avoid controversy in the first race."

FRONT
WING

SIZE

The front-wing size has been extended for 2019, and now spans 2000mm – an increase of 200mm. It's also 20mm taller and 25mm deeper, recouping some of the downforce lost from the elimination of the cascade winglets and vortex generators stacked on top of the mainplane.

ELEMENTS AND STRAKES

To reduce the complexity of the new generation of front wings, the number of elements has been restricted to five, while the number of strakes attached to the underside has been limited to just two.





REAR WING

GEOMETRY

The span of the rear wing has been increased by 100mm, with a 70mm height increase and simplified endplates. Here, the focus is on changing the path of the vortices shed from the rear of the car, slightly reducing the negative impact of dirty air on the following front wing. There are also small LEDs on the trailing edge of the endplates to improve visibility in rain and fog.

DRS

To increase the effect of the drag reduction system, the slot gap of the rear wing now opens by an extra 20mm, taking advantage of the larger top flap to slash the drag further in the DRS zones.

“There were quite a few phrases in the rules such as ‘minimal’ or ‘for the purpose of...’ which enabled us at the FIA to pull the reins back a little. This gave us a degree of leverage to refine things through the Technical Working Group meetings.”

Nobody is suggesting these regulations are anything other than an interim step before the potentially seismic 2021 changes. The expectation is that there will be no further tweaks for '20, which at least gives teams two years of stability.

“We have 2021 only two years down the line and there will be big steps for that,” says Tombazis. “We don’t have any objective to do intermediate steps between '19 and '21, so '20 should theoretically be carryover, unless there is any gigantic loophole found that is undesirable, then we would do something. But I don’t think that is going to be the case.”

Key to these regulations is the relationship between the FIA and Formula 1. Former Benetton and Williams technical

supremo Pat Symonds heads up the technical department at F1 that has been working on the research and development to conceive the 2021 regulations. The '19 application of some of the findings has very much been pushed by the FIA.

“We are very close with Formula 1,” says Tombazis. “We share the same objective to improve F1 as a sport and keep it sustainable, and we support the work they are doing and contribute to it. We, as the FIA, need to write the rules and have control of that. But they have spent a lot of time and effort to contribute with the research, which frankly we would not have the resource to do. So it’s a win/win situation. Sometimes we hear it’s a separate project, that it’s two separate organisations, but we do work closely.

“This 2019 rule was very much an FIA development, not because there was any desire to make it ‘my project versus their project’ but because of time constraints. The rules were done within a couple of weeks. For '21, there will be more extensive changes needing much more research, so they are doing a lot of work. We frequently have meetings about it, which I think overall is a good process.”

What we can be sure of is that, while this is a step in the right direction, it is only a very small step on the journey. It’s unlikely that there will be a vast improvement in overtaking in the season-opening Australian Grand Prix in March. What’s more, Albert Park is one of the worst tracks for passing, so we should also be careful about drawing too many conclusions straight away. But if these changes slightly ease the problem of following, or even just prevent it getting worse, it’s arguably worth doing. Teams will criticise the cost involved, but at least the direction is well-researched. And from the fan’s perspective, any disruption to the rules increases the prospects of a shake-up in the competitive order.

“Australia is never going to be a massively entertaining circuit, and so I don’t think we can really make a judgement for that,” says Tombazis. “We’ll have to see over a span of time.

“Equally, if one team happens to do a much better job than everyone else, and is six tenths ahead of everybody else, then I regret to say that this could be a boring year. Because, no matter how close the others can get, if they lose touch with them after one lap, then that will not be particularly exciting.

“All in all, we need to keep pushing on a range of things, whether it is the tyres, the sporting rules and so on, just to keep attacking everything we can. It is an important step towards 2021, but it is not '21. We hope it is going to be an improvement and we believe it probably will, but if not it does not mean let’s stop '21 and not change anything. Because in engineering, in science, you don’t always hit it with the first attempt. Until we see how it goes, we will not be able to make any conclusions.”



ENDPLATES

The endplate construction has now been defined in the technical regulations with the maximum allowable curvature reduced. This is to reduce the variance between front wings and the control over the vortices produced by them.



WILL THE NEW REGULATIONS WORK?

Simpler front wings are part of the changes aimed at making overtaking in Formula 1 easier, but how much is likely to change?

JAKE BOXALL-LEGGE

In some corners, the change in technical regulations for 2019 represents the biggest change in Formula 1's aerodynamic formula since '09. That rules set produced a sea change in the pecking order, but didn't exactly prove to be the silver bullet in addressing F1's on-track shortcomings.

The 2019 regulations have been designed and developed by FOM and the FIA's in-house technical research teams, and are selected elements taken from FOM's research ahead of the '21 season, when bigger changes are planned. Together, their respective engineers have seen tangible merit in their respective simulations, otherwise the changes in dimensions simply wouldn't have been included.

Of the field so far, only Williams and Force India have trialled 2019-spec front wings on track, at the mid-season test in Hungary. Although the concepts seen this year will undoubtedly be more

refined with an extra half-year of development, Williams technical director Paddy Lowe expressed some surprise that no other teams had joined in.

"It was a good test and, given that the rule is quite simple and the wing that you can design with the rules is quite simple, the wing we had was not a million miles off what people will end up running," says Lowe. "So it was certainly useful, and we were surprised that so few other teams did the same."

"We were already stretched with our resources, but managed to prioritise the project. I think that Force India was the only other team – and maybe Red Bull [with a simplified 2018 wing] – to do some work in that area. We saw Ferrari doing something [in Abu Dhabi], so I think there was a bit of a late realisation from some of the teams that they'd missed a trick!"



“THE MORE DOWNFORCE YOU HAVE, THE MORE YOU SUFFER WITH THE WAKE. THAT’S JUST BASIC PHYSICS”

A STEP IN THE RIGHT DIRECTION

It’s important to take the new cars for what they are. The redefined rules aren’t proclaimed to be F1’s saviour, but rather a concerted step forward to where FOM and Liberty Media aim to take the category – essentially a precursor to the much-vaunted overhaul pencilled in for 2021.

The feeling in the paddock is that F1’s on-track product regressed after the redefinition of the cars in 2017, and the FIA moved forward certain elements of FOM’s ’21 concepts to address that. These include the front wing being extended and simplified to mitigate the downforce lost at the front when following another car.

“The main reason [for the new regulations] is that the outwash off the front-tyre wake is the most dominant factor in whether we improve overtaking or not,” explains Lowe. “From the knowledge that we have – and not only from recent research but research over the last decade in these areas – [the new rules are] going to be directionally correct to improve following, just as much as the rules we made for 2017 were directionally incorrect.

“We said it at the time, and it proved to be so. What we don’t know is by how much. We know for certain that the more downforce you have, the more you suffer with the wake because you’ve got more to lose. That’s just basic physics.”

With the change in rear wing size too, the collective impact should be to reduce the dreaded outwash factor credited with making the act of overtaking difficult.

CAN THE RULES CREATE A 2009-ESQUE SHAKE-UP?

“I think so,” answers Lowe. “It’s not a minor change – it’s quite substantial. A lot depends on the degree of innovation and what solutions people come up with. And that brings a lot of unexpected directions, so you may see some change in the pecking order.”

Of course, even if one of the smaller teams on the grid produces a passable Brawn impression and steals a march on the rest of the field, the better-funded squads will undoubtedly have the resources to catch back up.

“The underlying capability and performance of the teams remains in place,” continues Lowe (above). “Even as we see innovations that bring brief disturbances, as we saw last year it took only months or at most a year for the bigger teams to catch up. It’s difficult to say, because sometimes people can come up with something difficult to copy quickly.”

TEAMS WORKING TO RECOVER LOST DOWNFORCE

Without the outwashing capabilities around the front wing, combined with the various other pieces of accompanying furniture, there’s been plenty of head-scratching across each team’s design department as they seek to recover the downforce lost around the rest of the car.

“It’s a big change to the aerodynamics, but it’s a relatively small change to the regulations,” explains Force India technical director Andy Green. “On the surface, you’d say that’s not going >>



BARGEBOARDS

The bargeboards have been given a dramatic overhaul, being extended horizontally by 100mm but shortened vertically by 150mm. Although this is predicted to have a limited effect, this redefinition was more closely linked to commercial considerations, increasing space for sponsorship available on the side of the chassis bulkhead.



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**BRAKE DUCTS**

The amount of 'furniture' around the brake ducts has been cut, and the duct bodywork on the front upright must not pass a 180mm radius from the centre of the wheel. This is to further limit the outwash capabilities around the front of the car.



to do a lot, but in reality it's affected the car's performance a lot – overall performance and balance as well.

"It's been a big hit. When we first put it in the tunnel a few months ago, we're talking a few seconds of lap time, and a poorly balanced car as well. It was the worst possible outcome.

"Hopefully, it has some positives with respect to closer racing. Like everyone else, we've been trying to crawl our way out of the hole that we jumped into with these new regulations. It's significant – not quite a complete change of car, but it's pretty close.

"When you make those substantial changes, it has a profound effect on everything else – it's starting again, really, with a new concept in 2019. The development curve is really steep again, and all of a sudden we're into bringing updates all the time to try to keep on top of the change in performance of the model."

WILL IT HAVE AS BIG AN EFFECT AS EXPECTED?

Although Lowe talks about the potential for shaking up the order, Green is less effusive about the new rules' ability to provide better racing. "There is a small change to the outwash on the car," he confirms, "but it's relatively small, so if you flinch you miss it. I think it came about as part of a round of work that Formula 1 was doing on the 2021 car, and they plucked it out at a very early stage to go into '19. I think now they've done more work on the '21, it's probably quite a small modifier in the whole equation.

"We'll see, but it's a relatively small change. You might struggle to see a significant difference. It's made the cars a lot slower. It's going to make the wings less complicated, that's for sure. The wings are a lot bigger – front wings are huge now – so they're going to be prone to damage so we've got to take that into account. We're going to be losing a few quite regularly.

"[There's] less [dirty air] in the respect that the performance of the car has deteriorated because it's less output for sure. But when you go back behind the rear wing, and look at the actual effect right behind the car, it's massively diluted.

"We're talking about a very small change – you can hardly see it. I think we'll struggle to see a big difference following another car. I hope I'm wrong; I hope all this work will result in some positives,

but for the analysis we've seen it looks relatively small.

"It's in the right direction, but I think now there are bigger parts to play with to get it where they want to go. It's a shame because it costs an awful lot of money to do all these changes, and I'm not sure it's going to close the field up."

ANY EARLY INDICATIONS OF LOOPHOLES?

There was, but the FIA quickly picked up on one loophole. Teams were using the front-wing-flap adjuster to guide some of the airflow outwards. Having been explored by some of the teams, the scope to use it in recovering the lost outwash was quickly extinguished by the FIA in its latest update to the regulations.

"We've lost a lot of material for what we use to achieve outwash, particularly around the front-wing endplates and front-brake-duct furniture, as we call it," says Lowe. "But we're doing everything we can and trying every trick we can dream up to get back to where we were.

"Because there are so few tricks left to manage outwash, some people got onto the idea of the front-wing adjuster as an aerodynamic device in itself! You'll see in the rules that the size of the adjuster and where it's positioned has now been pinned down, which sort of gives you a flavour of what's been going on."

WHAT'S THE SCORE?

Our only true metric of whether or not the new cars produce any significant strides in improving the on-track product will be once the season starts. Sure, pre-season testing might offer some indication – and will certainly underline whether the slash in downforce is as large as the teams have feared – but we'll have to wait until the opening races to find out if it helps the racing.

"I know that I've seen a lot of quotes that it's not going to make any difference," Lowe contends, "but I'm not so sceptical.

"If we didn't change the rules, overtaking in 2019 would be worse than this year, because we'll have developed one or two seconds a lap more from downforce, which is what we do year on year. We'd have had disproportionate degradation in following distances, and that's unquestionable in my mind." ❧

AUTOSPORT
INTERNATIONAL

THE RACING CAR SHOW

10-13 JANUARY 2019, NEC

UNWRAPPING 2019

This week the 29th edition of Autosport International takes place at the NEC in Birmingham.

Since its 1991 inception, the show has gathered the entire spectrum of motorsport – from karts and oval racing through to rallying and, of course, Formula 1 – all in one place.

On Saturday, the World Rally Championship will launch in front

of the public for the first time at the show. McLaren will present its all-new F1 driver line-up, Lando Norris and Carlos Sainz Jr. Gamers can fight for a share of \$100,000, plus W Series enters the limelight as it seeks to break down the barriers to greater female participation in motorsport.

Alan Hyde, guru of the British Touring Car paddock, who will take the reins as host of the Autosport Stage this year, says: "I know

the calibre of guests Autosport International attracts from around the world, so I know I'm in for an entertaining and star-studded ride."

The four-day extravaganza opens its doors today (Thursday). The first two days are dedicated to the motorsport industry, before the public is welcomed on Saturday and Sunday. Here's a taste of what's to come from Europe's biggest motorsport show.





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Why Sebastien Ogier rolled the dice and left M-Sport



MCKLEIN

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The full list of who's at the show and where to find them



P36 FLOORPLAN
Your map of Autosport International 2019

WHO TO LOOK OUT FOR*

ZAK BROWN

McLaren Racing chief executive and Motorsport Network chairman

KARUN CHANDHOK

Former F1 racer and returning Sky Sports F1 presenter

DAVID COULTHARD

Thirteen-time grand prix winner and backer of the new W Series

DAVID CROFT

Sky Sports F1 commentator will be the Live Action Arena host

JOHNNY HERBERT

Three-time GP winner and Sky Sports F1 presenter



TOM INGRAM

Runner-up in the BTCC last season has helped bring Toyota UK back to the series

ANDREW JORDAN

2013 BTCC champion



TOMMI MAKINEN

Four-time WRC champion and Toyota team principal

CHARLIE MARTIN

Transgender racer will host a talk on her pursuit of competing in the Le Mans 24 Hours

KRIS MEEKE

Newly signed Toyota WRC driver

MATT NEAL

Triple BTCC champion

THIERRY NEUVILLE

2018 WRC runner-up

GERARD NEVEU

World Endurance Championship chief executive

LANDO NORRIS

McLaren F1 driver and Formula 2 runner-up



SEBASTIEN OGIER

Six-time WRC champion

ALICE POWELL

Shortlisted driver for inaugural season of the W Series

CARLOS SAINZ JR

McLaren F1 driver

GORDON SHEDDEN

Triple BTCC champion and WTCR driver

SHMEE150

YouTube star will display a selection from his supercar collection

OTT TANAK

Toyota driver and the fastest man across the 2018 WRC season

COLIN TURKINGTON

Triple BTCC champion

MISS EMMA WALSH

Supercar vlogger will co-host the Live Action Arena

*Correct at the time of print

SHOW INFORMATION

JANUARY 10-13, BIRMINGHAM NEC

Open 9am-6pm each day (January 10-11 are trade only)

TICKET PRICES (Saturday and Sunday)

Ticket type	Advance price	Door price
Adult	£34	£39
Child (6-15)	£16	£25
Paddock Pass	£45	£49
Child Paddock (6-15)	£26	£35
VIP Club	£125	£130

All tickets include a free seat in the Live Action Arena and free entry to the Performance Car Show.

For more information visit autosportinternational.com

ROUTE-FINDER

BY CAR

The NEC is easily accessible from junctions 6 and 7 of the M42, which connects to the M6, M40 and M5. The A45 also passes the NEC. Alternatively, type B40 INT into your satnav.

BY TRAIN

The NEC is a few minutes' walk from Birmingham International Station. Connections from Birmingham New Street run regularly and the station has excellent links to all major UK cities.

BY PLANE

The NEC is a short drive from Birmingham International Airport. The easiest way to reach the venue is by the Air-Rail Link, a free shuttle service running every two minutes between 0330 and 0030. For scheduling call 08445 766000 or visit birminghamairport.co.uk

BY COACH

National Express runs regular services to Birmingham city centre and the airport. For more information visit nationalexpress.com





OGIER'S EMOTIONAL M-SPORT GOODBYE

This weekend the reigning World Rally champion will appear at the show in his new Citroen colours, but before that there was the small matter of saying farewell to the British team

DAVID EVANS



Ogier clinched his second title for M-Sport in 2018 Australia finale

When Sebastien Ogier talks of his fresh World Rally Championship deal and new life at Citroen, he speaks of potential, of prospects. It's all about one last roll of the dice; one final challenge.

But take him back a month, to M-Sport, and his face creases. He smiles. Malcolm Wilson's team, his home for two seasons, was his family. It's still surprising the impact Ogier and co-driver Julien Ingrassia had on the British squad; and, probably even more remarkable, the impact that M-Sport had on the Frenchmen.

When Ogier signed to drive a Ford Fiesta WRC for 2017, it was almost impossible to predict how things would play out. The service park hadn't been short on stories of how Ogier had enjoyed a cosseted life with Volkswagen. The Hanover team was his. Sure, Jari-Matti Latvala and Andreas Mikkelsen were along for the ride, but nobody was in any doubt about the number one, the golden boy. World titles buy you that status.

But M-Sport's not that kind of place. Hang around after final service on an event and you'll see team principal Wilson or his wife Elaine make a final sweep of their place, tidying chairs, moving cups or picking up cable ties. Nobody is bigger

than this team – not even the boss.

As Ogier made the transition from one of almost 650,000 employees at the world's second-biggest carmaker to a corner of Cumbria where 300 folk work, there was some degree of trepidation within M-Sport. Before 2017's opening round in Monte Carlo, Autosport fielded more than a couple of calls from the Dovenby Hall HQ asking what Ogier would be like to work with. It was a tricky one to answer. His departure from VW was followed by stories hinting at high maintenance.

In the end, nothing could have been further from the truth. Ogier doesn't come from a background of great wealth; his is a pretty ordinary, hardworking French family from the mountains. If there were any airs and graces, they were left at the door.

From the moment Ogier and Ingrassia walked into Dovenby, they knew the score. That's not to say they weren't demanding – they were. But they picked their battles. Ogier was certainly not going to argue about the absence of a third or fourth PR person or the lack of a mezzanine level in the hospitality area. Or even the fact that he had to share crew room with any M-Sport customers competing – eating alongside a variety of private Fiesta R5 drivers kept it 'real' from early on.

What did matter was the need for more torque from the engine. Or a new damper specification for Finland. Or an extra day of testing for Wales. Those things counted. Ogier fought those battles and usually won.

"I don't remember Malcolm ever telling me no when I asked for something," he says. "When it came to the car, when it came to winning, he always found a way."

Ogier had enjoyed good relationships with team management before. At Citroen, he and Olivier Quesnel worked well together, and he was on the same page as Jost Capito and Sven Smeets at VW. But they were part of a corporation, cogs in a wheel made to sell metal.

In rallying, Wilson sees a different picture. And Ogier loved that. When Ogier and Ingrassia went to their first pre-season M-Sport team meeting, they were told they would be eating – along with Ott Tanak and Elfyn Evans and their co-drivers – at Wilson's house.

"I didn't do that before," says Ogier, smiling at the recollection. "I'd never gone to my boss's house for dinner. Never. I was a little bit surprised..."

He shouldn't have been. That was Wilson's way of welcoming them and painting them into the picture.

"It was fantastic," says Ogier. "The food was beautiful. Elaine is an amazing cook." ►

JANUARY 12 2019

THE STARS ON SHOW

> As a motorsport fan, it's your duty to attend Autosport International – six-time World Rally champion Sebastien Ogier is expecting you.

The WRC was launched at Birmingham's NEC for the first time last year. But Ogier wanted the fans to see more of the action. The 2018 series was unveiled on Thursday's opening day of ASI. Why couldn't we do this on a Saturday, he asked.

Why couldn't we do this on a Saturday? We could. And Saturday January 12 is going to be good. It'll be known as the WRC's very own 'Super Saturday'.

Ogier is delighted: "This is good news, great news. Last year it was a good event to launch the season, to have everybody together. And if there are going to be even more fans there this year, then it's going to be even better.

"Without fans our sport would not exist. We need them and the launch is always an exciting time when you come to discover the new liveries. It's going to be great to see lots of fans joining us – see you soon guys!"

Livery launches are at the heart of 'Super Saturday', with three (providing M-Sport makes it and signs up with the FIA) of the four factory squads bringing new colour schemes to show off for the first time.

Visit on the first two days of ASI and you'll find all four works World Rally Cars present in their 2018 paintjobs. For the weekend, it's all about the year ahead – with Ogier's own Citroen C3 WRC reckoned to be in for a radical new design.

With the exception of Sebastien Loeb and Daniel Elena (they're excused on account of being a bit busy on the Dakar Rally), every other driver, co-driver and team principal will be at the launch, answering questions



MOTORSPORT IMAGES/PORTLOCK

about the season ahead and attending autograph sessions throughout the day.

As well as the main field of factory cars, there will be plenty of WRC2 machinery – including something special from Proton Motorsport – and M-Sport's all-new Junior WRC challenger, the Ford Fiesta R2.

Beyond the action on the centre stage, the World Rally Championship will have a huge stand in Hall 3. This is the area that will host the manufacturer cars. It's also the place where you can buy WRC merchandise and get behind the wheel and test your pace against the best of the best in the official WRC game.

There will, of course, be more rallying at the show than what's available on the official WRC stand. There'll be the usual collection of national and historic cars, offering you the chance to compare and contrast the machinery in a year that celebrates the 40th anniversary of the drivers' world championship.

The Motorsport UK stand is the home of the British Rally Championship, offering a full rundown of another fascinating season of domestic sport.

Tickets for Autosport International, which runs from January 10-13, are available at www.autosportinternational.com.



WRC
Stand 3350
Hall 3



Ogier's past two years with M-Sport have been a real journey. He's learned plenty about the economics of motorsport, seen a lot of life at the coal face. And he's got nothing but admiration for what Wilson achieves.

When it was time to sign off from Dovenby, at a final get-together in early December, it was difficult to know what to expect. In the preceding weeks, we'd heard plenty about the human story that Ogier, Ingrassia and Wilson had forged while winning the drivers' and co-drivers' titles for the past two years – with the 2017 manufacturers' title in there for good measure. But it was now time to go.

Compering the celebration, the ebullient Howard Davies had raised his glass and commanded a toast to the world champions. Briefly, it looked like the moment might have passed. Wilson had offered words full of feeling and wrapped in emotion.

Ogier waited for the applause to die down. He wanted to say something, but caveated his words with the admission that he wasn't generally an emotional person: "Two years ago we were having some hard

TICKETS: AUTOSPORTINTERNATIONAL.COM OR PHONE 0844 338 0338

STATS
OGIER AT
M-SPORT

2

drivers' titles

6

victories

60

stage wins

451

points



M-Sport farewell gathering was one of celebration

times. The team where we achieved so much and worked so hard had a new car for the future, but suddenly it stopped. It felt like the world was falling apart.

"But like every time in life when you have this kind of thing, you have to overcome it. And, at the end, it was one of the best things that happened to us because it gave us all the opportunity to meet all of you and to be part of this

family. We discovered feelings I probably didn't have before; everyone knows how much I respect Malcolm, but it's the same for all of you guys. Thank you."

Standing in M-Sport's vast facility on a chilly winter's afternoon, Autosport had wondered how the place could generate any kind of an atmosphere. Even with close on 300 people standing, listening and clapping at every opportunity, we were in one corner

of a big building. The moment would surely be lost to all that space. Not a bit of it. The electricity Ogier's words generated was just incredible. Tears gathered in the corners of eyes.

Elaine's seen the stars come and go, from Carlos Sainz to Colin McRae, and Marcus Gronholm to Mikko Hirvonen. But these guys are special.

"We've learned a lot from them," she says, "but I think they've learned from us as well. Seb talks about the human side of the story and that's what we're about, and maybe they've learned some of that about the feeling, the passion and the emotion that we've all felt for having them with us.

"We've had this with a lot of drivers, but, you're right... these guys have been special."

And, typically with M-Sport, they wanted to share the moment with as many people as possible – which meant some lucky members of the supporters' club were invited along.

Jane Smith was one of them. "This means the world to me," she says. "I've said to all of these guys, today's better than my wedding day! I've had a rubbish ►

year: I've had breast cancer, somebody crashed into my bloody car and I just thought, 'If anything else happens this year...' And then I got the call to say my name had been drawn from all of the [M-Sport] supporters.

"This is the best thing ever. I think Seb and Julien probably thought, 'Who is this mad Englishwoman pouncing on me doing the continental kisses?' It's been awesome."

The irony of professional sport is that by the time they were saying their goodbyes, Ogier and Ingrassia had already tasted Citroen's C3 WRC in preparation for 2019.

Analogies with partners playing the field were dispatched. Nobody was buying them. Ogier had been quite clear that his preferred option was to stay where he was. "We all know it was coming to a point where the support of a manufacturer [Ford] was not present enough with Malcolm and that was what was missing the most," explains Ogier.

Wilson was perfectly clear from the outset. He could only fund this adventure for one year. He managed two. Commercially speaking, three would be suicide. He listened to his head.

As these words are being written, the cost of those world titles and six WRC wins in two years is still being calculated in Cockermouth. And the cloth being cut to fit the coming season. Will M-Sport be in the world championship? Most likely,

yes. But the chances of winning are drastically reduced – and that's no slight on Evans or Teemu Suninen, who are both fine drivers and great prospects. But neither of them is an Ogier.

With the champions out of the door and off to the Wilsons' place for the last supper, the party, the moment and the era was over. But the mood was anything but melancholy. Clichéd as it sounds, this started out as a celebration and remained as such.

Rich Millener, Wilson's deputy on events, worked closely with Ogier and Ingrassia. As

much as anybody, he's enjoyed the sunshine. And, in the knowledge that showers might follow, he made the most of it.

"In lots of ways," he says, "I think we got this right. We've had two very, very good years with them, won two from two [drivers' titles] and three from a possible four [drivers' and manufacturers']. That's better than having them with us for longer, for five years or something, but only winning a bit.

"It's tough when they've gone. We've got used to them being here and, of course,



Ogier has already started testing the Citroen C3 WRC (below)



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we've got used to winning. It's going to be difficult seeing them in a different team. In a way, it's quite hard knowing they've gone already; they're already working and testing with a different team. But we're not worried about that – we're better than Citroen!”

But Citroen is the future for Ogier now. At least for the next two years. He has already said his return to Versailles represents the final act in his WRC career. Just 28 rallies remain. Should he maintain his current success rate, he would close this chapter on eight titles, tantalisingly short of Sebastien Loeb's record of nine.

Put that to him and he looks slightly bemused and points out that there remains the small matter of titles seven and eight before he could even consider a ninth.

So what's it like to be returning to Citroen, with which Ogier scored his first WRC event wins in 2010-11?

“I don't know if we can talk about coming home, because it's been a lot of years since I was last in the team and a lot has changed,” he says. “But it's nice to go back to a French team – I'm not used to working in French! There was a very nice welcome for Julien and me in the team and I feel everybody is really motivated by the challenge.”

Nobody can forget what happened there last time. Yes, it may be eight years ago, but Quesnel and Ogier

were hoofed out. And, let's not kid ourselves, they were hoofed out at the behest of Loeb and then-boss of Citroen motorsport Yves Matton.

When asked why it took so long for Ogier to return – why he didn't go back to France instead of taking his trip to M-Sport two years ago – he is frank. “It was probably not the right time in my eyes,” he says. “Before – and I've said that already – they haven't shown me enough motivation to convince me to come back and I was happy where I was.”

With a degree of devilment, there's the inevitable follow-up about whether Matton's departure and Pierre Budar's arrival in his place might have had

something to do with the move. “Definitely it was important,” adds Ogier. “It's no secret I was never close with Yves Matton and when you have a difficult connection it doesn't help find agreements.”

“With Pierre, it was different from the beginning. The first impression was good and, so far, I still like the way he is working. He has shown me a big motivation to turn things around and bring the team back to where they used to be, and one of the elements for that was to put me back in the car. I will do my best to help him.”

When he walked away from Citroen at the end of 2011, everything had become all too personal. This time, it's strictly business. ■



**> 1968 ALFA ROMEO
GTAM REPLICA**

Estimate: £55,000-£65,000

A 1750 GTV built to resemble its bigger Group 2 racing brother, and then competed throughout the 1970s and '80s.



GOING, GOING, GONE

The stars of the Silverstone Auctions sale

MATT KEW

For the first time ever, Autosport International will be hosting a Silverstone Auctions car sale. More than 55 cars will be going under the hammer on Saturday, and all told they're expected to fetch in the region of £5million.

There's also an assortment of motorsport artwork, replica helmets, signed Formula 1 steering wheels – and even a Ducati motorbike that was originally registered to Nigel Mansell among the list of lots. But we're more interested in the provenance of the four-wheeled motorsport offerings. Here are our seven to watch...



^ 1961 EMERYSON-CLIMAX 61
Estimate: £180,000-£225,000

At a stretch, the Emeryson may even be considered good value considering that an equivalent Lotus 25 will cost a further £100,000. The brainchild of racing driver and front-wheel-drive Formula 2 and F3 car designer Paul Emery, this 1961 Climax-powered machine is the last survivor of four cars built. It was driven in period by Jack Fairman and Mike Spence, with Spence notably finishing second in the Brands Hatch Lewis-Evans Trophy. After a £90,000 restoration, including a rebuilt FPF motor, this 1.5-litre car has competed in the 2018 Monaco Historic Grand Prix and been in regular Goodwood Revival and Historic Grand Prix Cars Association action since '98.



**^ 1965 STUDEBAKER LARK
DAYTONA 500**
Estimate: £100,000-£130,000

The distinctive Studebaker Lark Daytona 500 is another one of the Autosport International sale cohort that's a firm hit at Goodwood. It's the only known Lark Daytona 500 race car in Europe, and produces a healthy 430bhp from its Chevrolet V8. That helped it finish second in the opening St Mary's Trophy race at last year's Revival, driven by triple British Touring Car champion Matt Neal. This limited-edition model from the final year of production takes its name from a starring role as the pace car for the Daytona 500. It heads to sale from the collection of Silverstone Auctions managing director Nick Whale.

TICKETS: AUTOSPORTINTERNATIONAL.COM OR PHONE 0844 338 0338**SILVERSTONE
AUCTIONS**
Stand 4000
Hall 4

2010 BMW Z4 GT3 Estimate: £120,000-£140,000

For fans of more-modern machinery, this is one of the most well-decorated BMW Z4 GT3s ever made. Built for competition in the German VLN series and Nurburgring 24 Hours, it moved on to win pole for the 2011 Spa 24 Hours in the hands of Maxime Martin. He and his team-mates also secured three wins in the Blancpain GT Series that year. It then moved on to be victorious in British GT and to race in the European Le Mans Series before a '15 nut-and-bolt rebuild by the experts at Barwell Motorsport.

1966 FORD CORTINA LOTUS Estimate: £180,000-£200,000

The lot with the most significant history is this ex-works Lotus Cortina, raced in period by Formula 1 champions Jim Clark and Graham Hill in the British Saloon Car Championship. Clark qualified on pole for a rain-disrupted 1966 Oulton Park race before the car was passed over to Peter Arundell and Jacky Ickx. This car has been restored but retains its original shell and period race modifications, including a conversion to BRM fuel injection.



It ended its works career on a high – Hill topped his class and classified second overall in the 1967 Race of Champions support race at Brands Hatch.

1980 FORD CAPRI 'FABERGE' Estimate: £70,000-£80,000

Fans of the Goodwood Members' Meeting will be quick to recognise this Ford Capri from the Gerry Marshall Trophy races for Group 1 saloons, thanks to its distinctive Brut aftershave livery. It's not the original 3.0-litre machine that Stuart Graham raced in the British Saloon Car Championship, but rather an exacting copy. A Ric Wood engine produces more than 300bhp, and that's sent to the rear wheels via a straight-cut four-speed gearbox and limited-slip differential. Even by Capri standards, it's something of a featherweight and so has enjoyed plenty of success, notably with British Touring Car star Tom Ingram at the helm.



1985 MG METRO 6R4

Some enthusiasts may consider it sacrilegious that an icon of the Group B rallying era, and later European rallycross, has covered just 175 miles in its 34-year life. But there's a good reason, as this Metro 6R4 was acquired by Williams Grand Prix Engineering in 1988 – the Formula 1 team's co-founder Patrick Head and engineer John Piper were consultants to Austin Rover Motor Sport during the 6R4's development.



It remained on display at Williams's Didcot site until its auction in 2005. The current owner bought chassis 111 in '15 and has since presided over a full mechanical recommission.

A NEW HOME FOR 2019

LONG HALL JOURNEY

Your guide to the key attractions at this year's Autosport International



CARTEK

Hall 3 / Stand 3544

1 CARTEK is now a recognised brand and major supplier of specialised equipment with a constantly expanding product range. Our products are used in every level of motorsport from amateur to International GT.



EEC PERFORMANCE SYSTEMS

Hall 3A / Stand E342

3 Supplying race teams worldwide, EEC Performance Systems is the 'go-to company' for refuelling equipment. The f-POD delivers consistent, accurate, reliable results, making refuelling errors a thing of the past.



SPARCO

Hall 3A / Stand E470

5 Sparco will present its new seat range with QRT technology (30% lighter than standard), the Custom Easy programme for suit customisation, and the Trackmate – a new way to analyse your track performances.



DEMON TWEEDS

Hall 2 / Stand 2550

2 Since 1971 our aim has been to give you, the Demon Tweeds customer, the most complete and innovative motorsport product range available worldwide. So no matter what your level or discipline, we can help drive you to realise your motorsport ambitions.



HP TUNERS

Hall 4 / Stand 4930

4 HP Tuners, the home of VCM Suite and the MPVI since 2003. We offer the only tuning and diagnostic solution you'll ever need for your modern vehicle – sophisticated and quick to implement via your OBD2 port.



THINK AUTOMOTIVE

Hall 3A / Stand E720

6 The automotive plumbing specialist. Since 1967 Think Automotive has specialised in oil cooling, and offers equipment from all leading manufacturers. We also offer a large range of other plumbing-related equipment.



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A-Z OF EXHIBITORS

EXHIBITOR	HALL/STAND	EXHIBITOR	HALL/STAND	EXHIBITOR	HALL/STAND	EXHIBITOR	HALL/STAND
#TrackAddict	3A/W780	BRSCC	2/2180	EARS Motorsport Ireland Ltd	3/3342	Hedtec	2/2374
195mph Limited	1/1665	Bruderer Ltd	3A/E322	EBC Brakes	3/3644	Hel Performance	3A/E625
3J Driveline Ltd	3A/E464	Bruntingthorpe Proving Ground	3A/E840	Eco Trailers	3/3260	Helix Autosport Ltd	3A/E701
750 Motor Club Limited	2/2280	BTN Performance	3A/E330	Ecumaster UK	3A/E761	Henleys Love Sweets	3A/W620
920Engineering	3/3231	Bute Motorsport	1/1174	EcuTek	3A/E613	Hexis UK	4/4110
A1 Performance Products	3A/W530	Butler Installations	3A/W630	EEC Performance Systems	3A/E342	HiETA Technologies Ltd	3A/E451
Absolute Alignment	3/3860	Caged Steel Corsa Ltd	4/4210	Elbach UK	3A/E670	Higgins Car Parts	3/3524
Active Simulators	2/2350	Camcoat Performance Coatings	3/3444	Electrostatic Magic	2/2616	HiSpec Motorsport Ltd	3/3674
Advanced Fuel Systems Ltd	3A/E640	Cannonball Run Europe	4/4250	Elite Racing Transmissions	3/3252	Historic Sports Car Club	4/4040
Advantage Motorsport	2/2742	Car Audio & Security Ltd	4/4530	Empire RV	2/2540	Horsepower Hangar	4/4130
Aero Tec Laboratories Ltd	3/3534	Car Crazy Models	2/2794	Engine Parts (UK) Ltd	3A/E230	Hortons Books	4/4034
AeroCatch	2/2692	Carspunk	4/4805	Epartrade.com	3A/E421	HP Tuners LLC	4/4930
Aerocom Metals Ltd	3A/E782	Cartek Motorsport Electronics	3/3544	Euro Therapy UK Ltd	2/2348	HRX SRL	2/2364
Aford Awards	2/2610	CaseLiner sro	3A/E450	EVO Corse	3A/E702	Ifor Williams Trailers	2/2644
Aireshelta	4/4010	Castle Combe Circuit	2/2493	EXGEL Motorsport	2/2693	IMSM	3A/E110
Akrapovic	4/4640	Castle Combe Racing Club Ltd	2/2491	Exo Sports Cars Ltd	4/4249	Induction Technology Group Ltd	3/3774
Allens Crankshafts Ltd	3A/E262	Celtic Tuning	4/4910	Extreme Performance Tyres	2/2861	Intercomp	3A/E432
Alutight - Perma Grit	1/1487	Central Motorway Police Group	3A/W250	F1 Model Helmets	2/2850	Intrax Suspension BV	2/2732
Anglo American Oil Company Ltd	1/1230	Central Scanning	3A/E122	F1 Racing	2/2160	Isoclima Group	3A/E362
AP Racing	3A/E530	CES Europe Ltd (Pit Equipment)	3A/E580	Ferodo Racing	3A/E600	J E Pistons	3A/E510
Aptec	3A/E400	CGTech VERICUT	3A/E111	Ferrari North Europe	2/2720	Jabrock Eyewear	2/2730
Armed Forces Race Challenge	3A/W750	CKW Distribution	3A/W860	Ferrea Racing Components	3A/E540	Jenvey Dynamics Ltd	3/3241
ARP Automotive Racing Products	3A/E520	Cl Brakes	3A/E423	FEV Fire Suppression	3/3343	Jim Kelly Books	1/1646
Arrow Precision	3A/E442	Classic Sports Car Club	3/3730	FGR Motorsport	3/3410	Juicy Details	4/4730
ASK Kugellagerfabrik Artur		Classic World Racing Ltd	3A/E401	Flapjackery	3A/W704	KA Sensors Ltd	3A/E646
Seyfert GmbH	4/E886	Clickheat	4/4905	Flint & Flame	1/1634	KartSim	2/2640
ASNU (UK) Ltd	3A/E626	Clubmans Rallycross Championship	3A/W730	Focus Racing Cup	2/2473	Kelgate Performance	3/3724
AST Suspension BV	2/2450	Cobra Coatings	3A/W380	Force Racing Wheels Ltd	3/3545	Kent Performance Cams	3/3256
Atlas Composite Technologies	1/1280c	Cobra Cord	2/2618	Force Technology Ltd	3A/E781	King Engine Bearings Ltd	4/4552
ATM Service Parts Ltd	2/2885	Cobra Seats Ltd	2/2760	Ford Mania	3A/W460	Kulite Sensors Ltd	3A/E352
Aurora Bearing Company	3/3240	Compbrake Motorsport	3/3430	Ford ST Owners Club	4/4280	KW Automotive UK Ltd	2/2655
Auto Campers	1/1574	Competition Clutch	4/4810	FOUR Car Audio	4/4740	Kwik Fit BTCC	2/2580
Auto Finesse	4/4540	Competition Supplies Ltd	3/3775	FreeM - Free Minds Srl	2/2353	Lamborghini Club UK	4/4070
Autoenhance	4/4620	Corbeau Seats Ltd	2/2570	Fun Cup	2/2380	Land Lords	4/4750
Autosport Bearings and Components	3A/E680	Coventry University	3/3721	Funk Motorsport	3/3751	Lane Motorsport	3A/E760
Autosport Stage	1/1150	CSF Radiators Europe	3/E632	G&S Valves Ltd	3A/E430	Launch Tech UK	2/2791
Autotel Race Radio	3/3531	Custom Cages Ltd	3/3250	G&T Tools	2/2743	Lazer Lamps Ltd	3/3550
Autoverdi AB, Motordesign		Custom Racewear	2/2792	Gala Performance	2/2774	Le Mans Esports Series	1/1410
Sweden AB, Unic AB	3/3440	Daniel Ricciardo Series DRS	1/1440	Garage Style	4/4821	Leather Genie	1/1645
Aviaid Oil Systems	3A/E636	Dave Beecroft	3A/W360	Gathercole Race Engines Ltd	2/2595	Legends Cars	2/2590
BAC	2/2340	Daz's Models/		Gazeboshop	2/2816	Liberty Walk	4/4505
BARC	2/2745	Dan's Motoring Memorabilia	1/1628	Ginetta Cars	1/1560	Life Racing	3A/E552
BB Engineering Supplies	2/2630	DBA	4/4450a	Giorgio Piola Timepieces	4/4020	Lifeline Fire & Safety Systems/	
BBS Motorsport GmbH	3A/E301	DBM Technologie	3A/E644	Gloria Srl	3A/E160	Old Hall Performance	3A/E722
Bcomp Ltd	3A/E620	De Montfort University	1/1280b	Goodridge (UK) Ltd	3A/E684	Ligier UK	2/2360
Bianco Motorsport	2/2344	DeatschWerks	3A/E622	Grand Design Systems	3A/E584	Lille Racewear	3/3734
BMW Car Club	4/4180	Demon Tweaks	2/2550	Great British Sports Cars	4/4920	Link Engine Management	3A/E843
BMW Racing Drivers Club	2/2270	DEN Motorsport	3/3420	Greaves 3D Engineering	3A/E480	Liras Optical	3A/E260
BRAID	3A/E410	Designer Fragrances	4/4822	Greenpower	3A/E181	Lista UK Ltd	1/1570
Bremsen Technik (UK) Ltd	3A/E660	Diecast Race Models	2/2832	Grip Tyre Softener	3A/E290	LJ Agricultural Engineering	3A/W350
Brian James Trailers Ltd	1/1270	Dimsport SRL	3A/E422	Gripper Differentials	3A/E420	LN Engineering	3/3443
Bridgwater and Taunton College	3/3121	DK Products	3/3855	GRP4 Fabrications	3/3322	Lodge Initiatives	4/4742
Britcar	1/1464	DMS Technologies	3A/E806	GT Omega Racing	2/2735	Lohen	4/4720
British Historic Kart Club	3/3712	Docking Engineering	3A/E842a	GTMA	3A/E100	Lotus on Track Racing Drivers Club	4/4160
British Motorsports Marshals Club	3/3713	Dogs Trust	3A/W705	GTMA - Ardingley Solar Car	3A/E220	Louvre Hotels Group UK	2/2372
British Rally Marshals Club	3/3711	Draper Tools	2/2560	GTR Drivers Club	3A/W450	Magelec Propulsion Ltd	3A/E460
British Series Ltd	3A/W770	Drenth Motorsport Gearboxes	3A/E784	GTROC	3A/W600	Maha UK Ltd	3A/E674
British Superkart Association	3/3720	DTA FAST	3A/E431	Hadleigh Castings Ltd	3A/E202	Manchester Metrology	3A/E212
British Womens Racing Drivers Club	1/1485	Duke	1/1470	Hamilton Classic	2/2880	Marcos Owners Club	4/4060
Brooklands College	3/3116	DX Distribution Ltd	2/2734	Harper Adams University	3/3210	Marina Racewear	3/3344
Brown & Geeson Limited	2/2660	Dynojet UK	3A/E170	HB Bearings	3A/E604	Mark Rogers	3A/W550
		Earls Performance Products	3A/E842b	HCI Systems	3A/E601	MasterCraft	4/4440

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MCF Srl	3A/E250	Pickup Truck Racing Ltd	2/2790	Serck Motorsport	2/2342	Total Headtuners	4/4240
McGard Deutschland	3/3670	Pilbeam Racing Designs Ltd	3A/E270	Series Elite Ltd	1/1550	Total Seal Piston Rings	3A/E550
McGill Motorsport	3/3270	Piper Cams	3A/E570	Signature Motorhomes	1/1370	Track Obsession	3/3664
Memento Exclusives	2/2754	Pirelli Tyres Ltd	2/2140	Silver Fern Rally	2/2793	Trackday Directory	4/4150
Mercedes AMG F1 Experience	4/4350	Pistol Racing/ItalianRP	3A/E484	Silverstone Auctions	4/4000	Trident Racing Supplies Ltd	3A/E610
Meteor Motorsport	3/3654	Planet Kart Cross	3/3554	Silverstream TV	1/1540	TRP	2/2494
MEV Limited	3/3850	Porsche Cars GB Ltd	1/1260	SlammedUK	4/4660	TRS Motorsport	3A/E631
MG Car Club Ltd	2/2785	Porsche Club Great Britain	4/4370	Smart Tech Car Care	4/4926	TT Bar & Networking Lounge	3A/E50
MG Car Club Ltd	2/2783	Powerflex	3A/E750	Smiths Metal Centres Ltd	3A/E650	TT Bar & Networking Lounge	3A/W50
Midland Brakes	3/3321	Precision Technologies International	3A/E242	Southdowns Motor Caravans	1/1220	TTV Racing	3A/E785
Millers Oils	2/2670	Precision Turbo and Engine	3A/E642	SPA Design	3A/E740	Turatello Race Trailers	2/2370
Milltek Sport Ltd	3/3755	PRG Trailers	2/2454	Spantex	1/1444	Turbo Zentrum UK	4/4550
Mimirbox	3/3710	Pro Formance Metals Ltd	2/2490	Sparco Spa	3A/E470	TW RACING PARTS INC	2/2634
MINI Challenge	2/2480	Pro Tune Europe	3/3653	Spax Suspension	3A/E881	TXT	2/2394
Mission Motorsport	3A/W430	Proflex Advanced Technology UK Ltd	3A/E350	Specialty Fasteners & Components Ltd	3A/E562	UKi Media & Events	3A/E240
MK2 Wings	3A/W650	Projex Design	4/4430	Speed Ministry Ltd	4/4650	University of Hertfordshire	3/3214
MME Motorsport	3/3234	PTSD 999	3/3155	Sport Tec	3A/W410	University of Wolverhampton	3/3120
Monogram	2/2780	Quantum Tuning	3A/E880	SST Technology/Lentus Composites	3A/E482	Urban/Nero/Yiannimize	4/4610
Morris Lubricants	2/2352	Questmead Ltd/Mintex	3/3442	Stafford Driving Centre	2/2593	Urban/Nero/Yiannimize	4/4625
Motec Europe Ltd	3A/E637	RaceandRally.com	3/3520	Stand 21 UK	2/2384	V-Tech Dynamometers	3A/E500
MotoDirect Ltd	2/2354	Race Engine Technology	3A/E616	Steel Seal UK T/A Automotive Brands	2/2771	V2 Sport	2/2862
Motor Sport	4/4050	Race Tech	3/3770	Super B	3A/E774	VAC Motorsports	3A/E310
Motordrive	2/2645	Race Technology	2/2690	Super One	3/3610	Vagabond Wear	4/4700
Motorious	4/4310	Racecar Engineering Magazine	3A/E405	Supertech	3A/E360	Vantage 97 Outlet	1/1662
MotorsportDays.com	2/2691	Racelogic	2/2770	Surf & Turf Instant Shelters	2/2740	Vanworx	4/4140
Motorsport Electronics	3A/E635	Raceparts	3A/E734	Swanflight.com	2/2464	Venvil Design	3A/W725
Motorsport Images	1/1120	Raceworld	2/2820	Swift Group Limited	2/2440	Vintage Metal Signs	3A/W804
Motorsport Industry Association	3/3030	Racing Aces	1/1475	SXS Racing	3/3740	Viraver Technology SRL	3A/E611
Motorsport Live	3/3370	Racing Line Ltd	1/1350	Symdeck	1/1486	Vision Plus	3A/W570
Motorsport UK	1/1554	Rally Design	3/3752	System Store Solutions Ltd	3A/E654	Vital Equipment	3/3570
motorsporttrophies.co.uk	3/3541	Rally4Wales	3/3510	Syvecs Ltd	3A/E617	VP Racing Fuels Inc	2/2787
Motorvehicle University of Emilia-Romagna	3/3115	Random Imports	3A/W880	Talk Shop	3/3310	W Series Limited	1/1144
Motul - Witham Motorsport	3/3672	Randstad Ltd	3/3560	Tarox	4/4710	WT Author Watches	2/2824
Movaltec - PSI - CV	3A/E414	Ravenol UK	3/3640	TE Connectivity	3A/E621	Walker Motorsport	3A/W500
MRF Limited	1/1240	Reis Motorsport Insurance	1/1551	Team Dynamics	1/1460	Wave trac	3A/E630
Mylaps Sports Timing	2/2786	Renapur	3/3853	Team HARD	2/2470	Weatherweave	3/3630
NASCAR	1/1340	Renault Sport Club	4/4170	Team Whittingham - Tractor Pulling	3A/W180	Westfield Sportscars	2/2530
National Autograss Sports Association	3A/W480	Repack-S	3A/E612	TecMate International SA/NV	3A/E770	Westwood Cylinder Liners	3A/E452
National Motorsport Academy	1/1280a	RetroArtz	3A/W840	Tegiwa Imports	2/2390	Willans	3A/E764
Newman Cams	3A/E372	Reverie Ltd	3/3446	Teknofibra	3A/E763	Wilwood Brakes -	
NGK Spark Plugs (UK) Ltd	1/1454	Revive	3/3530	Texense/Renvale	3A/E280	Blackline Traction Systems	3/3754
Nicky Grist Motorsports/Stilo SRL	1/1462	Reycar Remolques Y Carrocerias SI	4/4149	The Allendale Group	2/2620	Wiseco	3A/E512
NPL Rally Hire & Preparation	3/3330	RJF American Motorhomes	3/3160	The Awning Company	3/3620	Woodford Trailers	3/3764
OBP Motorsport	3/3254b	RM Toys Ltd	4/4924	The British Truck Racing Association Championship	3/3650	Working for Wildlife	3A/W623
OBP Special Ops	3/3254a	Road 2 Race	2/2845	The Cannon Run Ltd	4/4630	WRC	3/3350
Ohlins	1/1450	Rob-Co Tooling	4/4915	The Chocolate Fondue Company	3A/W765	Wrights Auto Supplies	2/2826
Okulan	1/1638	Robert Bosch Ltd	3A/E754	The Events House	1/1072	www.SimpsonRacing.co.uk	2/2346
Okulan Sensitive Cleaner	3/3854	Robin Read Racing	3A/E130	The Jim Clark Trust	4/4022	XITE	4/4560
Omex Technology	3/3540	Roger Albert Clark Rally	3/3725	The Nicoman Ltd	2/2860	Xona Rotor UK	3/3253
OMP Racing SRL	3A/E686	Rose Plastic UK Ltd	3A/E641	The Performance Company	4/4520	Xpel Ltd	4/4830
OPEN MIND Technologies UK Ltd	3A/E210	Rottler Manufacturing LLC	3A/E180	The Product Showcase	3A/E10	Xtrac Ltd	3A/E710
Optimax Image Inspection & Measurement Ltd	3A/E370	Royal Air Force Engineering	3/3122	Think Automotive Ltd	3A/E720	Xtreme Clutch	4/4450b
Optimum G	3A/E340	Ruroc	2/2781	Three Sisters Race Circuit	2/2835	Yamazaki Mazak UK Ltd	3/3170
Oxford Brookes University	3A/E772	Sadev	3/3655	Thyssenkrupp Bilstein Tuning GmbH	1/1360	YCW Suspension/Swift Springs	2/2392
PDP Masters of the Airbrush	1/1660	Safety Devices International Ltd	3A/E780	Tillett Racing Seats	2/2744	Yokohama HPT Ltd	1/1452
Perfect Bore Manufacturing Ltd	3A/E121	Samco Sport	3A/E804	Tilton Engineering Inc	3A/E440	Young Calibration Ltd	3A/E542
Performance Automotive Aftermarket Association	4/E870	Samsonas Motorsport	3A/E730	Titan	3/3150	Zamp Helmets	3/3709
		Santa Pod Raceway	2/2680	Titan Motorsports	3A/E800	Zeitronix Inc	3A/E624
		Schroth Racing	2/2761	Top End Power	3A/E560	ZF Race Engineering GmbH	3A/E790
		SCS Delta	3A/E572			Zircotec	3A/E488

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CELEBRATING THREE DECADES OF WINNERS

After helping to crown 30 McLaren Autosport BRDC Award winners, the famous Formula 1 team will no longer be involved, but it has left a fine legacy

KEVIN TURNER

PHOTOGRAPHY  **motorsport**
IMAGES



1989 DAVID COULTHARD

OTHER FINALISTS Everyone and no-one! (selected for Award without tests)

He says: "I'd done my first year in Formula Ford, entered 32 races and won 22 I think. It was a great first year and I'd already been to see Jackie Stewart about doing Formula Vauxhall Lotus in 1990."

"I was at the Autosport Awards and when they started talking about the new award I thought they were talking about Allan McNish. When they mentioned my name it was a big surprise."

"It was all about the chance to test an F1 car [below]. I got to find out that it was only a car, just a bloody quick one. The Award got me in front of Ron Dennis, got me down to McLaren, and I met a lot of the guys I ended up working with later."

"There's no question it makes a difference. I don't have many trophies at my Monaco apartment, but I have the McLaren Autosport BRDC Award, which was given to me years later. That shows my affection for what the Award meant to me."

WHAT HAPPENED NEXT Made it all the way to F1, winning 13 GPs and finishing as title runner-up in 2001 with McLaren



For 30 years, the McLaren Autosport BRDC Award has searched for the next British Formula 1 star. McLaren will no longer be part of the Award from 2019, so now is the right time to look back at the past three decades with the winners.

Autosport's Peter Foubister and then-McLaren boss Ron Dennis introduced the Award in 1989. David Coulthard was the inaugural victor and since then winners have racked up more than 600 F1 starts, an F1 world title, a World Endurance crown, three DTM titles and three Indianapolis 500 wins, to name just some of the headline-grabbing successes.

From the start a key part of the prize was a test in a McLaren F1 car, giving young talents their first taste of the pinnacle of the sport. Over the years McLaren has also been involved in other parts of the process, from conducting fitness tests to providing data analysis.

The Award's new partner will be announced very soon, but before then Autosport and the British Racing Drivers' Club would like to thank McLaren for its incredible commitment over such a long period.

Here is our celebration of the 30 winners.

1990 GARETH REES

OTHER FINALISTS Philip Bate, Steve Brogan, David Cuff, Shaun Nicholson, James Rhodes

He says: "The driving assessments involved a few laps in a saloon car with one of the judges – Mika Hakkinen in my case – then driving a car from the formula above that in which you had competed that season, which for me meant the Vauxhall Lotus. It couldn't have gone any better and my quickest time would have put me comfortably on pole for the previous weekend's British Vauxhall Lotus race, so a last-minute decision was made to put me in Mika's F3 car. There wasn't time to fit me in properly, which wasn't ideal as I'm significantly shorter than Mika. Wedged in with foam, struggling to reach the pedals properly, barely able to see over the screen and with dusk descending, I set off down the pitlane for my first drive in an F3 car. I was never going to set pole times in those circumstances but it was a great experience to work with the reigning British F3 champion driver and team, and to drive the championship-winning car.

"Although the identity of the winner is kept secret, I did have a couple of indications that gave me cause to feel optimistic. Firstly, at the McLaren factory they had presented awards to the winners of the physical and driving assessments and I had won both, so I figured it would be a bit odd to win both of those but not the overall award! Secondly, in the reception before dinner, the film director responsible for the evening's coverage pulled me to one side to tell me where the cameras would be when I went up to collect the Award!

"There is absolutely no doubt that winning helped my career enormously. McLaren was the top F1 team at that time and being endorsed by them and Autosport was invaluable, giving my profile and credibility a huge and sustained boost. The relationship I enjoyed with McLaren through most of the 1990s provided me with great experience, not only in the F1 car but also in learning how to work within a large organisation, receiving assistance with marketing and sponsorship advice and much more. I am proud to have won it and I am grateful for the opportunities and experiences it provided."

WHAT HAPPENED NEXT Won the 1994 Marlboro Masters F3 and '96 British Formula 2 title before running out of funds and becoming a motorsport commentator



1991 OLIVER GAVIN

OTHER FINALISTS Dario Franchitti, Jonathan McGall, Dino Morelli, Guy Smith, Jamie Spence

He says: "I secretly had a Class B Formula 3 test a couple of weeks beforehand to try and get an idea – I know the other guys did something similar. The test was at Donington Park and the focus was on the single-seater. I nearly crashed the F3 car on the first lap down the Craner Curves, completely sideways. It really caught me out and I thought it was all over, but I managed to gather it together.

"On the Awards night the nerves were unbearable. One of the things I learned from it was how to deal with my nerves – I'd never been up for anything that big before and it was awarded by Ayrton Senna, my hero. Winning it was one of the biggest things that's happened in my career.

"The F1 test was at the end of 1993 at Silverstone, on the National circuit in the cold and rain. Steve Hallam was running the test and he got a huge manual out on how to drive the car – it was page after page because it was the active car with all the technology, including traction control. I was in complete overload on page one!

"I don't think I got anywhere near the limit of the car. I was so scared I was going to hurt the car, I was out of my depth. It was still a big day, but winning the Award was the big thing for me. The kudos that came with it and the doors it opened were really important and I still get asked about it now."

WHAT HAPPENED NEXT Won the 1995 British F3 title, then forged a GT career with Corvette Racing, taking five class wins at Le Mans



1992 DARIO FRANCHITTI

OTHER FINALISTS Paul Evans, Ralph Firman, Jonny Kane, Martin O'Connell, Brian Saunders

He says: "It was my second turn so I'd been through the disappointment of not having my name called out at the Autosport Awards. I knew I had to lay it on the line – almost drive over the limit.

"Michael Andretti presented me with the Award and it was an incredible feeling, to turn around and face the room. I felt on top of the world. The money – I won £20,000 – came in incredibly handy and it all came into focus when Norbert Haug phoned Autosport to ask who Mercedes should be looking at. They said Oliver Gavin and myself. That really opened the door to my DTM drive.

"My F1 test was the day after the 1995 Autosport Awards, so there was no partying that night! I flew to Jerez and got a half-day. Everything about it was amazing. It was a huge opportunity and I think it helped me with going to America."

WHAT HAPPENED NEXT Moved to the US after a spell in the DTM, winning three Indianapolis 500s and four IndyCar crowns

1993 RALPH FIRMAN

OTHER FINALISTS Darren Malkin, Darren Manning, James Matthews, Guy Smith, Jamie Spence
WHAT HAPPENED NEXT Was the 1996 British F3 champion and 2002 Formula Nippon title winner. Made it to F1 with Jordan, then won the '07 Super GT title



1994 JAMIE DAVIES

OTHER FINALISTS Alex Deighton, Peter Dumbreck, Jonny Kane, James Matthews, Richard Westbrook

He says: "My test was funny because we ended up doing a secret test after the assessment days and before they chose the winner. I think the team that supplied the Formula Vauxhall Lotus had run one of the drivers, so me and Richard Westbrook were invited back to do a separate FVL test with Paul Stewart Racing at Silverstone."

"The Award is a fantastic thing to win – the prestige and the BRDC membership. To be part of that heritage, you can't buy your way into it. Winning definitely helped in terms of getting my name out there, though getting a drive for the next year was still down to me and my family. But it makes you hot property – there were a lot of calls offering to test – and it gives you a confidence boost."

"My F1 run was in December 1995 at Jerez. I'd never driven anything more powerful than an F3 car and never driven at Jerez, but it went really, really well. From the first lap to my last [20th], every lap was quicker than the previous one. Lap time-wise I think I was a tenth quicker than Dario Franchitti, who had spent more time in the car earlier in the week."

WHAT HAPPENED NEXT Got as far as F3000 before switching to sportscars, becoming the 2004 Le Mans Endurance champion



1995 JONNY KANE

OTHER FINALISTS

Wayne Douglas, Marc Hynes, Kevin McGarrity, Guy Smith, Justin Wilson

WHAT HAPPENED NEXT

After winning the 1997 British F3 crown, he made a career in sportscars and won LMP2 in the 2010 Le Mans 24 Hours

1996 DARREN TURNER

OTHER FINALISTS David Cook, Peter Dumbreck, Darren Malkin, Tim Mullen, Dan Wheldon

He says: "I don't think anyone had won from Formula Renault so I didn't think I'd win – it was one of those perceptions that people get sometimes. That may have helped because I just went there to try and enjoy the driving and the Awards night. I had one little spin, but

other than that it was a couple of fantastic days. When they announced my name it was a bit of a blur. I partied hard that night."

"The F1 test was a big jump. I'd raced in Formula Renault and done a couple of F3 tests. I screwed up the out-lap – I went off at Vale. But I loved it and by the end of the third run I was fairly comfortable in the car. I only did three laps on the final run and I came in because I wasn't going to go any quicker and my head was on my shoulder. It was, 'Wow, these things are physical.' It was the start of a relationship with McLaren that lasted until 2006. McLaren was also instrumental in my Mercedes DTM drive."

"I think for everyone who wins it the Award is a game-changer. Without the Award I reckon I'd have cobbled enough together to do one more year of racing. It gave me a big stepping stone to being a professional racing driver."

"As a judge, it's very exciting to see the next generation coming through. We've seen a number at Base Simulators [as part of the Award tests] over the years and George Russell is one of those that stood out – he had that spark and he got in the sim and blew it away. What's interesting is how polished the current generation of drivers is. They're so professional at such an early age."

WHAT HAPPENED NEXT Became an Aston Martin factory driver in 2005 and remains so, having taken three Le Mans 24 Hours GT category wins



1997 ANDREW KIRKALDY

OTHER FINALISTS

Matt Davies, Marc Hynes, Leighton Walker, Dan Wheldon, Adam Wilcox

WHAT HAPPENED NEXT

Reached F3 before successfully switching to GT competition, first as a driver and then a team boss

A SPECIAL PLACE IN MOTORSPORT



A JUDGE'S REFLECTIONS ON THE AWARD

It's a salutary thought that the last five winners of the Award had not been born when I was first asked to be one of the judges, back in 1995. This was the year after the British Racing Drivers' Club, at the instigation of the then-club secretary John Fitzpatrick, had joined McLaren and Autosport as the Award's stakeholders. Already by then, just six years after its launch, the Award had established itself as an important goal to which every young British driver aspired.

The involvement of the BRDC had one immediate financial benefit in that the cash prize doubled to £50,000. Back then, this was a very worthwhile contribution to the budget required for the next step up the ladder. Until recently the prize increased to £100,000 but has since been replaced by benefits in kind.

The BRDC involvement also meant that the on-track assessment days could find a home on the Silverstone Grand Prix circuit where they have remained ever since, apart from a four-year exile at Snetterton from 2005 to '08 when Jonathan Palmer took on the management of the Award. MotorSport Vision's managing director has been a major supporter of the Award from the outset, most notably since '10 by making available the required number of MSV Formula 2 cars, all prepared to MSV's exacting standards. In the earliest days the test cars were a couple of Formula Vauxhall Lotus and later F3 cars, which had to be shared around. Now, each finalist has his own car with more power than they will have experienced to that point.

The stated aim of the Award has always been to find the next British F1 driver, so the principal focus has been on a driver's performance in the single-seater. However, the other cars play an important role in showing versatility and, as has happened in several cases, catching the eye of the likes of McLaren or Mercedes. For many years one of the top British Touring Car teams (WSR, Dynamics, Nissan) provided a car or two complete with one of its regular drivers. This produced one of the legendary performances of the Award in 1998 when Jenson Button started lapping a Nissan Primera as quickly as its regular driver, the late David Leslie, on a saturated track, their times five seconds faster than any other finalist's.

At the moment the UK appears to be on the crest of a wave, with both George Russell and Lando Norris about to make the move into F1, while Dan Ticktum is knocking on the door.

IAN TITCHMARSH, FORMER BRDC DIRECTOR

1998 JENSON BUTTON

OTHER FINALISTS

Doug Bell, Matt Davies, Robbie Kerr, James Pickford, Justin Wilson

WHAT HAPPENED NEXT

Was in F1 just over a year after winning the Award, became world champion in 2009 and scored 15 GP wins





1999 GARY PAFFETT

OTHER FINALISTS

Westley Barber, Ryan Dalziel, Richard Lyons, Craig Murray, Leighton Walker

WHAT HAPPENED NEXT

Never quite made it to F1 despite becoming McLaren's test driver, but is a DTM ace and has won the title twice

2000 ANTHONY DAVIDSON

OTHER FINALISTS Ryan Dalziel, Matt Gilmore, Derek Hayes, Robbie Kerr, Mark Taylor

He says: "Winning the McLaren Autosport BRDC Award is a special moment. It marks you as a driver to look out for in the future, and also helps to highlight your current achievements. I'll never forget nervously stepping onto the stage to become the 12th person to win it with what felt like the world of motorsport looking on."

"Prior to that moment, all of the finalists had to endure a rigorous series of tests with an experienced panel of judges looking into every detail both on and off the track. After being one of the judges a few years on it made me realise what a responsibility it is from their side too!"

"I certainly hold this achievement in high regard. The trophy still proudly sits on the top shelf along with only a select few, because without it I'm not sure the others would be there at all."

WHAT HAPPENED NEXT Got to F1, but didn't get his hands on frontrunning machinery. Forged a sportscar career, becoming 2014 World Endurance champion



2001 STEVEN KANE

OTHER FINALISTS

Carl Breeze, Matt Gilmore, Robbie Kerr, Simon Pullan, Danny Watts

WHAT HAPPENED NEXT

Got as far as FR3.5 before switching to sportscars and touring cars, and is now a factory Bentley GT driver



2002 JAMIE GREEN

OTHER FINALISTS Westley Barber, Adam Carroll, Dan Eagling, Christian England, Danny Watts

He says: "I'd done one year of car racing, in Formula Renault UK, so things were moving pretty quickly and there I was jumping into a DTM Mercedes, which I'd never really heard of. The power of that really stood out, the F3 car had lots of downforce, and it's the only time I've driven a front-wheel-drive touring car, WSR's British Touring Car MG."

"After driving the F3 and DTM, during my first run in the MG I was off the track at Copse every lap. It was the only car with no real downforce so I was over the limit. The second run was better and I think I did a pretty decent lap time."

"I thought my biggest challenge was getting up to speed in the F3 car against people like Adam Carroll, who had done F3. I didn't think I did as well on new tyres in the F3, but I did well on old tyres and in the other cars, and I was quietly confident on the Awards night."

"When they called out my name I remember this feeling of, 'Yes, I was right, I'm good enough.' It added to my career momentum. After the DTM test, HWA called and asked if I wanted to come and drive an F3 car at Hockenheim. That's what led to the DTM a couple of years later."

"I got my McLaren F1 test at the end of 2004. It was quite a long wait, but that was good as I'd done Euro F3 and some days in McLaren's F1 simulator. It was a shame it was on the Silverstone National circuit instead of the GP track, but the car was incredible. What struck me was how effortless it felt to go quickly. It had lots of power, lots of grip, lots of everything. Every lap you could carry more speed into Copse. Lewis Hamilton and Alex Lloyd tested the same day and I was pretty happy with my lap times."

WHAT HAPPENED NEXT Beat Lewis Hamilton, Nico Rosberg and Robert Kubica to 2004 F3 Euro Series crown, then switched to the DTM and has so far scored 16 wins, driving for Mercedes and Audi

2003 ALEX LLOYD

OTHER FINALISTS Ben Clucas, Tom Kimber-Smith, James Rossiter, Ryan Sharp, Susie Stoddart

He says: "It was surreal being 'the big winner of the night' when you're alongside so many motorsport greats. Winning was the most special achievement of my career because it required so many elements — being fast and consistent in multiple types of machinery, providing exemplary feedback in terms of how those cars behaved and how to make them faster, being commercially viable for sponsors, and so much more. You needed the whole package, and getting the nod from such esteemed judges gave me a wealth of confidence moving forward."

"The standout moment at the test for me was driving the Mercedes DTM. While the car wasn't overly powerful, it did things no machine with a roof should be able to."

"For my F1 test, I was incredibly lucky that it was dry at Silverstone in December. I really wanted to experience the car on slicks. To this day, it was the most incredible experience I've had at the wheel of a race car; you just can't explain how fast those machines are — and back then it was the high-revving V10 monsters."

"When I moved to America in 2006 the Award gave me enormous credibility. It means something in every corner of the motorsport world. It was essentially the reason I even made it to IndyCar in the first place. I had no sponsorship for '04, and the Award prize fund enabled me to race a part-season in European F3000. That was the last bit of budget I had as a driver, and winning races in F3000 was enough to prove myself and gain all future drives based on ability and results rather than dollars."

WHAT HAPPENED NEXT Won the 2007 Indy Lights title and made 27 IndyCar starts between 2008 and '11



2004 PAUL DI RESTA

OTHER FINALISTS Tim Bridgman, Mike Conway, Jonathan Kennard, Scott Mansell, Susie Stoddart

He says: "I'd just signed a contract with Mercedes before the tests and you got to drive some mean machines when you're young. I knew what the DTM was about, but driving it was something else. It was the highlight and Mercedes was very happy with how I got on."

"The biggest thing at the time was that you got a guaranteed F1 test, plus the prestige of the Award. And it wasn't just an F1 test, it was with McLaren. The prize money was a great help to me for the following year too. It got you into the BRDC, into McLaren, and talking to people at the top of British motorsport."

"When I came back with Mercedes to shake down the DTM Mercedes for the finalists it was all about seeing the young drivers, like George Russell. It just shows what the Award is all about and shows the amount of British talent."

WHAT HAPPENED NEXT Was Euro F3 and DTM champion before making it to F1, twice scoring a best finish of fourth. Recently returned to the DTM with Mercedes



2005 OLIVER JARVIS

OTHER FINALISTS Sam Bird, Joey Foster, James Jakes, Joe Tandy, Duncan Tappy

He says: "That year was a pivotal point in my career. I had set myself the goal of winning the Formula Renault UK Championship and the McLaren Autosport BRDC Award. I was very aware that without winning both it would probably have been the end of my career as we simply didn't have the funding to make the next step."

"The tests were held at Snetterton and it was freezing. I remember that we didn't run tyre warmers on the Formula Renault 3.5, and leaving the pits for the first time the rear wheels were spinning all the way through until fourth gear. That was an immediate shock to the system! That year that particular car caught several drivers out as conditions were cold and the track was damp at times."

"It is such a surreal day as you get to drive all these amazing cars but you are also so aware that every detail of what you do is being analysed. It's so important that you go out and impress on track, but at the same time the smallest of mistakes in difficult conditions could be the end of your chance of winning."

"The moment I heard my name was so emotional as I was sat there with my family. I can't emphasise how important it was to all of us because of how much effort and sacrifice had gone in to giving me the opportunities to get to this point in my career. I have no idea what I said once on stage, but to be up there and presented the award by Sir Stirling Moss and in front of all my peers was such a magical and career-defining moment."

"The F1 test was simply awesome. I will never forget the acceleration of the car as I pulled out of the pitlane, from first gear to seventh in what seemed like a few hundred metres. Then the braking and all-round grip was phenomenal – it was amazing how well-balanced and how at home I felt in the car."

"Without the McLaren Autosport BRDC Award I'm not sure I would still be racing today. Winning it not only put me in demand for F3 but also without the prize money it wouldn't have been possible to finance it. Aside from that it also put my name on people's radar and this led to the opportunity to race in Japan as a paid driver in 2007 and, later on, I believe to race for Audi in the DTM."

WHAT HAPPENED NEXT Became a winner in A1GP and Super GT, then in the WEC with Audi. Now part of Joest Mazda IMSA squad racing in the United States



GIBSON

2006 OLIVER TURVEY

OTHER FINALISTS

Jon Barnes, Sam Bird, Nathan Freke, Jeremy Metcalfe, Oliver Oakes

He says: "With the famous list of previous winners, winning the Award really gave me a massive boost and recognition within motorsport that has allowed me to progress to where I am today. Before the Award, I had always struggled for budget, so I felt it gave me an opportunity to show my talent in the same cars."

"Despite studying at Cambridge University at the time, I prepared very hard for the test, as I knew it was an extremely big opportunity that I wanted to grab with both hands. The test was an amazing experience, driving three fantastic cars and visiting the McLaren Technology Centre for the first time."

"Driving the McLaren F1 car for the first time was phenomenal; the speed, downforce, braking



SPINNEY

was unlike any other car I had driven up to that point and a memory that will stay with me forever. That prize test with McLaren led to the team signing me as one of their test drivers, a role I am still doing today."

WHAT HAPPENED NEXT

Got as far as GP2 before making a successful switch to sportscars. Currently competes in Formula E with NIO



STALEY

2007 STEFAN WILSON

OTHER FINALISTS Henry Arundel, Callum Macleod, Dean Smith, Nick Tandy, Duncan Tappy

He says: "The whole assessment is ingrained in my memory. Everything about it was incredible. I'd only done a year out of karts so some of the machinery, such as the Formula Renault 3.5, was surreal. I think what won me the Award was being able to adapt to the cars so quickly."

"The best memory was the DTM Mercedes. The weather was changing all the time and the way it worked out my DTM run was bone dry. To experience the car and the professionalism of the team was amazing."

"There were two large accidents in the FR3.5, so Duncan Tappy and I had to stay an extra day so they could rebuild one car out of the two. I was 18 and I was nervous – I'd seen what could happen. Duncan went before me and by the time it was my turn it was close to dusk, really cold and dark. I think that's what won me the Award too: despite all that, I pushed the car and didn't make any mistakes."

"I had such a great experience, but I still didn't know which way it was going to go. I didn't even hear them call my name – I just felt a hand on my shoulder. It was my older brother Justin."

"It was difficult to get me into the F1 car because of my 6ft3 frame. I think we spent two or three days at the McLaren Technology Centre. I was looking pretty glum, but one of the guys came over and said, 'Don't worry, we've never not been able to get a driver in... Actually, there was one guy. I think his name was Wilson.' It was Justin so that didn't fill me with confidence! In the end they made a new steering column, so McLaren did an amazing job to get me in."

"The F1 test was in the pouring rain. I was pretty nervous about that too. It was wheelspinning in fifth gear on the National straight and there was a lot of standing water. There were some hairy moments."

WHAT HAPPENED NEXT Followed brother Justin to the United States and has so far made two Indianapolis 500 starts

2008 ALEXANDER SIMS

OTHER FINALISTS Wayne Boyd, Adam Christodoulou, Jason Moore, Aaron Steele, Dean Stoneman

He says: "The Award is still the most incredible experience that I have had in motorsport. I remember driving to Snetterton and stopping at a carwash on the A14 as I wanted to make sure there wasn't a 'bad mark' against me in even the cleanliness of my car!

"I vividly remember asking the DTM head engineer about the gear usage in the DTM car and he just replied with, 'You tell me after the session.' That was an incredible moment and I remember feeling a rush of responsibility. I'd never driven carbon brakes or with tyre warmers, I had to get on it in 10 laps on a damp track knowing I was being judged, and I didn't even know which gears to use! Obviously you work it out pretty damn quickly but that feeling of anticipation when I was in the pits waiting to go was immense.

"After the first run I remember coming in for a set of new tyres and going again. On lap four of the run the onboard camera mount broke and it was flying around the passenger side of the cockpit and I pondered whether I should come in or not, but quickly thought the tyres wouldn't work as well again so I'd lose a chance and so cracked on.

"As well as the DTM there was an Aston Martin GT4 and the Carlin-run F3 car. I really enjoyed both of them. I think I only drove the Aston in the wet and, with the ABS it had, I think it was very much a road-car system. I remember realising that pressing the pedal too hard meant the ABS could handle it so I quickly learnt to initiate the ABS but then release the brake slightly to allow the ABS to be less active and thus slow down quicker.

"The F3 car was actually a relatively normal car for me as I'd done Formula Renault for the two years previous. That went well except I realised on my last lap that I wasn't going to improve and so just pitted, and I remember [judge] Ian Titchmarsh not being happy that I didn't complete the run. I just hadn't seen any point in it as I was going slower but he felt I should have done the run as prescribed. My engineer came up with a lovely story in support of me saying that they would often tell their drivers to do that to reduce engine and tyre miles. I couldn't say at the time but I really appreciated that.

"The F1 test was quite surreal and is by far the fastest car I have ever driven. My standout memory was leaving the pits and accelerating on the first straight and assuming that I would hit the pedal stop, but it kept going further and further away from me and the power kept increasing. It was fabulous and really great of McLaren to take it so seriously and give a true experience in every sense.

"Now that I have been a judge for the past two years, it has made me aware of two things that others might not appreciate. Firstly, it's shown me how open and honest the entire process is – the best and fastest driver wins. There are never any politics involved in the decision process – we look at the hard facts of all the drivers' fitness, simulator skills, race runs, new-tyre qualifying runs, adaptability between cars, work ethic etc. The raw pace has a slightly higher weighting as that is the fundamental skill we are looking at, but it's no good being good at something if you don't also work hard at it.

"Secondly it has alerted me to how much the Award relies on the goodness of many different organisations to pool their resources together and make it happen. No-one is doing it to make money – everyone gives so much time and resource that it makes me proud of what is achieved each year from all involved."

WHAT HAPPENED NEXT Won races at F3 and GP3 level, switched to GTs – winning the 2016 Spa 24 Hours – and is currently in Formula E with BMW



2009 DEAN SMITH

OTHER FINALISTS

James Calado, Adam Christodoulou, James Cole, Callum Macleod, Chrissy Palmer

WHAT HAPPENED NEXT

Made it as far as GP3, where he was a podium finisher, before falling out of the sport



2010 LEWIS WILLIAMSON

OTHER FINALISTS Luciano Bacheta, Tom Blomqvist, Jack Harvey, Scott Malvern, Nigel Moore

He says: "The standout moment was getting acknowledged by being picked for the shootout. I hadn't won the Formula Renault UK title and I was delighted to get a crack at the other five drivers. I enjoyed the whole process, including going to the McLaren factory and speaking to the judges.

"After winning, a lot of doors opened and I had the reassurance that I was doing the right things and could be a professional racing driver. It also confirmed you have to be yourself – as long as you try hard and do your best people respect that. All the drivers are good and have performed at a high level – it comes down to how you handle the pressure. As you go up the ladder in motorsport the pressure increases so it's a good way of seeing who has got what it takes.

"For the F1 prize test the following year I was out on the same day as the 2011 finalists were having their tests. It wasn't so much the speed, it was more the braking capability. In other cars I had my braking points at Silverstone, but in the F1 car you're going 50mph faster and brake 50 metres later. That was a big step and I don't even know where the limit was."

WHAT HAPPENED NEXT Became a winner in GP3, but suffered misfortune in Formula Renault 3.5. Now races in GT3 with Strakka

2011 OLIVER ROWLAND

OTHER FINALISTS

Emil Bernstorff, Tom Blomqvist, Alex Lynn, Scott Malvern, Dino Zamparelli

He says: “You’ve got the pressure of having to perform, not crash, and impress the judges. You’ve got to give it your all and not leave anything on the table. The pressure was probably the most enjoyable part of it. It was my first year in single-seaters so it was a little unexpected so I just went there to enjoy myself.

“The Awards night seemed to drag on for ages – it felt like there were 400 awards before mine! But I was satisfied with the job I’d done.

“I’d dreamed of driving an F1 car since I was young so the McLaren test was fantastic. They ask you to take care of the car, but it’s a rare opportunity so I gave it everything I could.

“Even now people mention it as one of the big things on my CV. You make new contacts and the whole prestige of the Award is massive. After winning the Award one of the biggest differences was the support of Derek Warwick. He took me on as his own and taught me a huge amount. It was clear at the time I needed some discipline and he taught me this. He made me into a better person and really showed me the definition of true hard work and dedication. I will be forever grateful for his time and effort during those days.”

WHAT HAPPENED NEXT Won the 2015 Formula Renault 3.5 crown and became Williams F1’s 2018 junior driver. Now in Formula E with Nissan



2012 JAKE DENNIS

OTHER FINALISTS Jack Hawksworth, Josh Hill, Jordan King, Melville McKee, Josh Webster

WHAT HAPPENED NEXT Switched to endurance racing after winning in Euro F3 and was a winner in Blancpain Endurance in 2018 with R-Motorsport



2013 MATT PARRY

OTHER FINALISTS Jack Aitken, Jake Hughes, Chris Middlehurst, Seb Morris, Charlie Robertson

He says: “The one thing I do recall from the night, and seem to relive every year when seeing the finalists awaiting the result, is the complete mix of emotions. You’re there surrounded by friends, family and legends of our sport excited, nervous and scared, thinking, ‘If I do win what on Earth am I going to say?!’ Your name comes up and there’s an immediate sense of relief but then you’re hit with all the prior emotions again... trying to remember, in your speech, to thank all the people that helped you get there. I promise, you really don’t know who has won it until the announcement so preparing for winning isn’t easy.

“The highlight was of course stepping into an F1 car for the first time. Always, when you embark on this journey, your goal is F1 and it lived up to my every expectation. The power, stopping ability and downforce was just fantastic to experience from machinery at the top of our sport.

“Certainly the name and title of being the 25th winner of the McLaren Autosport BRDC Award has opened doors and it still does. However, when I look back it’s the process that helped me the most. It was the first time, during the two-day evaluation event, that I was treated as a professional driver. You weren’t there as a driver bringing finances for the test or the tyres, fuel, race wear etc. You had to follow a strict timetable and drive as fast as you could without making any mistakes. I seemed to turn a corner with that experience, which has stayed with me throughout my subsequent driving career as a professional driver, especially when competing in endurance races such as the Spa 24 Hours.”

WHAT HAPPENED NEXT Took a victory in GP3 before making the move to GT racing in Blancpain



2014 GEORGE RUSSELL

OTHER FINALISTS Alexander Albon, Ben Barnicoat, Sennan Fielding, Seb Morris, Harrison Scott

He says: "The Award was life-changing in my career progress. Just being nominated as the youngest finalist felt like a huge achievement in itself. I'm only starting to realise how incredible what everyone from McLaren, Autosport, the BRDC and Mercedes put on for us is. Getting that opportunity to drive three fantastic cars on one of the world's best circuits was just amazing and the experience we take from that is unparalleled."

"One highlight was jumping into the Mercedes DTM car for the first time. I went around Luffield corner on my opening lap and the car just stuck to the ground. I was lost for words exiting that corner with how much grip the thing had – it felt on another planet compared to everything I had driven before and I'll remember that feeling for a long time."

"On the night of the Awards at Grosvenor House, surprisingly I was fairly relaxed. I think that was because I knew I had given it my best shot and I felt I maximised everything from the preparation, the driving, the feedback etc. So I entered the evening with my head held high. That said, in the closing moments when we were watching the VT to some very tense music, nerves started to rise."

"The moment Steve Rider called my name was one of the best feelings I've ever had in my life. That feeling of accomplishment was enormous and I was extremely humbled to be on the list of Award winners along with some amazing drivers. I had planned a little speech on stage, but I was literally lost for words."

"Driving the McLaren F1 car was such a surreal feeling. It's been my life-long dream to be an F1 world champion, so I felt privileged to get my first taste of an F1 car at 17 years old. At the time, I had no F1 connections and my career seemed to be destined for DTM. Therefore, I thought this might be my first and last opportunity in an F1 car, so I'd best enjoy the moment. I brought my whole family with me – they have been a major part of all of my success so having them standing on the sidelines full of pride was a fantastic moment."

"I remember coming out of the pitlane, taking off the limiter and the car just flew. My face was beaming with a massive smile throughout every lap and that was just a fantastic experience."

WHAT HAPPENED NEXT Swept to GP3 and F2 titles as a rookie and is now set for his F1 debut with Williams



2015 WILL PALMER

OTHER FINALISTS Jack Aitken, Ben Barnicoat, Ricky Collard, Jake Hughes, Toby Sowery

He says: "There were six weeks between the tests and the winner being announced, and the dream of winning the Award was all I could think of. I thought I had a shot as I'd felt really strong in the F2 car, particularly in the final 'qualifying' runs, but with so much going into consideration it was impossible to know how much of a chance I really had."

"To be announced as the winner of such an amazing Award in front of such a prestigious crowd is a moment that I will remember forever, and remains the greatest racing highlight for me. Winning the Award certainly puts you very much on the map, and I took a huge amount of confidence from it. On top of that, the help from the BRDC to the winner is so significant, both in terms of advice and support. A nice moment was Derek Warwick being the first to congratulate me as I got out of the car after winning at Monaco in Formula Renault, a year and a half after handing me the Award!"

"The major highlight though is the McLaren F1 test at Silverstone. So few drivers ever get to drive one, and I feel massively privileged to have been able to do it, particularly at the home of British motorsport with friends and family watching. As a driving experience, that will never be beaten for me – even if I didn't manage to quite take Abbey flat out!"

WHAT HAPPENED NEXT Was runner-up in the 2017 Formula Renault Eurocup, then graduated to GP3

2016 LANDO NORRIS

OTHER FINALISTS Ricky Collard, Sennan Fielding, Toby Sowery

He says: "Winning the McLaren BRDC Autosport Award was one of the proudest moments in my career. I remember being nervous beforehand, but when my name was called out it was an awesome feeling."

"There's nothing better than getting behind the wheel of an F1 car and the Award gave me that first chance. From there I developed a strong relationship with McLaren, training, developing on the sim, which gave me an opportunity to join the junior programme."

"There is no doubt that without the help of the McLaren Autosport BRDC Award, I wouldn't be where I am now."

WHAT HAPPENED NEXT Took Euro F3 crown as a rookie, was then runner-up in F2 and will race for McLaren in F1 this year





2017 DAN TICKTUM

OTHER FINALISTS Enaam Ahmed, Max Fewtrell, Harrison Scott

WHAT HAPPENED NEXT The Red Bull junior took his second Macau GP win in 2018 and will compete in Super Formula in Japan this year

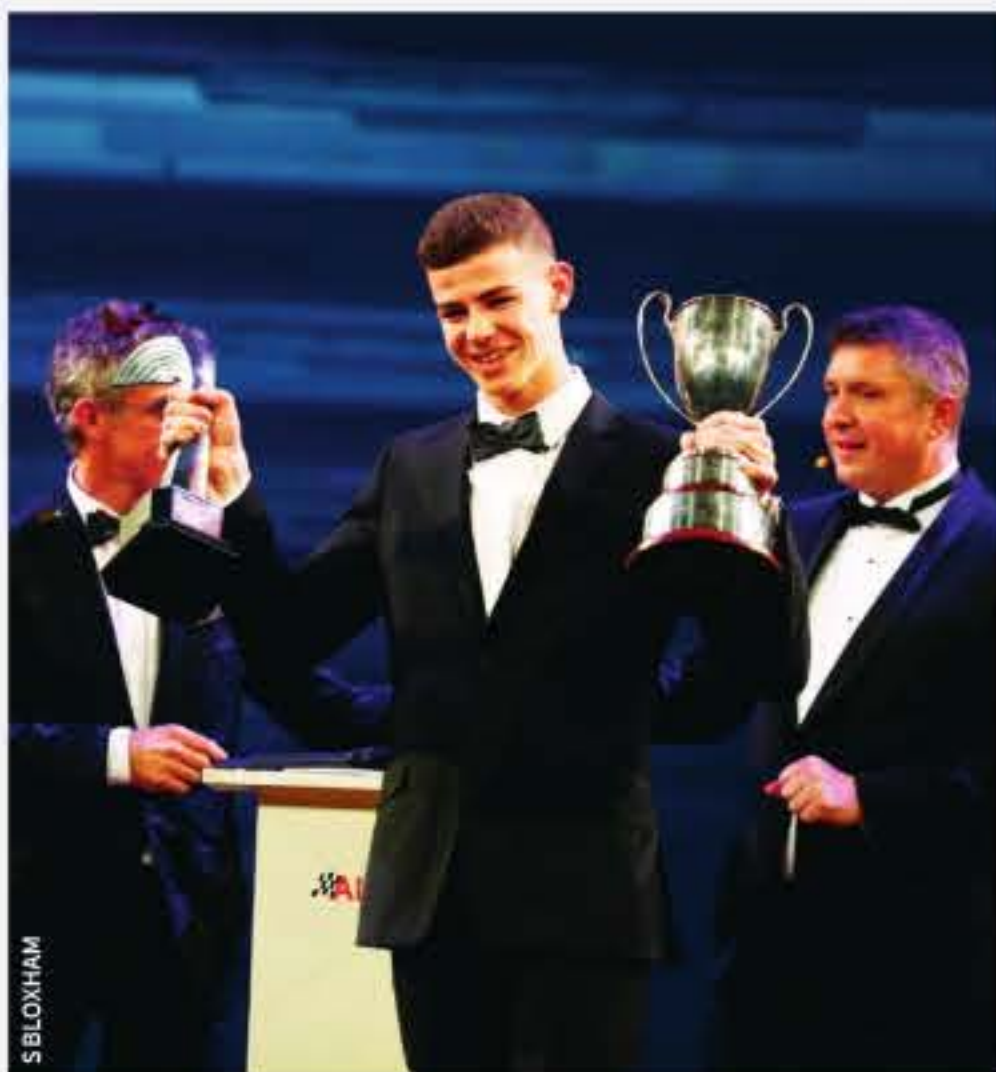
2018 TOM GAMBLE

OTHER FINALISTS Jamie Caroline, Max Fewtrell, Kiern Jewiss

He says: "Winning the McLaren Autosport BRDC Award means so much to me, it's something that every up-and-coming British single-seater driver wants to win and many people have gone on to race in Formula 1, which really shows the Award can lead to great things."

"Ever since I was young I wanted to compete in the Award and it was always my end goal for 2018 to be in the final four, but to be able to win it was incredible. It's also great to pay back everyone around me, like my family, who have shown so much support for me over the years."

"The test at Silverstone was probably two of the best days of my life. To be able to drive three phenomenal cars at one of the best tracks in the world, Silverstone GP, which we had exclusive use of, was amazing! Although they were all amazing to drive, my favourite car was probably the F2 just because of its incredible power and grip and was a real step up from what I was used to. The 10-lap pursuit run at the end was great fun as the tyre degradation was massive, so as a driver you really had to try to manage it and get the most from it."



THE MAN IN CHARGE



DEREK WARWICK ON McLAREN'S CONTRIBUTION

One of the biggest strengths of the McLaren Autosport BRDC Award has been the continued support from so many people. None more so than McLaren, which has been a very special partner at the heart of the Award and helped give it massive credibility. Being able to use the McLaren Technology Centre gives everyone such a boost – you can see it in the finalists when they arrive and take in the amazing history that McLaren has, with the display of world championship cars and trophies.

McLaren has also organised the fitness and simulator testing in some years, along with all the data analysis to help the judges find the winner every year.

The biggest part of winning the Award is getting to drive a Formula 1 car for the first time. Watching the previous year's winner step into the McLaren F1 car, with the following year's finalists and their own family looking on, has been one of the highlights of the year for me. McLaren's commitment to find the next British star has been massive and without them the Award would not be what it is today.

I believe the Award has become one of the most prestigious and important in British motorsport. It has helped so many young drivers achieve their dream to become a professional racing driver.

DEREK WARWICK, CHAIRMAN OF THE JUDGES

"McLAREN HAS BEEN A VERY SPECIAL PARTNER AT THE HEART OF THE AWARD AND HAS HELPED GIVE IT MASSIVE CREDIBILITY"



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MINIS TO REPLACE CLIOS AS BTCC SUPPORT SERIES

MINI CHALLENGE

The Mini Challenge has completed a multi-year deal to take over the vacant slot on the British Touring Car Championship support package from 2020 onwards. The vacancy had been created by the departure

of the Renault UK Clio Cup, which will cease to run after the 2019 season.

BTCC organiser TOCA had been searching for a direct replacement for the Clio Cup to ensure that a suitable tin-top feeder series continues to form part of the race undercard.

Clios not the end for Renault

RENAULT UK CLIO CUP

Renault is already assessing different options for future motorsport activity in the UK after it decided to axe the Clio Cup at the end of this season.

It was confirmed just before Christmas that the popular Clio Cup would not continue beyond 2019. The timing of the series' closure coincides with the planned introduction of the fifth-generation Clio elsewhere. Only the UK series is ceasing; other Clio Cup championships around the world will continue and a new series is being launched in the Middle East.

Although the decision may suggest a scaling-back of race operations, Renault Sport Racing sporting manager Tarik Ait Said has revealed that talks about future projects have already begun.

"In the UK the decision has been taken that it would be best not to continue [the Clio Cup] for 2020," he told Autosport. "It doesn't mean there won't be any motorsport activities in the UK forever. But we had to consider how it would be in 2020.

"We're already working with Renault UK about other things to do. Renault UK has a lot of activity around Formula 1 and there are other activities that may come in 2020 or 2021. We've just started looking at different options."

Ait Said would not be drawn on any of the ideas but recognises the manufacturer's long history in the UK. The Clio Cup series began in 1991 but Renault's one-make history dates back to the '70s with the Renault 5. It also supported the Formula Renault UK series between 1989 and 2011.

STEPHEN LICKORISH



Mini JCWs
swap British GT
for BTCC
support slot

The announcement that the Mini Challenge would join the TOCA package was due to be made at the Autosport International Show at the Birmingham NEC, which opens today (January 10).

The deal secures two Mini races on the undercard of all 10 scheduled BTCC rounds. The top-flight two-litre turbocharged 265bhp JCW Challenge cars will get the lion's share of the fixtures with eight appearances, before the lesser-powered 1.6-litre Cooper Class joins the bill for two rounds.

The JCW Challenge has supported the British GT Championship for the past two seasons. It has also played host to a string of guesting past and current



Clios race into the sunset
for Cup's final season in 2019

BTCC drivers — such as Rob Collard, Paul O'Neill and Matt Neal — in recent years. A number of BTCC teams have branched out into the category, such as Team Dynamics, Eurotech Racing and Power Maxed Racing.

Mini Challenge promoter Anthony Williams said: "The deal to join the TOCA package represents one of the biggest moments in the history of the Mini Challenge and it's certainly something we've been working very hard towards over the last few seasons.

"The JCW is now a proven, purpose-built race car and driver feedback has suggested that it is the closest thing out there to the thrill of driving a full NGTC touring car, making the Challenge an ideal feeder category for the BTCC. Running in support of the UK's biggest circuit racing championship will only strengthen that link.

"The deal is also brilliant news for the Cooper Challenge. Electing to run the JCWs at eight of the 10 rounds helps keep budgets under control, and also gives us

the chance to elevate the Coopers onto the main stage and show the strength of the Mini Challenge at all its levels."

Williams added that his organisation was working towards implementing a discounted entry-fee scheme for any drivers competing in the 2019 season and wishing to make the jump across to the TOCA package for '20.

BTCC chief Alan Gow added: "We've kept an eye on the development of the Mini Challenge over the last few years and it's clear that it's a very popular and competitive championship.

"At TOCA we are keen to showcase not just the British Touring Car Championship, but also the cream of national racing categories to our audiences both at the circuits and on TV. Recent years have certainly shown that the Mini Challenge is an ideal feeder category for drivers aspiring toward a career in the BTCC and I'm sure the championship will be an excellent fit within our 2020 weekends and beyond."



BMW's merged into single grid

BMW CAR CLUB

The 750 Motor Club's M3 Cup and BMW 330 Challenge categories will be amalgamated into the BMW Car Club Racing Championship for 2019.

The two series shared a grid last year but still struggled to get more than 15 entries combined. Now the club has decided that rather than running dedicated championships for these cars, they can move to the popular BMW Car Club series. This has achieved championship status for its second season this year and the regulations have been written to make sure cars

from the other categories can easily be accommodated.

"We're not going to run M3 Cup and 330 Challenge [individually] and instead will focus on running one very strong BMW Car Club Racing Championship," said 750MC competitions secretary Giles Groombridge.

"We have written the regulations in such a way that the M3 Cup cars will have an ideal place in the M2 class. Also the Class 6 is for six-cylinder non-M3-powered cars, and the 330s will be ideally placed to be competitive in that. It makes sense and we hope to have 30-plus-car grids."

STEPHEN LICKORISH



NASCAR prize on offer in new series

EURO PICKUPS

A fully paid drive in the NASCAR Whelen Euro Series is the prize for the winner of a new championship for 2019.

The V6 Euro Pickup Series will feature four-litre, 350bhp machines that were previously used – with Ford Mondeo bodies – in the Benelux Racing League Series. The pickups will be centrally run by Total Motorsport, established by Stephen Young and Hubertus Heyman as a satellite of Racing-Total, which currently runs two cars in the NASCAR Whelen Euro Series.

There will be six race weekends with 27 races across

two venues: the half-mile Venray oval in the Netherlands and the Racepark Meppen road circuit in Germany. A full season will cost €55,000+VAT. The total prize fund is worth more than €175,000, with the champion getting a 2020 NASCAR Whelen Euro Series seat with Racing-Total.

The runner-up will win two race weekends in the same series with the team, while the third-placed driver in the '19 standings will win one race weekend. The top rookie will receive a full day of testing with Racing-Total at one of the current Euro NASCAR tracks.

There will also be a Legends class for drivers over 40. The

Legends champion will win an all-expenses-paid race weekend in the South African V8 Masters Series. A National A licence is required for the new series, though a racing school is available for rookies.

Organisers hope to attract a field of up to 22 drivers.

Sometime NASCAR Xfinity and ex-Formula Palmer Audi racer and 2016 V8 Masters champion Young believes it will help European drivers seeking to make a career in North America.

"This really is the road to NASCAR, the turn-up-and-drive format makes it accessible for everyone from career drivers to amateur racers and everyone in-between," he said. "We have an outstanding and unique prize fund that will help further the careers of European drivers wishing to race in the States."

"We are the only series in mainland Europe that combines oval and road-course racing so we are already attracting interest from some high-profile drivers who want to hone their oval-racing skills, especially after the closure of Rockingham."

Young plans to make further announcements at Autosport International this week.

KEVIN TURNER

Parker gets uprated Bentley

BRITISH GT

Title-winning British GT Championship squad Team Parker Racing will run at least one version of the second-generation Bentley Continental in the category this season, and may expand to two cars.

The team, which won the overall title with Seb Morris and Rick Parfitt in a Bentley Continental in 2017, has taken delivery of the uprated cars from builder M-Sport. It will run one example in the Blancpain GT Series Endurance Cup as well as the domestic campaign. No drivers have yet been signed for the UK assault.

Team boss Stuart Parker said: "We've had a four-year relationship with Bentley and we are delighted to be able to field the new car. I'm impressed with it."

"M-Sport has clearly taken all the lessons it learned from the first generation of the car and improved in those areas. I think it will be a competitive proposition for the season ahead, and we can't wait to hit the circuit."

"We are still talking to drivers, but I think we will have a really strong chance with this new car. It's also the 100th anniversary of Bentley, which will make this a special season."

MATT JAMES



NEW CAYMAN GT4 UNVEILED Porsche has introduced a new version of its Cayman GT4 racer after the original machine struggled to match some of its rivals. The new 718 Cayman GT4 Clubsport model features 40bhp more than its predecessor, which competed unsuccessfully in British GT in 2016 and '17.

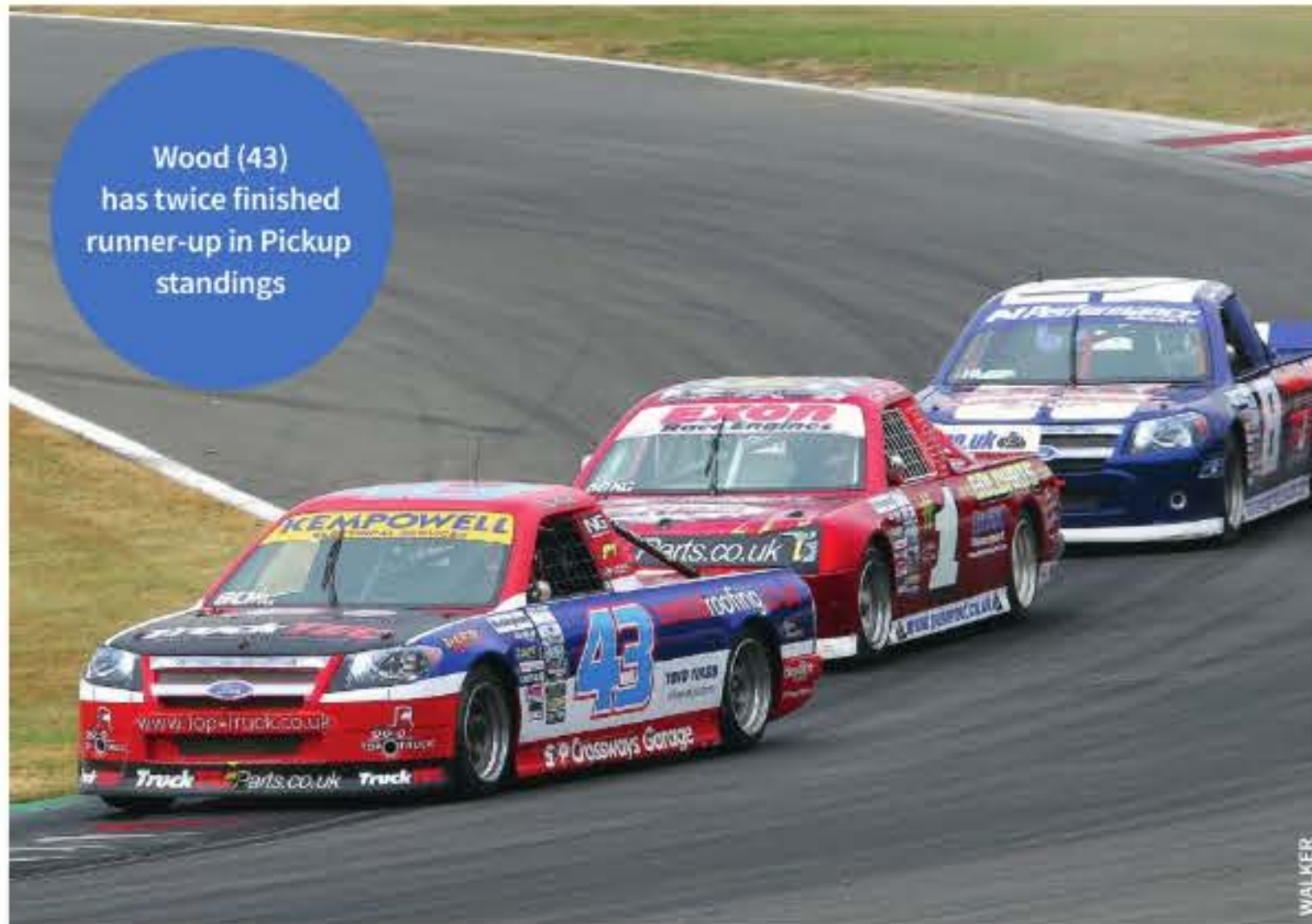
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Wood (43)
has twice finished
runner-up in Pickup
standings

WALKER

New challenge for Wood

PICKUP TRUCKS

Ex-British Touring Car racer Lea Wood is weighing up a return to tin-tops in 2019 after three years in the Pickup Truck Racing Championship.

Wood, who finished second to Scott Bourne last year and Freddie Lee in 2016, is eyeing a new challenge. One that has caught his eye is the Touring Car Trophy, a series launched by Stewart Lines for two-litre turbocharged touring cars.

"I'm looking at my options for this year," said the 2013 BTCC Jack Sears Trophy winner. "There's a few irons in the fire. I'll be going to Autosport International to see what's going on there."

"The only thing that strikes me as being quite interesting is the

Touring Car Trophy. It does appeal to me and it's had a lot of interest and I'll certainly be looking at that closely. Stewart Lines has set all of that up and I know him well. We've had a chat about it."

Wood praised the Pickup series, citing reliability issues as the reason why he did not achieve his goal of taking the series title in 2018. "It's a great championship and organisation, but I felt like I'd done my three years and we hadn't won the championship like I hoped we would," he added.

"It was disappointing with the Ford engine, as that's let us down badly this year. People who are in the Pickup Championship know that it cost us the championship."

JACK BENYON

BTCC racer Price in Aston

BRITISH GT

Former British Touring Car racer Josh Price has been revealed as part of TF Sport's two-car British GT4 entry.

The team, which will also run two next-generation GT3 Vantages as it attempts to defend its teams' title, will return to GT4 for the first time since 2014 with a pair of new Astons.

Ginetta Junior race winner Patrick Kibble, former Toyota and Mercedes driver Tom Canning and ex-Porsche Carrera Cup GB racer

Rory Collingbourne join Price in the GT4 line-up. This is despite Alex Toth-Jones previously being confirmed.

• Ex-British Touring Car Championship driver Sam Smelt will contest British GT this year with RACE Performance. The team will make its debut in the series with a Ford Mustang GT4, after becoming the first squad in Europe to take delivery of the car. Smelt tested the Mustang before Christmas at Donington Park.

STEFAN MACKLEY

IN THE HEADLINES

CATERHAM SWITCH

Multiple RGB champion Matt Higginson will contest the British Racing and Sports Car Club's Caterham 420R Championship this season. Higginson, who won the 750 Motor Club's RGB overall title three times in 2013, '14 and '16, plus four class crowns in that period, will drive a car prepared by two-time 420R champion Danny Winstanley's team.

TIN-TOPS TO CLASSIC

The Historic Touring Car Challenge from the Motor Racing Legends team will feature six rounds, including a return to the Silverstone Classic. The season starts at the Donington Historic Festival and takes in a one-hour race in May at Oulton Park during an AMOC Racing event. The series will also feature at the Thruxton Motorsport Celebration.

SCRUTINEERING BOOST

Scrutineering in the Renault UK Clio Cup will be bolstered this season by RML commercial director Simon Holloway assisting long-time chief scrutineer Keith Auld. Holloway is already familiar with the Clio Cup cars as he has served as chief data analyst for the category. Rumours of cheating in 2018 resulted in the top three cars being impounded for extensive checks.

WINNER GETS £1000

A new-for-2019 GT Challenge Trophy race will be held at the Castle Combe circuit this year, with the overall winner receiving £1000. Five classes are open to entries, including GT3, GT4, turbo/supercharged, over 3000cc and 2000-3000cc, with a total of 42 spots available. The race will be held on Bank Holiday Monday, May 27.

NEW BWRDC PRESIDENT

The British Women Racing Drivers' Club has announced Lorina McLaughlin (below) as its new president. She is one of a handful of female drivers to have driven Formula 1 machinery in competition and currently owns an ex-Michael Schumacher Benetton B192 in which she set her ninth 'fastest time by a lady driver' at the Goodwood Festival of Speed in 2018. She has also set women's records on the Goodwood hill.



MOTORSPORT IMAGES/JBLOXHAM



Albone takes a sabbatical

RGB

Two-time RGB champion Billy Albone has announced that he will not be racing full-time in 2019, boosting the chances of title runner-up Christopher Wesemael, who returns for his second year in the series aiming to fight for the crown.

Spire GT3S driver Albone, who won back-to-back titles in 2017 and '18, is stepping back to focus on his business. "I've got too much going on to race full-time this year," he said. "We have a couple of cars in the C1 Challenge now. We have eight drivers signed up, four in each car."

"We're running a karting team with full factory support in the British championship this year as well. It's a bit up in the air with

what's going on with karting, so we're keeping our options open."

Wesemael graduated to RGB from karting in 2018, and put his Mittell MC-53 on pole at Donington Park in his first-ever session in a car before the rest of the meeting was snowed off.

"We'll be trying to take a championship home," said Wesemael. "It's very important to know that the field is very strong. I'm sure there'll be some new drivers who are very fast as well. We just need to keep working really hard."

"We had a few mechanical issues during the 2018 season. Without them a championship challenge definitely would have been possible. With 2018 being a bit of a developing season, I made a few rookie mistakes that shouldn't happen again."

JACK BENYON AND GRAHAM KEILLOH



National series introduces Rookie class

FORMULA FORD

The National Formula Ford Championship is introducing a Rookie class this year.

Grids in the BRSCC-run series have grown over the past two seasons, with a number of karters making the jump into single-seaters, prompting the setting up of the new class.

"It was just a no-brainer," said James Oldfield, boss of FF1600 team Oldfield Motorsport. "If you imagine a 16-year-old coming straight in, they will have very little experience but it's probably better to allow them to compete against the likes of Niall Murray and Joey Foster but still go for a championship that's much more possible to achieve."

Rookie drivers will still earn points for either the Pro or Clubman class, the latter having been streamlined into one category after previously being split into Post-'89 and Pre-'90 chassis.

- Another FF1600 series will be celebrated in 2019, as Castle Combe marks 50 years since its championship was created.

Former champions and cars will be invited to the season-opening Howard's Day race meeting on Easter Monday, April 22. The circuit's FF1600 round will be a double-header, with the aggregate winner from the two races awarded a commemorative trophy.

STEFAN MACKLEY



Racers find new home

BARC SOUTH EAST

Competitors in the Intermarque, Tin Tops and Modified Saloon Car series will continue to race together in 2019 despite the closure of the British Automobile Racing Club South East Centre.

BARC SE, which ran the three series, has been shut as part of a BARC reorganisation. The categories are now set to race under the banner of the Classic and Modern Motorsport Club, featuring at events run by the British

Racing & Sports Car Club, MG Car Club and MotorSport Vision Racing.

Prime mover and experienced racer Rod Birley said: "What the BARC wants to do is focus on national series, but there are some competitors who don't have the finances or interest in racing nationally."

"What we're doing is trying to keep the competitors together. There are too many series out there, but we're not trying to do anything new; we just want to carry on racing in the south-east."

KEVIN TURNER

SPORTS CARS

Races 1 & 2 Joe Spencer
(Radical PR6)

SALOON CARS

Races 1 & 2 Andy
Thompson (SEAT Toledo)

Spencer took a brace of
wins but Porter (inset) led
the Sports Car race initially



Spencer marks Boxing Day with Radical double victory

MALLORY PARK
BRSCC
DECEMBER 26

Double North West Sports/Saloon champion Joe Spencer gained some useful experience ahead of his 2019 750 Motor Club Bikesports campaign by winning both of the BRSCC Sports Car races at Mallory Park on Boxing Day in a newly acquired Radical PR6.

The Leicestershire driver won the regional title in 2015 and '17, and a campaign in the 750MC competition – aboard a Spire – was mooted for last year. “We’ve still got the Spire in build,” explained the 23-year-old. “We’ve got this car [the ex-Phil Cooper race-winning PR6] as a bit of a benchmark. I’ve never driven a downforce car before, so I thought if I got the Radical I would know roughly what it should feel like so we could set the Spire up. Then we can

work out which one to go with.”

With only one trackday under his belt before Mallory, Spencer entered the Plum Pudding races late and thus lined up on the back of the grid for the opener. And he gave himself an additional penalty. “I wasn’t even ready,” he said. “I was still fiddling about with the lap timer when the lights went out.”

In spite of starting his race several seconds late, Spencer was up to seventh by the end of the opening lap and second by lap three. He then set about diminishing the advantage of the other Radical on the grid, Dave Porter’s SR3 RS, which had started from pole position.

What had been a seven-second gap was virtually nothing five laps later, and the two Radicals went either side of the slower Caterham of Tristan Judge on Kirkby Straight. At the entrance to Gerard’s they touched – each driver pointing the finger at the other

– and while Spencer continued, Porter traversed the grass. Such was his advantage that he retained second and only the Lotus Exige-bodied, Radical-chassised car of Paul Woolfitt also finished on the lead lap.

A late spin for the Ariel Atom of Darren Edmonds at Lake Esses handed fourth to Woolfitt’s brother Jon, in a Hayabusa-engined MK Indy. The top five finished in the same order in race two, minus Paul Woolfitt, who didn’t take the start.

Andy Thompson did the double in the Saloon Car contests, which boasted a healthy 26-car entry. Steve Barnard, who won one of the races a year ago in his spaceframe Audi TT, took the lead from Rich Hockley’s Honda Civic at Gerard’s Bend at the start, with Thompson’s SEAT Toledo soon following. Barnard was still ahead when he spun at the exit of the Esses on lap five, rejoining in eighth and providing Thompson with a straightforward passage to victory. Barnard recovered to second – taking Hockley again at the Esses on lap 11 – and was initially shown the chequered flag and, with no timing in operation, classified first before the result was amended. Behind Hockley came Tony Haberman’s Volkswagen Beetle and Jacob Carter’s Civic.

The second race finished with the same top two, but with Adam Chamberlain’s Vauxhall Astra VXR – which had started on pole position due to a partially reversed grid – completing the podium.

IAN SOWMAN



Thompson was another
double winner in the
Saloon Car contests

CLUB RACING'S UNDERDOGS

Whether it's a team, a driver or a series, here's Autosport's pick of the unsung heroes that battled the odds in 2018

GRAHAM KEILLOH, STEFAN MACKLEY, MARCUS PYE AND IAN SOWMAN

MGBCV8 CHAMPIONSHIP

Many would have questioned the ongoing viability of a 40-year-old multi-class championship with just 15 cars on the grid for its 2017 finale at Snetterton but, 12 months on, more than twice as many entered the concluding MG Car Club BCV8 Championship round at the same venue.

Thanks to the sterling work of long-time coordinator Pam McCarthy – mother of 2017 champion Russell – and with added promotional impetus from established competitor James Wheeler, grids surged from an average of 17 cars in '17 to 27 for the '18 season. With the cars dating from the 1960s and '70s the category benefits from a historic bounce, and the roaring full-race V8-powered machinery in the top class makes it one of the most spectacular championships around. The memorable decider – which had five contenders with a realistic chance of the title – was run in changing conditions, and McCarthy did enough to retain his title.



JONES



JONES

TEAM CUPRA

The Birkett Six Hour Relay race is an eclectic, run-what-ya-brung affair and, while the handicap prize is the coveted main award, there has been increasing competition for scratch-race honours.

Unsurprisingly, rear-wheel-drive cars have dominated down the years, and a saloon-car-based team hadn't come out on top since the race became a Silverstone Grand Prix circuit fixture in 2010, Radicals winning more often than not.

But the stars aligned for the 68th running in 2018. TCR machinery provided a rapid, robust and reliable basis for Team Cupra, with TCR UK regulars Stewart Lines and Carl Swift being joined by multiple club-racing champion brothers Shayne and Lee Deegan in a trio of SEATs.

Although Radical teams, and a squad of Sakers, set the pace initially, as conditions turned wetter the front-wheel-drive cars gained the advantage, and Lines held off Wade Eastwood's SR3 on a thrilling final lap to win by half a second.

WARREN GILBERT'S MARCOS

It's one of the most recognisable cars in UK motorsport, with its lime-green livery and thunderous Corvette seven-litre V8. And despite it being more than 20 years old, the outdated Marcos Mantis run by Topcats Racing continues to challenge for class wins against newer machinery.

"It's got no traction control, no anti-lock, no flat-shift, no paddles, and no electric diffs," says Topcats owner Warren Gilbert of a car that was acquired in 1997.

"It's got a sequential box but you still have to pull it back and forwards on a lever. Apart from the power-steering, that's it."

Despite the lack of driver aids, the car – which has competed in more than 500 races and is dubbed 'Big Green' – finished third overall in last season's GT Cup Championship with Gilbert, Mick Mercer and Jon Harrison at the wheel.



CHRISTOPHER 'CHIPPY' WESEMAEL

Christopher 'Chippy' Wesemael stunned on his car-racing debut, immediately taking pole in the high-quality RGB Sports 1000 Championship's 2018 season opener at Donington Park. He couldn't capitalise, as the meeting got snowed off, but it heralded a strong first part of the year in which he was always fast and bagged several poles, although could not convert them into victory.

Poor reliability was part of the problem, particularly fuel issues that took time to resolve. But Mittell MC-53 driver Wesemael admits "rookie mistakes" also cost him, such as stalling on the grid at Croft because he wasn't familiar with the starting procedure.

Yet with accumulated experience, as he adapted from karting, his pace eventually paid off, first with a crushing Silverstone win, then a double victory in Snetterton's finale. It allowed him to pinch second in the table – "Something that seemed mathematically impossible, wasn't," he concludes. He's now plotting a 2019 title challenge.



MORGAN LEWIS



A 16-year old with next to no experience of any driving making their racing debut in an ultra-competitive series, while juggling GCSE studies, would have already been an achievement.

Yet Morgan Lewis did all this with the added challenge of having talipes – more commonly known as club foot. Following in the path of her father Jonathan, who has extensive racing involvement, Lewis's motorsport ambitions were undimmed and last year she took part in two Mini Se7en rounds in a car with specially adapted pedals, seat, steering column, rollcage and gearstick. "I can't heel-and-toe like everyone can," she explains. "I call it a Riverdance [on the pedals]."

She twice brought the car home safely on her Snetterton debut, even though in race one she faced a new challenge of wet conditions, and repeated the performance at Thruxton, taking a best result of 16th.

BENN TILLEY

Jumping from Historic Sports Car Club Historic Formula Ford 1600 – in which he landed regular podium finishes in 2016-17 – to Classic FF1600 brought the deserved breakthrough for Benn Tilley last year against stiff competition.

The Lincolnshire lad, who turned 19 in October, dominated the Pre-'82 championship with nine wins from 14 races in Mandie Hadfield's Merlyn Mk20, his success mirroring father Stuart's Pre-'74 title in 1992.

"Part of the reason for switching was cost," says 2017 FJunior standout Tilley. "Fewer rounds meant less cost, but it was still hugely competitive. Particularly against Rick Morris; at 71 he is a very tough cookie to crumble."

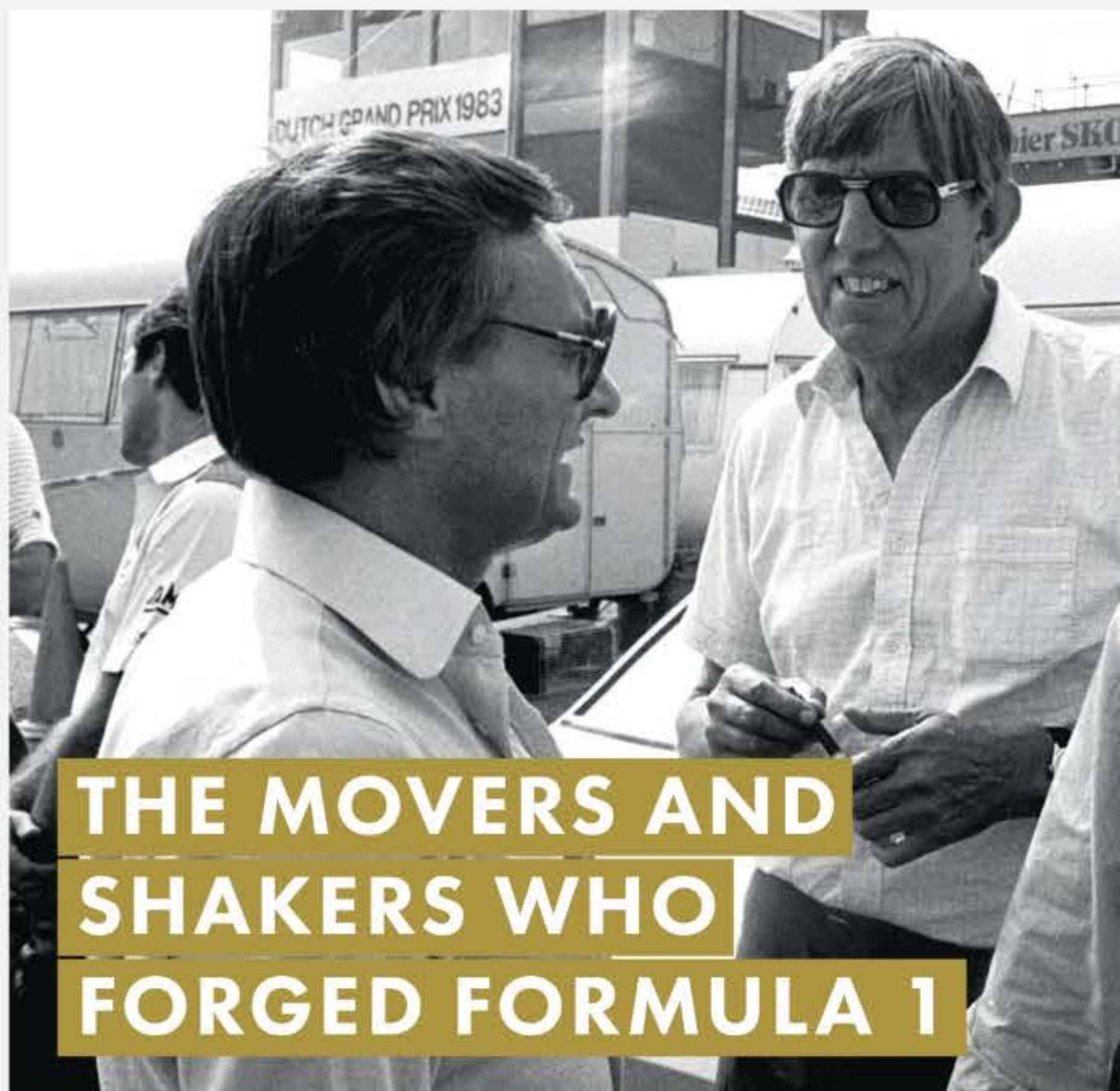
Lifelong racing nuts Benn and father Stuart spent their shoestring budget wisely, preparing the car themselves. Tilley Sr also helped ex-BRM apprentice Paul Fisher keep the engine sharp.

Their quandary is how to progress in 2019. "There are options," says Tilley, "but sponsors – absolutely vital to us – want TV coverage!"

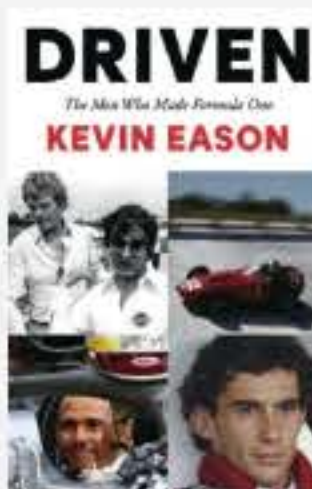


FINISHING STRAIGHT

IN THE MEDIA • ARCHIVE • QUIZ



THE MOVERS AND SHAKERS WHO FORGED FORMULA 1



BOOK REVIEW
DRIVEN: THE MEN WHO MADE FORMULA ONE
RRP £20.00

"They competed on the track and scrapped to outdo each other's bank balance, yet whenever shit hit the fan, they

closed ranks like the Corleones."

Take a moment to consider just how many times the names of Bernie Ecclestone, Max Mosley, Ron Dennis, Frank Williams, Eddie Jordan, Colin Chapman, Ken Tyrrell, Luca di Montezemolo and Enzo Ferrari have graced the pages of Autosport. Then, consider why the names of these nine men have become synonymous with Formula 1.

Individually, their USPs would make

each a formidable opponent: Ecclestone's eye for a deal; di Montezemolo's suave persona combined with his links to the upper echelons of Italian society; or the intensity and self-belief to make things happen of Dennis and Williams. "They might not have been much alike," notes author of *Driven: The Men Who Made Formula One* Kevin Eason, "but they operated like a sporting Mafia family."

After stepping down from F1 reporting duties for *The Times* in 2016, journalist Eason has written a highly entertaining look back on the characters who laid the foundations for likes of Chase Carey, Toto Wolff and Christian Horner.

It would be easy to fall into the trap of simply regurgitating the same old story about how Ecclestone strong-armed himself into position as F1's emperor, right under the noses of contemporaries such as Tyrrell,



'Crashgate' coverage doesn't enjoy the same depth as earlier anecdotes

MOTORSPORT IMAGES/PATCHING



Chapman and Williams. But Eason aims “not to attempt to tackle the complexities of the sport in detail, but to paint portraits of the people I dealt with in 20 years of reporting from tracks all over the world”.

The main building blocks of the book are the anecdotes popped into every chapter that reveal just a little more about its subject. For example, Ecclestone once offered a Mercedes 230SL hardtop to a car dealer who had got one over on him. Never

“THEY MIGHT NOT HAVE BEEN ALIKE, BUT THEY OPERATED LIKE A MAFIA FAMILY”

to be outfoxed, for a knockdown price Ecclestone sold the lucky dealer exactly that: a hardtop for the 230SL. Or the time in Kuala Lumpur, when Eddie Jordan jumped in a taxi and headed to Chinatown to buy a bag full of £20 ultra-realistic fake Omega watches after spotting Eason’s over dinner.

In its early chapters, *Driven* is a little jumpy as it tries to chronologically follow the entwined paths of the pioneers. As Ecclestone begins to wield influence with Mosley in tandem in the early 1980s, the

book becomes a lot slicker. Perhaps there’s a metaphor in there somewhere...

With such a strong repertoire of interviewees, it’s a shame that the scandals of ‘Spygate’ and ‘Crashgate’ are not further unpacked. With Dennis refusing to speak about the 2007 annus horribilis at McLaren, that story goes as far as it can. But even with Ecclestone, Mosley and then-Renault boss Flavio Briatore discussing Nelson Piquet Jr’s crash that aided Fernando Alonso’s victory in the 2008 Singapore Grand Prix, the reader is left wanting more.

But that’s a minor gripe, for the book’s many anecdotes make it fast-paced and difficult to put down. A particular highlight is the tale of Ecclestone, all 5ft3 of him, allegedly threatening to throw a ranting Tyrrell out of a window. The teams, who cottoned on to Ecclestone’s unique business model, were apoplectic. But as the now 88-year-old reminisces, “we didn’t go into the business to make money. We went in to race and if we made some money then good. But we were racers.”

It can be very hard to strike a balance between stimulating the mind of an F1 devotee and a casual fan who might happen across the book on a shelf or online. But Eason has found a strong middle ground between pleasing any reader, motorsport enthusiast or not.

JAKE NICHOL

YouTube

youtube.com/AUTOSPORTdotcom



As Michael Schumacher’s 50th birthday is celebrated, Autosport has been ranking all 20 of the Formula 1 cars that the seven-time champion raced. There are no specific criteria – number of race wins, which is prettiest, and so on – upon which they are judged, so it’s an open debate with no ‘right’ answer. Be sure to check out the comments section and leave your own. No doubt, everyone’s order is different. <http://bit.ly/SchumacherCars>



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WHAT’S ON

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Round 2/12

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January 12

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Eurosport 2, Saturday 1430.

BBC Red Button, iPlayer, online

Dakar Rally

Lima, Peru

January 7-17

24H Series

Champion of the Continents

Round 1/4

Dubai 24 Hours, United Arab Emirates

January 11-12

Asian Le Mans Series

Round 3/4

Buriram, Thailand

January 12

Toyota Racing Series

Round 1/5

Highlands Motorsport Park, New Zealand

January 12-13





FROM THE ARCHIVE

Michael Schumacher (Ferrari F310B) kicks up the dust and detritus during the 1997 Japanese Grand Prix at Suzuka, the penultimate round of the season. He started the race from second place on the grid, behind title rival Jacques Villeneuve (Williams-Renault FW19), but Schumacher's ascension to the top step of the podium was assisted by Ferrari's pragmatic and very effective deployment of Eddie Irvine as his wingman.



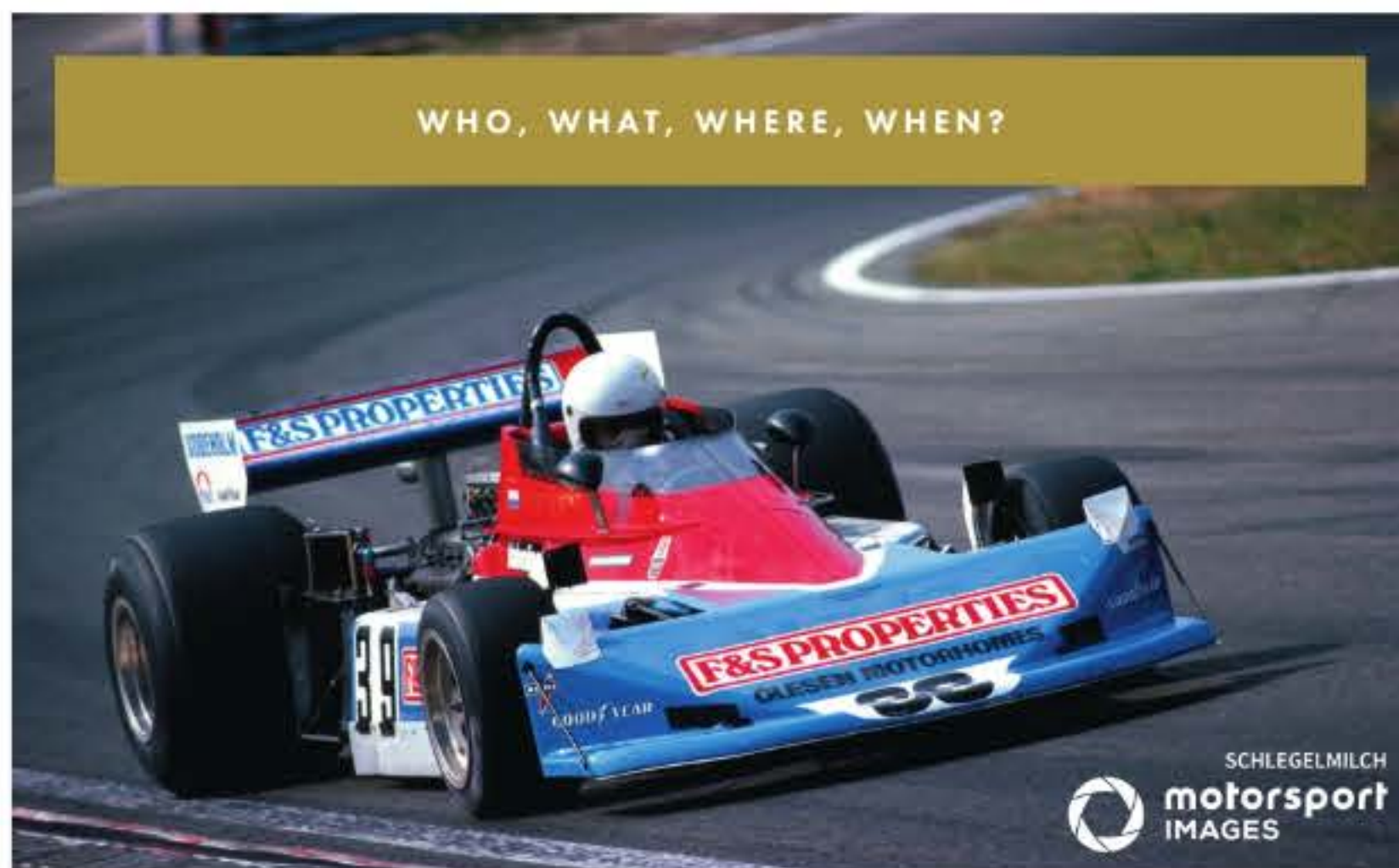
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QUIZ

WHO, WHAT, WHERE, WHEN?



WHO IS THIS?

This bandy-legged maestro set new standards that still pass muster to this day.

Having swapped books for spanners he initially set off in a blue oval, but it was a switch to a bow-tie that yielded international recognition. When the guns fell silent he was invited to join the best and soon proved his worth. Poor reliability blunted his first assault on the world stage, but he responded in dominant fashion.

Injury meant he spent the next year on the sidelines, while a lack of a competitive car stymied his comeback.

This was but a blip and he was soon fired back into contention, and he delivered over and over and over and over again.

He became an unlikely political pawn as the horse rode into town to make a point, while after time had caught up with him he enjoyed a lifetime of guaranteed support from a star he'd helped to shine so brightly.

ON THIS DAY

1 Today is Eddie Cheever's birthday. Where did he score his only front-row start in F1?

2 Bobby Rahal is 66 today. For which team did he make two F1 starts?

3 Rodger Ward was born on this day in 1921. He famously entered his Kurtis Kraft Midget in the 1959 US GP – how far off the pace was he in qualifying?

4 Which ex-F1 racer scored his career-best Formula E result on this day in the 2015 Buenos Aires E-Prix?

5 That race was also the only FE outing for which Indycar race winner?

NAME THE HELMET



LAST WEEK'S ANSWERS

Who, what, where, when? Justin Wilson, Peugeot 406 SCV8, Rockingham, June 28 2001. **Who is this?** Anthony Davidson. **On this day** 1) Brabham. 2) Graeme Lawrence, Ferrari 246T. 3) Russell Spence. 4) 5th. 5) Ove Andersson. **Name the helmet** Jacky Ickx.

IN NEXT WEEK'S ISSUE



WHAT FERRARI MUST DO TO BEAT MERCEDES

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FROM FE SAVIOUR TO SCALING NEW HEIGHTS IN BUSINESS

Never an organisation to do things by halves, ABB FIA Formula E has forged a brave new path with its Gen2 challenger, which has changed popular perceptions about what a single-seater racing car should look like.

After an entertaining opening race of the season at the new Ad Diriyah E-Prix in Saudi Arabia last month, we'll get a direct comparison between new and old this weekend in Marakech, when the new car takes to a circuit where FE has been before.

Amid this sea of optimism, it's easy to forget that the championship faced the very real prospect that it would be halted in its infancy without a functioning battery. As series founder Alejandro Agag now admits, FE was in real trouble in 2013.

Step forward Williams Advanced Engineering, an offshoot of the Formula 1 team that has now established itself in its own right as a leading proponent of motorsport-inspired technology in diverse engineering sectors.

As WAE boss Craig Wilson tells Alex Kalinauckas in this issue's cover feature, while it may have lost the battery supply tender for FE's Gen2 car, the business is continuing to go from strength to strength, with its

growing portfolio of projects – many of which have nothing to do with motorsport – showing the enduring appeal of a proven track record in motorsport. Read about the full extent of WAE's activities on page 14.

On the subject of Williams, F1 team boss Claire Williams recently revealed that the flaws with her team's FW41 were so considerable that even tripling its budget would not have done much to improve its dire 2018 season, underlining the challenge involved in creating a competitive car for a fraction of the budget of the works teams.

As well as celebrating the last F1 car to be produced on a shoestring, the 2012 HRT F112 (page 24), we've gleaned from a host of experienced engineers involved in budget F1 projects from the past 30 years the key traits they shared (page 20).

We also meet IndyCar's head of aero Tino Belli, who lent his design talents to the struggling Fondmetal and Larrousse teams between successful stints in IndyCar that yielded stacks of wins and titles. Don't miss his top career tips on page 34.



James Newbold

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ATL FUEL CELL WINS ASI CROSS-INDUSTRY APPLICATION AWARD

Inaugural Product Showcase prize winners announced at Autosport International

Fuel-tank manufacturer Aero Tec Laboratories (ATL) has won Autosport International's Product Showcase Cross-Industry Application Award – presented by the Manufacturing Technologies Association (MTA) – for its FIA FT5-1999 fuel cell.

The award is aimed at products that have demonstrated their potential application in sectors of industry as well as in motorsport. ATL's FT5 fuel cell was considered the strongest candidate among its competitors, and was recognised as the winner of the cross-industry category in the inaugural Product Showcase Awards.

"Companies are continuously looking to improve the safety of those who engage with their technology," said MTA technical manager Joshua Dugdale. "Whether you work in marine, aerospace, automotive, defence or construction, safety is of paramount importance. The innovation and technology utilised in the design and construction of the FIA FT5-1999 has allowed ATL to position themselves as the industry leader for fuel cells within motorsport.

"At the MTA, we felt that this technology, which sets the safety standard for motorsport, has huge potential to be utilised across a number of other industries, aiding their continuous drives to improve safety."

ATL's FT5-1999 fuel cells are primarily developed for use in Formula 1, in which the company has supplied every team on the grid with its products over the past 20 years, but have also been adapted for other categories in motorsport, including Super Formula and the World Rally Championship.

Produced using a combination of Kevlar and elastomers, ATL's fuel cells can be tailor-made to a range of applications, while keeping to the same FIA specifications.

Designed to be resistant to tears and punctures in motorsport, the high-performance nature of the FT5 bladder can also be built to comply with other applications, such as the defence or aerospace industries in which safety when handling fuel is paramount. This is enhanced with fabric internal baffles to prevent sloshing within the tank, also ensuring efficient fuel pick-up while in use.



ATL's fuel tank impressed the MTA to win Cross-Industry Application Award

Already involved in the marine and aviation sectors, ATL has used its motorsport expertise to pioneer its development of fuel-cell technology, and can transfer its FIA-homologated fuel cells into more-diverse fields given the flexibility of the design.

Among the other category winners were Bcomp's powerRibs™ (Innovation) – a lightweight composite reinforcement product developed with the European Space Agency – and the Texense IRN8-WS4 IR sensor (Data & Measurement) used in Porsche's record-setting 919 Hybrid Evo.

ASI PRODUCT SHOWCASE AWARD WINNERS

Innovation Bcomp (powerRibs™)

Cross-Industry Application Aero Tec (FIA FT5-1999)

Vehicle Performance Tuning HP Tuners (MPV12)

Safety Bosch (ABS M5 Kit)

Lightweighting Evo Corse (EVOjack)

Data & Measurement Texense (Texense IRN8-WS4 IR)

Manufacturing & Fabrication Motordrive Seats (MD20 FIA8862-2009 seat)

Electronics Cartek (Speed Marshall)

Energy Efficiency Bosch Motorsport (Electric Coolant Pump ECP 160)



Bcomp was recognised with innovation prize



M-Sport Poland released the first R2 car designed to the FIA's latest regulations in December, the new EcoBoost-powered Ford Fiesta R2 replacing the outgoing model that debuted in 2009.

The new car, which will form the basis of the Junior World Rally Championship, is the first produced from the new M-Sport Poland base in Krakow and is inspired by M-Sport's Fiesta World Rally Championship winner.

Its turbocharged 999cc engine produces 200bhp, up from 170 in the old model, and is equipped with new Sadev five-speed

sequential gearbox and Reiger dampers.

M-Sport Poland has committed to building 100 kits, with 20 being allocated for the opening round of the JWRC – Rally Sweden in February.

M-Sport Poland board member Maciej Woda said: "The all-new Ford Fiesta R2 is a massive step forward and something everyone at M-Sport Poland is extremely proud of. It's the first car to be fully designed and developed here in Krakow, and a tremendous amount of effort, passion and enthusiasm has gone into making this project as successful as possible."



X-TRAC WINS GEARBOX TENDER FOR SUPERCARS

British gearbox specialist X-trac has won the contract to supply Australian Supercars with a new control gearbox from 2019 onwards.

It takes over from Australian firm Albins, which had been the control supplier since the latest-generation Supercar, known as the 'Car of Tomorrow', was introduced in 2013.

X-trac's P1293 unit is a longitudinal transaxle with six forward gears, selected with a sequential shift. In addition to tests specifically arranged for the new transmissions, prototype units were tested in race events during the latter half of the 2018 season by Nissan Motorsport and Holden squad Brad Jones Racing.

Testing has also included the Super2 Series for older Supercar machinery, although it will only be mandated in the top category for 2019 to allow time for teams to make the transition.

X-trac has been the exclusive supplier to the IndyCar Series since 2000 and also supplies teams in sportscars, touring cars and rallying.

The Berkshire company opened a new manufacturing facility extension in November. UK Prime Minister Theresa May was on hand to mark the occasion.

WAE GOES JET POWERED WITH BAE SYSTEMS

Williams Advanced Engineering and Williams Grand Prix Engineering will share expertise, skills and technology with Eurofighter Typhoon manufacturer BAE Systems in a new partnership announced in December.

It is expected that the partnership will use the companies' shared expertise in the fields of visual and augmented reality, aerodynamics, lightweight materials and battery technology, as well as developing solutions for intuitive cockpit designs for fighter pilots and racing drivers.

In addition to funding product and technology development, including Future Air Combat Systems, there will be secondment opportunities for engineers across both companies, which previously collaborated on a twin-seat cockpit simulator (below), to be based at BAE's training and simulation facility at Warton, Lancashire.

For more about WAE's recent projects, including its collaboration with Airbus, see this issue's cover feature on page 14.



IN BRIEF



ÖHLIN SELLS UP

Ohlins Racing AB founder Kenth Ohlin has sold a majority share in his suspension and shock-absorber company to Tenneco Inc in a deal that will see Ohlins become a subsidiary of the performance-ride firm. Ohlin will retain a minority interest in the company he started in 1976 and remain on its board.

STC CONFERENCE DATE

The Silverstone Technology Cluster's second Annual Conference will be held on May 21. Designed to highlight how STC members can benefit from collaboration, the inaugural event was held at Silverstone Park's University Technology College and featured 100 local companies, including RML, KW Special Projects and Delta Motorsport, plus representatives from Heathrow Airport and DowDuPont.

WMG SIM RECOGNISED

Researchers from the University of Warwick's specialist manufacturing department (WMG) were recognised for their 3xD Simulator project by winning gold at National Instruments Engineering Impact Awards in November. The facility is the first in which autonomous vehicles can drive in a virtual environment, providing a drive-in, driver-in-the-loop, and driving experience.

RADICAL TO GERMANY

Following its agreement with French firm Marcassus Sport in October, Radical Cars announced Glinicke Motorsport as its new German distributor in December. Glinicke will provide support and service to German customers of the British sportscar manufacturer, which plans to relaunch a pan-European Radical race series next year. Radical CEO Joseph Anwyll said: "In Glinicke Motorsport we are confident that Radical has found a partner with the ambition, approach and scale to support growth across the whole country."





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GORDON MURRAY AWARDED CBE IN HONOURS LIST

Design legend Professor Gordon Murray was recognised with a CBE for his 'service to Motoring' over a remarkable 50-year career in the Queen's New Year Honours list.

South African-born Murray is one of the most successful designers in Formula 1 history. He is credited with championship-winning Formula 1 cars for Brabham and McLaren, and headed up McLaren Cars, creating the seminal F1 supercar that won Le Mans in 1995. He formed his own vehicle design consultancy in 2005.

Murray said: "It is extremely humbling to receive a CBE in the Queen's New Year Honours. I've spent more than 50 years doing what I love, working with a wealth of highly talented and creative people around the world, but primarily in the UK.

"From competing during the heyday of Formula 1, to designing the world's fastest supercar, I've loved every minute. I'd like to dedicate this honour to all those I've worked with over the years and I look forward to an exciting new future for the Gordon Murray Group."



Gade left SPM after Indy DNQ

MOTORSPORTS IMAGES/LEPAGE

MULTIMATIC ADDS GADE TO ENGINEERING TEAM

Multiple Le Mans-winning race engineer Leena Gade heads a significant off-season recruitment drive from Mazda Team Joest and Multimatic, ahead of the partnership's second season contesting the Daytona Prototype international class in the IMSA SportsCar Championship.

Following the closure of Audi's successful LMP1 programme in 2016, which was run by Team Joest, Gade had stints with Bentley in sportscars and Schmidt Peterson Motorsports in IndyCar, but departed the latter mid-season after James Hinchcliffe failed to qualify for the 2018 Indianapolis 500.

Having joined Multimatic as a vehicle dynamics manager and race engineer in October, Gade will engineer the RT24-P driven by Harry Tincknell and Tristan Nunez. Timo Bernhard and Rene Rast will complete the line-up for Daytona.

In addition to Gade, Joest has appointed veteran team manager Chris Mower as team coordinator and former Audi engineer Brad Kettler as a consultant. Long-time Joest man Jan Lange has replaced Ralf Juttner as the CEO of Mazda Team Joest.

GREENPOWER RETURNS TO SILVERSTONE

Following the closure of Rockingham, the Greenpower International Finals will be held at Silverstone on October 17, 20 years to the day since its first event at Goodwood.

Staged annually by the Greenpower Education Trust since 1999, the competition for school-age students to design, build and race an electric car will be held at the home of the British Grand Prix for the first time since 2013. It had been based at Rockingham from '15 until last year's event in October.

Development and partnerships officer Gavin Woodruff said: "We are delighted to be hosting the International Finals 2019 at Silverstone Circuit, bringing Greenpower racing back to the famous venue for the first time since '13 when it hosted the Season Opener and Corporate Challenge."

Greenpower previously announced that it will stage new heat events on the streets of Hull, and at Lotus's Hethel test track.



Greenpower will return to Silverstone

AUTOSPORT SHOW



Racing Point partners will attend ASI

MOTORSPORTS IMAGES/PORTLOCK

RAVENOL PRESENTS OIL

Racing Point's oil and lubricant partner Ravenol will introduce its new USVO (Ultra Strong Viscosity Oil) range at the Show, and the Formula 1 team's official Esports driver Marcel Kiefer will man a simulator on the Ravenol stand (Hall 3 on Stand 3640). The German firm's new product changes the structure of the base oil to accept additives without requiring support particles to ensure a constant level of viscosity and oil pressure.

AP RACING'S NEW CALIPER

Performance braking and clutch manufacturer AP Racing will launch its forged six-piston World Mono caliper for performance road car applications at the Show from Hall 3, Stand E530. The World Mono range, which claims improved rigidity and enhanced cooling characteristics over standard calipers, will be manufactured using the same design philosophy as its pioneering Radi-CAL.

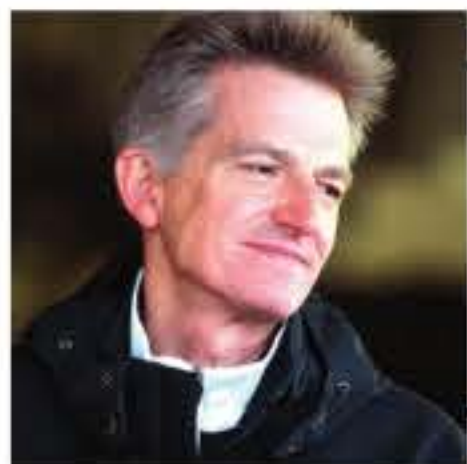
MOTORDRIVE SEAT PROWESS

Motordrive will display its four- and six-point-mounted advanced motorsport competition seats at the Show (Hall 2, Stand 2645), after becoming the first seat manufacturer to produce both configurations to FIA 8862-2009 safety standard. Its MD range is approved for use in race and rally events and the six-point, carbonfibre shell MD20 is the lightest in its class, weighing just 7.4kg.

MME HAND-CONTROLS

Slovenian custom motorsport solutions firm MME Motorsport (Hall 3, Stand 3234) will present three new racing products at the Show, including a new control system for drivers with disabilities. The fully adjustable device includes an electronic braking system, throttle, clutch and paddleshift attached to the steering wheel to facilitate drivers lacking function in their legs.





EXPERT VIEW
MARK WILLIAMS

WHY BEAUTY SLEEP CAN MAKE YOU FASTER

The ex-McLaren Formula 1 engineer explains why something as simple as a decent night's kip could improve your lap time

How many times have you thought that sleeping for around one third of your life, eight hours per day, is such a waste of opportunity?

That was before you matured and understood the huge range of benefits that sleep brings. How many times have you gone to sleep with an unsolved problem, only to wake up the next morning with the solution in your head? Consider how refreshed you feel after a full eight or nine hours' sleep as opposed to requiring regular infusions of caffeine after an all-too-short night.

Yet, in spite of all this personal experience, we still believe that a race weekend is a great opportunity to pull a few all-nighters.

You are probably wondering why this piece should appear in the Engineering section of the magazine and what has inspired me to write it.

Firstly, I believe it to be true: sleep does make faster cars. And secondly, some targeted marketing by Audible got me to read *Why We Sleep* by Matthew Walker. I've now learned that all animals that live more than a few days sleep, and that if you don't sleep you will die. Sleep helps you consolidate your learning and hone your motor skills; it washes your brain of all the detritus produced by the day's thinking... the list goes on and on.

So sending your driver back to the hotel early for a good night's sleep rather than poring through data for hours on end at the circuit just might win you a few more places on the grid the next day.

It always did whenever I engineered Mika Hakkinen, and he knew it. He would sidle up with that cheeky grin on his face and say, 'Do you still need me here?'. 'Of course not, Mika, time

you went home, I'll sort everything, see you tomorrow', would be my reply.

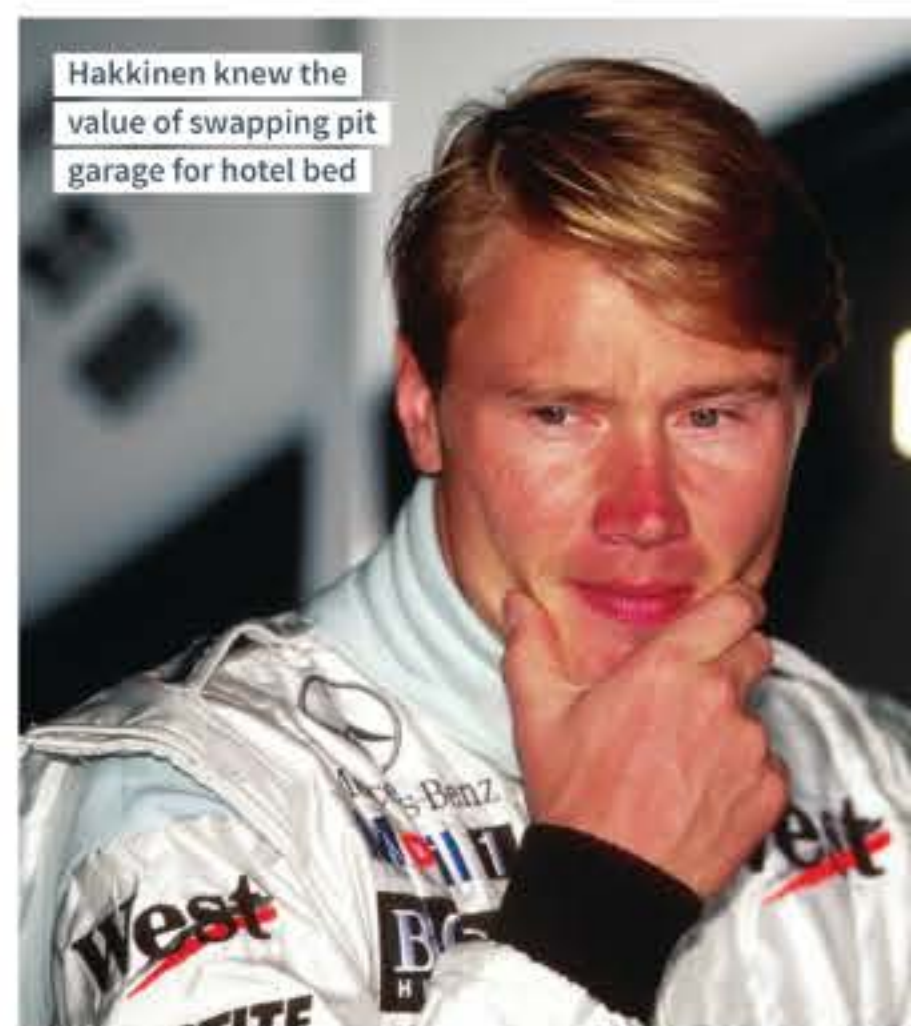
I now wonder, when the sleeping driver's brain replays virtual laps, do they ever crash? If so, it's a good job your muscles are made inactive during REM sleep.

After the Australian Grand Prix in 1999, Ron Dennis was giving his usual post-race update to the factory. The weekend hadn't gone well. The mechanics had worked through the night pre-race. Everyone was exhausted and someone sent the car to the grid without unplugging the umbilical, the communications cable that's plugged into the car whenever it's in the garage. The car pulled the overhead power and light assembly and most of the garage with it. Even Ron was trying to stop the whole garage from crashing to the ground.

He vowed he would never let that happen again. All-nighters were to be consigned to the history books. Well, I think that policy lasted about two weeks.

This was the period of cars requiring more hours of maintenance than they ran for on the track. I was with the MP4/13 for its pre-season test programme in 1998. The covers never went on the cars before 0300 and that would be an early night. Then you had a 40-minute drive to the hotel to grab a few precious hours of sleep before returning to the circuit for an engine fire-up at 0800.

Clearly we were short on manpower, but getting more mechanics was an uphill struggle. After a year of this, Dave Ryan finally agreed to take on one more mechanic per car, and as each year passed we got another mechanic. After four years we finally got back to the hotel before midnight. Interestingly, I've now learned that, while we were still at the circuit at two in the morning having left the hotel at seven the previous morning, our brains were in the same state as someone at the UK legal limit of alcohol for driving. ►



Hakkinen knew the value of swapping pit garage for hotel bed

“A good night’s sleep just might win you a few more places on the grid the next day”

JEP
motorsport
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Pit crews can make mistakes when not properly rested

MOTORSPORT IMAGES/SUTTON



Endurance-racing crews are accustomed to working long hours

MOTORSPORT IMAGES/GODET



Jean-Eric Vergne takes a nap during the Saudi Arabia Formula E rain delay

80mg/100ml. Now that's a scary thought.

I remember my first day at Lola for two reasons. The first thing I was asked to draw was a floor stay. I was puzzled as I couldn't understand why it hadn't been detailed from the design scheme, the master drawing of the whole car. That was my introduction to Lola's chalk-on-the-floor approach to design. That had to change.

Secondly, and most significantly here, at 1800 a huge guy called Bernie came in the drawing office and threw us out. 'What's happening?' I asked. 'Oh, that's Bernie, he locks up and sets the alarm every evening,' was the answer.

That was it. At 1801 I was in the car park heading back to my digs.

A few years later we all got keys and could lock up and set the alarm. But were we more productive? I'm not so sure. If you know you have to finish by a certain time it does focus the mind. There's no chit-chat,

it's all work, you press on. Then you go home for some well-earned r'n'r and, above all, a good night's sleep, which then improves the following day's productivity.

The challenge is avoiding the negative spiral where you get behind, work later, become less productive as a result and need to work later...

I would often try to get ahead by starting a new design scheme before leaving the office for the day (read evening) – a clean sheet of paper to which I would add a few centrelines so I could hit the ground running the next morning. The next morning, the first thing I would do is rub out those lines. So Bernie actually did us and the company a big favour by kicking us out at 1800. We just didn't appreciate it.

In 1994 I went to the United States to do some Indycar engineering for King Racing, Kenny Bernstein's team. Things weren't going too badly until we got to

the Indianapolis 500. This is a fascinating place and one where it's very easy to lose your nerve. Even the greats have bad years.

It all starts when you aren't as quick as you think you should be. The wind picks up and the quick guys stay in the garage, but you need to run so you do, you get lost with the set-up and go even slower. Soon it spirals out of control.

Now, the team manager was an 'hours' rather than a 'results'-based guy. So everyone had to stay at the track until we figured it out. Well, it's not that easy or we wouldn't have gotten into this mess. Fortunately he was replaced by someone who understood people and the technical side of the sport. A great guy named John Dick, and we are still friends to this day.

His advice was that, when things turn bad, close the garage doors and head for the bar, order a jug of margarita and chew it over. Basically, sleep on it – and after a few margaritas you certainly did!

He knew the benefit of giving the guys – mechanics and engineers – time off. We were at the Michigan 500 and it was early Saturday evening when he announced the engineering staff were leaving the circuit. "The car's nearly finished and once we leave, the mechanics will have it wrapped pretty quickly." They did. The next day we won the race.

Motorsport is definitely testosterone-fuelled, where the number of hours worked provides bragging rights. People stay in the office having completed their tasks, simply because they don't want to leave first.

But the world around us is moving on and playing smarter. Motorsport is an intellectual competition, so to me the situation is no different. To get the most from your team, make sure they get plenty of sleep. ■



Burning the midnight oil isn't conducive to good work

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DRIVING CHANGE LUCAS DI GRASSI

WHY AERO ISN'T F1'S SOLE PROBLEM

The inflexibility of modern circuit design is just as much to blame for our reliance on gimmicks



A

lthough I did not watch all the Formula 1 races in 2018, at the US Grand Prix in Austin it was very clear to anyone that even a faster car could not overtake a car in

front easily because so much time was lost by being in the turbulent air in the corners.

It was the same when I raced there in LMP1 — we could not get closer than 1.5 seconds away from the car in front unless there was traffic. The cars have become so reliant on downforce that you cannot overtake — you can't do anything.

People often blame the aerodynamics of current cars, but what is often overlooked is that there is a strong correlation between how exciting the race is and the layout of the track. For me, Austin, Barcelona and Yas Marina each have one flaw in common, which is that the balance of drag and downforce required is not working in a way to facilitate overtaking. In other words, the time you gain from being behind a car on the straights is less than the time you lose from being behind the same car in the corners.

If the tracks were designed in a way that you could gain a lot by being in slipstream or turbulent air and then not lose so much in the corners, it would have a much more

competitive outcome. The faster the corners are and the more downforce-dependent the track is, the more gimmicks you'll need to invent to create overtakes, like DRS in F1.

It would make a huge difference if we had more corners with different possibilities of racing lines, and where it would be possible to do the same lap time by using any of them. Imagine if, for example, in Abu Dhabi where you have the hairpin before the long back straight, you could have different camber angles where if you went on the outside instead of the inside, it would produce the same corner time. There wouldn't be a single line that everybody takes on a typical corner, which is usually

There are lots of other things you could do, such as making circuits geometrically optimised to ensure the racing line does not go to the edge of the track. But that's a topic for another column.

If they want to keep the tracks as they are, they will have to do something with the cars. From what I can see, the 2019 Formula 1 wings will make almost no difference again.

It's too small a change, and it will not be enough to remove the DRS and still have massive amounts of overtaking. They have to change the whole concept of aero car design. Engineers would go mad with the idea of creating inefficient aerodynamic cars just for the sake of overtaking, but

“The time you gain from being behind a car on the straights is less than you lose from being behind the same car in the corners”

from outside to apex to outside. Instead, drivers would take a different line, similar to the way IndyCar drivers do on an oval, benefiting from less downforce loss on the corners and the same benefit of losing drag on the straights, with many possible lines generating the same lap time.

that is necessary if you want to remove the overtaking gimmicks such as DRS and create 'pure' overtaking like we used to have in the past.

It's not a binary thing, however. It's not just the car and not just the tracks — it's a combination of both. We have to look at the whole picture and understand why there is a level of imbalance in the downforce and drag we observe at Tilke tracks.

The old tracks with long straights such as Spa and Macau are perfect examples of natural overtaking opportunities without creating any gimmicks. We all wish more tracks would be like that.

Even saying that, the total amount of overtakes now is far greater than we had in F1 20 years ago when Michael Schumacher won five titles in a row. As a product, F1 is still very good and there are a lot of good fights in most of the races. People are just hungry all the time to make it better. And too much excitement is never enough. ■





MOTORSPORT'S QUIET ENGINEERING PARTNER

Williams Advanced Engineering has been a major player in the short history of Formula E, but its reach has expanded beyond motorsport too

BY ALEX KALINAUCKAS

S

upermarket shoppers, babies in desperate need of emergency transportation and British soldiers – all are linked by one company. It's got a famous first

name in the motorsport sphere too: Williams Advanced Engineering.

Alongside Williams's illustrious 42-year history in Formula 1, its 114 grand prix wins, seven drivers' champions and nine constructors' titles, WAE can trace its roots back through the team's involvement with the Metro 6R4 rally car, the Renault British Touring Car squad and the 1999 Le Mans-winning BMW V12 LMR machine.

But the foundations of the WAE business were solidly put down in the late 2000s. F1 teams needed to buy or develop the first elements of hybrid systems with KERS units for the 2009 season, and Williams developed both battery and flywheel versions of the technology. Although the former was the favoured route taken for energy recovery in F1, Williams Hybrid

Power was established in '08 and went on to sell the technology into other industries – for instance, the stop/start drive cycle of city buses. But Williams's flywheel investment still achieved notable success in motorsport when it was used on Audi's R18 prototypes that triumphed at Le Mans in '12, '13 and '14.

In 2010, Williams was tasked with the development of Jaguar Land Rover's C-X75 hybrid supercar project. During the following years, it also continued to work on its own battery KERS technology, which was sold to the Marussia F1 team, and another grand prix squad – Caterham – also paid to use its second windtunnel.

Although Williams Hybrid Power was sold to automotive and aerospace multinational GKN in 2014 and the C-X75 – its appearance in James Bond film *Spectre* aside – cancelled, Williams saw enough from its side projects to justify creating an umbrella company, so it opened the WAE facility at its Grove base in '14.

"Despite having been involved in the C-X75, which was a very high- ▶

Clockwise from top: Jag FE programme is WAE's headline act; MoD has used WAE's expertise; WAE battery saved FE; Aerofoil tech is also transferred to the supermarket

WILLIAMS | ADVANCED
ENGINEERING



profile project, because we didn't go to production and so it didn't get the full whack of PR, we were still relatively unknown even in the automotive industry," explains WAE managing director Craig Wilson.

"No-one had ever said anywhere what Williams Advanced Engineering was doing versus what Jaguar was doing, so we didn't have a lot that was going out about us. But as each year has gone on that's changed. A lot of people are now coming to us – they're aware that we've done something or they've seen something we've done."

From the early days with just 50 employees, via initially spreading WAE's capabilities through networking and industry conferences, the company – and its project list – has grown. WAE has now completed more than 80 ventures for a range of clients in various sectors, and currently has another 40 on the go. Arguably its highest-profile development has been the battery that powered the original Spark-Renault SRT_01E for the first four seasons of Formula E.

Many of WAE's current and completed projects involve delivering specialist products – including building 16 C-X75s for the concept car's one-off silver-screen outing in 2015 – and investing in and encouraging start-up technology companies.

WAE's Babypod 20 incubator – built in collaboration with Advanced Healthcare Technology – is based on the carbon-fibre developments that raise standards for F1's driver safety cells. The lightweight system has been designed to attach to any transport stretcher and is used by the intensive care ambulances run by Great Ormond Street Hospital, as well as the Children Acute Transport Service.

Its Aerofoil technology, inspired by an F1 front wing, attaches to supermarket fridge shelves to channel cold air from spilling out into the aisles and provide significant energy savings – the "equivalent of a month's worth of the domestic CO2 emissions from a city the size of Manchester", according to its marketing material.

The Brompton Electric bike features



WAE's origins lie in 6R4 Group B monster and Laguna Super Tourer

"We've carved out our own identity in terms of why people think of us and come to us"

a 300Wh battery and front hub motor, benefiting from WAE's FE developments, while the Biological Surveillance and Collector System (BSCS) project – commissioned by the UK's Ministry of Defence and produced in conjunction with aerospace, defence, transport and security company Thales – draws on computational fluid dynamics developed for F1 to create a sensor-based air-particle detection system designed to protect soldiers from incoming biological attacks.

The company is also working with Airbus on an aerospace project called the Zephyr High Altitude Pseudo-Satellite – an unmanned, solar-powered communications and surveillance aircraft that uses WAE's ultra-lightweight material developments, and battery electrical cell

technologies.

"In the first part, people said, 'What exactly do you do?'"

Wilson says of WAE's beginnings. "They think of an F1 car and 'how is that relevant to our situation?'"

And while we have a lot of capabilities in common [with the F1 team], we are increasingly working with a lot of new technologies that are different to F1. I'm not saying they're better or worse – they're different.

"We've probably carved out our own place in the world alongside an F1 team that's recognised for agility and performance, packaging and light weight and all those things. We've carved out our own identity in terms of why people think of us and why they come to us."

But although WAE has established its own engineering place and partners away from motor racing, Wilson reckons its enduring link to the sport is crucial to the company's future. "The world's a rapidly changing place in the technology and engineering space and I think that motorsport is a fantastic enabler of change because it's very competitive, you're always trying to do more with less," he says. "It's a great platform for exploring and validating new technologies in a competitive environment. It's cutting-edge in many ways, so it's a very powerful component to have as part of the mix."

But had Williams's woeful 2018 F1 season occurred when WAE was just being established four years earlier, it might have been "very difficult" for the new business, according to Wilson. As it was, with dominant Mercedes power in '14, the F1 squad had its most successful season since '03,



Wilson charts the rise of WAE, and emphasises the growing importance of electrification



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Double podium in Abu
Dhabi capped excellent
2014 for Williams F1

with a pole in Austria and a double podium in Abu Dhabi on the way to finishing third in the constructors' standings.

"[The early stages of WAE were] difficult anyway because we were trying to create a new business and find new customers," Wilson adds. "If Williams F1 had had the year it had last year in 2014, that would have been very difficult for us to get going – I can probably describe it in that way.

"Now we're of sufficient size and capability and known for what we're doing that although Williams F1 had a difficult year, it's not critical for Williams Advanced Engineering because we are already at a certain mass and have relationships of our own that are going on.

"That's the other way of looking at it in terms of how it could have been had things been very different. WAE is just very fortunate that the Williams performance on track in 2014 and '15 was really strong. It'll get back there, but it's an important part of our DNA."

By building on its motorsport heritage and then establishing its own position in the engineering sphere, WAE has expanded to more than 300 employees, while the motorsport skill base and background of its workforce has diversified from roughly 60% when it was launched, to around 20%. This is because of the varied engineering backgrounds required to reflect the other industries where it's working.

Although its business portfolio is diverse and expanding into areas that rarely have previous motorsport associations, WAE's determination to retain a link to its racing heritage is reflected in what could be termed its headline acts. Namely, the FE Gen1 battery and its current technical-partner relationship with the Jaguar team.

For FE's Gen1 car, Williams was tasked with building a 200kg lithium-ion cell battery. It was initially expected to



FE's first race in Beijing
2014 passed smoothly
with new WAE battery

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motorsport
IMAGES

produce a maximum power of 133kW, but this was increased to 150kW ahead of the inaugural 2014-15 season and was then upped to 170kW for the second campaign. By the end of the 2017-18 season – WAE's last as the ABB FE Championship's battery supplier – the maximum power output was 200kW.

WAE's FE involvement came surprisingly late in the build-up to the series' first season. A major OEM had been working on the first FE battery, but that did not come to fruition and so in September 2013, just one year before the championship's first race would kick off in Beijing, WAE stepped in.

"We didn't win anything – in fact we had a bloody big problem in late 2013," Wilson says of WAE getting the contract to supply FE with its first battery. "But it was a great problem to have because it was like, 'If we can do this then it's fantastic for our business.' But it was really a tough assignment given the timescale."

The first prototype battery had to be built by February 2014 and the initial shipments for the first race started in

July of that year, around the pre-season testing arrangements, so time was tight for WAE to deliver.

Given the precarious situation in which FE found itself during its first season – CEO (and soon to be chairman) and founder Alejandro Agag has said the championship faced debts of \$25million before additional investment came in – any major battery dramas could have been disastrous for the series.

"I believe that if we had produced a battery that kept failing it would have killed the championship, it just wouldn't have existed," says Wilson. "There were enough other reasons why it would have stopped anyway, and that would have just been the straw that broke the camel's back. So it was great being part of that and watching the championship flourish."

When Agag is asked if he agrees that WAE saved his fledgling championship, he states: "Absolutely I would. We had a big car manufacturer that had committed to providing the battery. Then we were a few months down the line and everything was coming and suddenly they called and



Fleet of C-X75s was built for Bond movie but never released

“There’s no point in us getting credit and next year the programme stops”

said, ‘We cannot do it.’

“So, we found ourselves with no battery. It was a situation of total panic and the ones who stepped up and said, ‘We will build your battery, don’t worry about that’ were Williams. So, big credit to them, they did save Formula E before Formula E was born.”

Wilson says that electrification is “a big driver of what we’re doing and what our capability is”, and WAE is currently working on several high-profile projects in this area. In addition to the products already mentioned, it also supported the record-breaking Jaguar Vector V20E electric boat, works with various battery and energy-storage companies, and it will provide the powertrain for Aston Martin’s Rapide E road car, which is set to be the manufacturer’s first all-electric model when it launches later this year.

This rapidly evolving technology sphere is one Wilson thinks more people should be turning towards, even though WAE was unsuccessful in winning the FIA tender to supply the battery for the Gen2 FE car

– that deal ultimately went to McLaren.

“I read recently that a person who is now 14, 15, at the point that they come to buy their first car – let’s say in four or five years’ time – there’s a good chance it’s going to be an electric car,” Wilson explains. “Maybe, that’s not that far away. From that point they’re likely to never own anything but an electric car. If you think about it like that, then embrace Formula E because the world’s changing.”

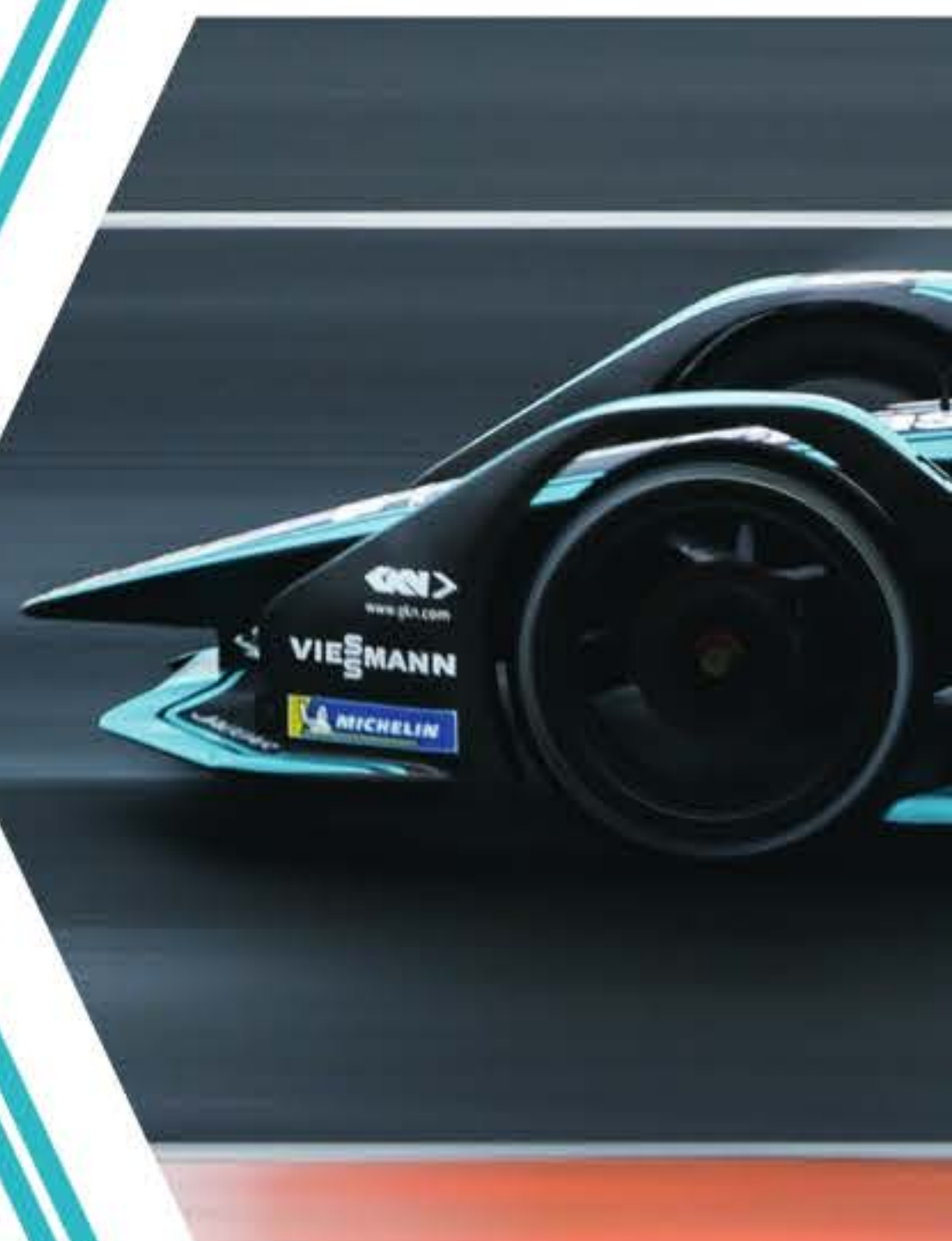
WAE certainly embraced FE beyond its initial role in supplying the Gen1 battery. Since the 2016-17 season, Jaguar has been competing in the series with significant support from WAE. As well as providing engineers and mechanics as Jaguar’s technical partner, the company has researched and produced the areas of the team’s powertrain that are open to development within FE’s tightly controlled regulations.

The company’s initial foray into working for an FE team actually came about in part



Williams F1 had a tough 2018, but WAE now has its own identity

MOTORSPORT IMAGES/DUNBAR

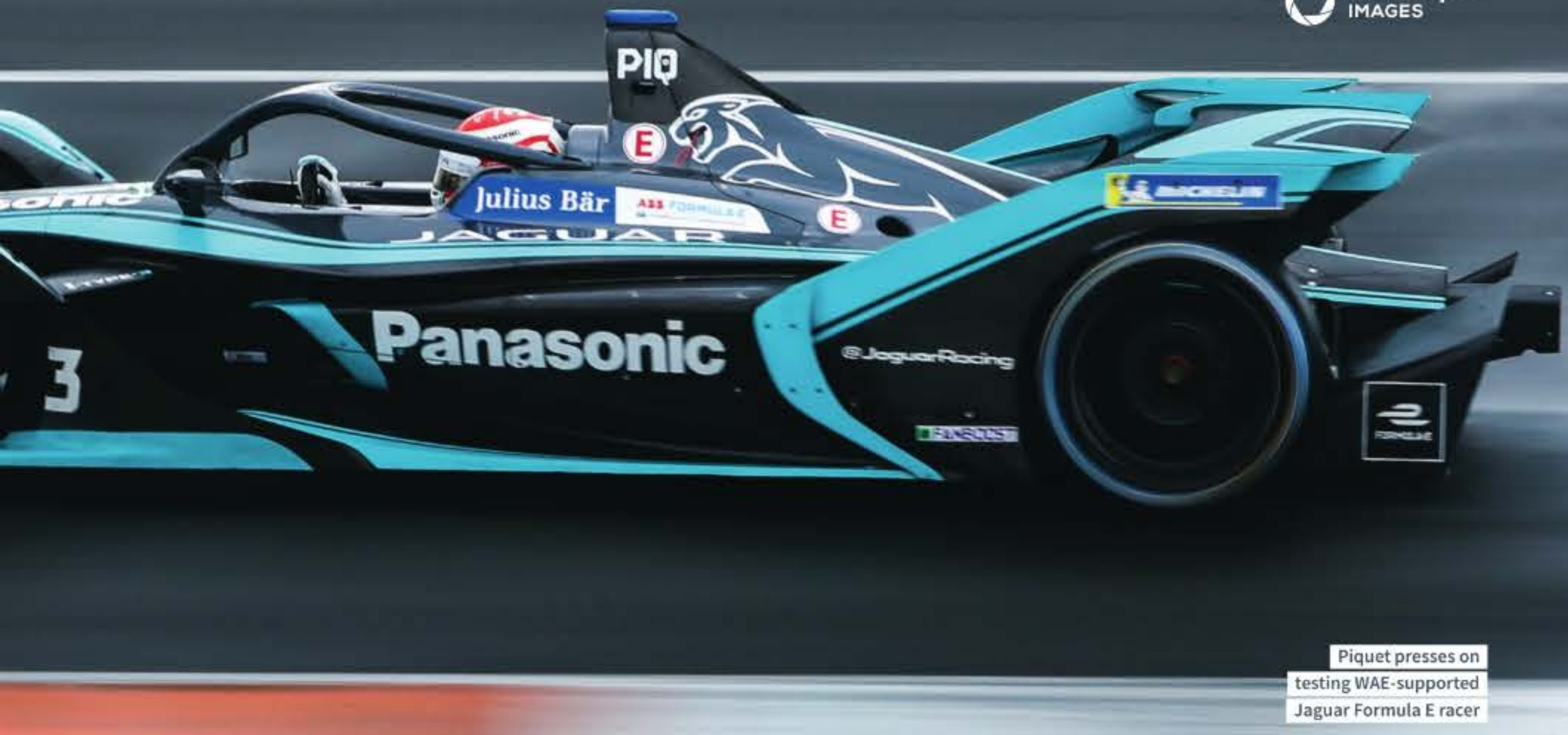


thanks to FE’s (now much-altered) technology roadmap. The championship’s initial intention was to have free battery competition from the start of the third season, which meant “we didn’t have a role in Formula E after year two at that time”, according to Wilson.

So, after battling away Agag’s understandable “badgering” to get Williams to formally enter FE as a competitor alongside its F1 commitments, WAE saw its chance to add a second strand from the series to its business via its well-established ties with Jaguar.

“By chance one day I was talking to Dr Wolfgang Ziebart, who was the head of Advanced Engineering at the time,” says Wilson. “He’s since retired, but he led the Jaguar I-PACE [SUV model that has its own FIA-sanctioned FE support series] programme. I said, ‘Would Jaguar have any interest in Formula E?’ because I knew that at that time Alejandro was still looking for more credible teams.

“His eyes lit up a little bit, which was a good sign, and about four months later I was asked to go to a meeting with him and three others to talk about what it might look like and how they could do it. We worked with them to put a proposal together, which was subsequently signed off by their board should the opportunity



Piquet presses on
testing WAE-supported
Jaguar Formula E racer

[to enter a team] present itself."

At that stage, while Agag was keen to add another major manufacturer to FE's portfolio, the maximum number of teams allowed to compete in the series was 10. All 10 slots had been filled since the first season and the existing squads were within their contractual rights at that moment to stop an 11th entrant coming onto the grid – although from the start of the current campaign 11 teams have been permitted and that will expand to 12 for 2019-20.

"[They said] 'No way, we're not going to have another team join, thanks very much, and certainly not Jaguar and Williams,'" says Wilson. "It took until the Trulli team fell over for an entry to become available and that's how – and because we were in pole position with everything signed off ready to go – we were able to start. Jaguar acquired that entry and went from there."

To avoid any accusation of conflict of interest for the following two seasons, where it continued to supply FE with its Gen1 batteries while working with Jaguar's team, WAE "transferred the technical management [of the batteries] to Spark".

"We trained up Spark engineers and they did all the interface with teams," Wilson continues. "So from that point we didn't look at any teams. We still maintained the batteries, so we did service repairs

and things if they needed them, but we completely severed any ties with any data link with teams. And it was fine; a couple of teams moaned for a couple of races, but it was nothing."

Although it may look as if WAE's Jaguar FE project is something of a flagship for the company, Wilson insists that's for others to say. WAE's relationship with the manufacturer – and the vast majority of the companies it works with – is to be very much a quiet partner.

"People in the industry know what we're doing," says Wilson. "It's not something that we're desperate to be singing and shouting about. In the first year, Jaguar was making a lot more reference to us than they do now and that's just their marketing reasons that are driving that. They've got their I-PACE out now – they need to really push that and at the end of the day, in a commercial roundabout that's what creates the revenues in order to fund their motorsport programme."

"So that's what we support. That's the most important thing – that the economic circle is joined up and works. There's no point in us getting a lot of credit and then next year the programme stops because it hasn't helped sell the cars, you haven't got the revenues. We've just got to be very mindful of the realities."

WAE is also keen to highlight how it sees itself in the UK's engineering environment. As well as its government commissions, Wilson points out that its innovations create jobs further down the line. For example, WAE doesn't make the Aerofoil system for supermarkets – "there's another business now who's making them," he explains.

"We're a very proud British company, that's the first thing, and I think that's a Williams thing as well," concludes Wilson. "We are doing what we can also to help UK companies. That really drives us – how can we help not only Williams but also the UK from an engineering perspective? So, we do a lot with schools, we do a lot with graduates, universities – bringing people in for training and development."

"Patrick Head was the one who really drove the engineering culture for many years at Williams, and we often say we're an engineering company. Frank has said actually we're an engineering company that happens to go motor racing, because his love was motor racing, but we just like solving engineering problems."

Compared to the brash nature of motorsport success, WAE maybe is something of a quiet company. But that appears to suit it well – it lets its products and innovations do the talking. ■

HOW DO YOU DESIGN A FORMULA 1 CAR ON A BUDGET?

It's well known that money is a significant factor in a grand prix team's success, but what happens when there is very little of it to design and develop the car?

A group of experienced F1 engineers explain the key things to prioritise

BY JAMES NEWBOLD

Formula 1 has changed almost beyond recognition since March pitched up to the 1970 South African Grand Prix with five Robin Herd-penned 701s. Each cost £6000 – later upped to £9k after a friendly word of advice from Ford's Walter Hayes – and claimed pole and a podium on debut, a mere matter of months after the company had been set up with just £10,000 put in by its four founding members.

Despite frequent attempts to cut costs by implementing test bans, along with ever-tighter restrictions on CFD and windtunnel usage, there remains a gulf between the haves and have-nots. This inequality appears desperately unlikely to change anytime soon, despite Liberty Media's best intentions.

The oft-mooted cost cap is no nearer to fruition than it was a decade ago, when the possibility of a £40m limit being imposed on teams prompted political chaos, including the possibility of a breakaway championship. While Mercedes spent

over £300 million – not including its engine division at Brixworth – to win the 2017 world title, fourth-placed Force India required a mid-season buy-out in '18 to survive the campaign.

In the face of this, the way Formula 1 teams approach their car design is changing. Contrary to the old model of designing everything in-house – ancillary components such as brake pedals included – Haas pioneered a new agreement with Ferrari in 2016, which has subsequently been copied by Red Bull junior team Toro Rosso, to purchase as many non-listed





Durand arrived late to work on 2001 Prost...



...but rear-end development led to points for Alesi in Monaco

parts as are permitted by the regulations. Haas then sub-contracts to Dallara the manufacturing of the monocoque, roll structures and major bodywork – which includes the wings, floor and diffuser – to further reduce overheads.

But amid this shift, the engineering challenge of producing the best car possible within financial restraints remains fundamentally the same. As Toyota discovered, success in F1 can't simply be bought. No amount of financial muscle is likely to turn McLaren's recent fortunes around overnight. At heart, it remains an

ideas game in which the team's budget simply dictates the extent to which these are turned into reality, as former Prost technical director Henri Durand explains.

"The bottom line is the budget determines the number of people you have and the equipment you have," he says.

"You have a certain amount of time between starting the development of the car and freezing the design for production, and the budget determines how much you can cram into that time because of the number of people. At that time [when he joined Prost], people were starting

to do two shifts in the tunnel. Essentially the difference between a small budget and a big budget was the number of shifts in the tunnel, the number of designers in the aero group and in the composite group who produced the design in the minimum amount of time. It's determined by the [number of] people, multiplied by the skills of the people."

Durand arrived at Prost from McLaren in January 2001, too late to impact the design of Jean-Paul Gousset's AP04, which had a Ferrari engine, transmission and rear suspension (optimised for Bridgestone



Haas and Racing Point take differing approaches to Formula 1 car design

"Budget determines the number of people you have and the equipment you have"

tyres, not the Michelins Prost were using). Durand prioritised work on the rear end and underfloor, introducing a "fairly drastic" development package for round seven at Monaco. This brought Prost's best results of the year, with Jean Alesi taking a sixth and a fifth in the next race, Montreal, although it wasn't enough to save the team from bankruptcy.

"That was something that we started right away, although it took us a few races to put it on the track," says Durand, who now works in NASCAR. "With a bigger budget, it would have taken us less time to put it on the car. We looked at it from a perspective where you have a certain number of tools in your toolbox and your opponent has more tools. If everyone had the same, it would be a lot of fun."

STRONG MANAGEMENT

Although the quality of research facilities such as the windtunnel are inevitably a contributing factor to the prospects of an F1 car, it's how these tools are managed that can make the bigger difference. Racing Point team principal Otmar Szafnauer has said as much himself, identifying the technical group led by Andy Green – and not an infrastructure he ►

deemed “substandard compared with our competitors” – as the team’s core strength. In 2018 the team finished seventh in the constructors’ standings despite cash-flow problems that meant it started the year with carry-over parts, was unable to build upgrades and, as a consequence of the mid-season buy-out, lost all the points it had accrued prior to Spa.

For George Ryton, who left Ferrari to head up the Basingstoke HQ of the tiny EuroBrun team in 1989, working on a shoestring budget could be a “thankless task” that required a “taskmaster” to get things done. Although Roberto Moreno miraculously qualified for two early season races with Ryton’s ER189B in ’90, he was unable to get it into the points and the team was closed at season’s end.

Ryton would go on to hold key roles at Tyrrell, Forti, Prost and Minardi, where the importance of effective management became clearer still.

“At Ferrari, you could delegate lots of things so you could move onto more conceptual elements,” he says. “The quality of what you could do and the time you could do it in was accelerated. With other teams, you had to do almost all of it yourself – from layout to drawings to organising the manufacturing.

“You’ve really got to be strong and control what you’re trying to achieve. Part of getting things done quickly and cheaply is to have people do what they’re supposed to do and not waste their time.”

But a design team can’t do anything without first knowing what budget it has to work with. That means being involved in discussions at an early stage, agreeing a figure and sticking to it. For Sergio Rinland, who counts spells at Williams, RAM, Brabham, Scuderia Italia, Fondmetal, Benetton, Sauber and Arrows on his lengthy CV, the most crucial elements when working with limited funds are transparency and planning.

“You decide your budget, know how much money you have and what technology you can use – those are your limitations,” he says. “You don’t start building the car and see how much money you spend. You’ve got to know beforehand how much it’ll all cost.”



LOW-HANGING FRUIT

As Rinland explains, this requires a healthy dose of pragmatism to decide how to get the best return on money spent.

“When you’re working for a small team, you have to say ‘Where do we want to perform?’” he says. “You can’t perform everywhere with a small team, you have to say, ‘I want to perform well at Monza or Monaco, or Spa’, and if you can perform well at Spa, you can do well at Silverstone or Barcelona as well.

“You have to make those decisions because you don’t have three or four variations of bodywork, you have maybe two front and rear wings, so you have to decide where to put those efforts.

“You need to look at the car holistically. You have an engine, you have a cooling requirement from the engine as well as a power requirement and a torque requirement from the gearbox, so everything in the design has to be homogeneous with what you have – the resources and the power you have.”

But it’s not every designer who is willing to make the necessary compromises to fall within the budget. Former Zakspeed,

Larrousse and Team Lotus pensmith Chris Murphy fondly recalls working with Gustav Brunner at cash-strapped Leyton House in 1991 – “talk about confidence” – but found working with the gifted Austrian wasn’t always plain sailing.

“He could lift [small teams] with a great design, the question was always, ‘Could they afford to build it?’” says Murphy. “That’s the difference that a designer who is prepared to compromise and adapt to the circumstances can make. It wouldn’t be any good putting somebody in from Williams or McLaren because they would probably design a car that the team wasn’t capable of building.”

Murphy joined Leyton House after a spell at Lola as chief designer and project leader for Larrousse. There he called upon his experience working as one of seven employees at the Formula 2 constructor Maurer – “I was race mechanic, composite laminator, I ran the stores, I was car assembler, draughtsman and workshop coordinator, all simultaneously” – to utilise pre-existing parts and free up design capacity to focus on the aero surfaces. Parts-bin special it may have been, but Murphy sees no problem in that.

“There was no point in machining a new part that does the same job as something that already exists,” he says. “I’d always be able to come up with solutions that fitted the circumstances, and that’s not just design criteria, that’s budget, resource – how many people we’ve got to design this and build it – and timeframe, which is invariably shorter with a little team because you’re doing everything at the last minute.”

He had discovered the limits and perils of lofty aspiration the hard way at the “super-ambitious” Zakspeed outfit, which



MOTORSPORT IMAGES/SCHLEGELMILCH



Zakspeed enjoyed limited success with its highly ambitious engine project



Twin-keel suspension helped Sauber annex fourth place in 2001

bit off more than it could chew when it joined Ferrari and Renault in attempting to build its own chassis and engine in 1985. The Norbert Kreyer-designed four-cylinder turbo was heavy, unreliable and a drain on the budget, although Martin Brundle managed a fifth at Imola in 1987.

"I couldn't say that we got that right at the time," admits Murphy. "We were up against it because it was a massive project for the number of people we had, but we did alright. Not surprisingly we were nearer the back than the front."

MAXIMISING KEY ASSETS

Having a bigger budget and more skilled staff to utilise doesn't make teams immune to problems, as Rinland discovered at Benetton when attempts to introduce a front-mounted differential in 1999 proved disastrous. But it does mean that those teams have a greater capacity to recover from such missteps.

Without the same financial safety net, it could be easy for budget teams to fall into the trap of following convention. But Ryton argues that this should be avoided, even if the risks involved are higher. Pursuing an edge doesn't have to be contradictory to pragmatism, especially when there is an in-house asset available.

"Without spending a lot of money and with the right ideas, you can make huge gains by looking at things laterally," Ryton says. "Don't copy what people have done before, look at the basic problem and see if there is a more state-of-the-art solution."

That's not to say that this path will always be rewarded. The failure of Team Lotus's active suspension programme is a case in point. After finishing fifth in the constructors' standings in 1992, the squad looked to utilise the expertise of



Perez took a surprise podium for beleaguered Force India in Baku

Peter Wright and his group at Lotus Engineering to introduce fully predictive active suspension for '93. But it only worked intermittently and the FIA banned the technology at the end of the season, leaving Lotus in a financial hole from which it never escaped.

Yet this was an entirely understandable course of development. The team's customer Ford V8 engine was lacking grunt relative to the works unit powering the Benetton, it was still reliant on a quarter-scale windtunnel for its aerodynamics and, as Murphy points out, Lotus didn't have the benefit of hindsight.

"We didn't know that at the time and it's easy to look clever in retrospect. We thought it was going to be a fairly big launchpad for us," he says. "We would be able to run and run with it – we didn't know it was going to get banned. That was a major setback for us because we had put a lot of resource into it, and that set us back on other aspects of the car, on normal mechanical design."

Rinland's Sauber C20 showed how it could be done. Although he had left the Hinwil team to join Arrows by the time it saw daylight, his twin-keel suspension dramatically improved airflow under the car, while the introduction of full carbon suspension and titanium uprights contributed to the C20 being 60kg lighter than its predecessor. This in turn allowed the team to direct ballast forwards to optimise the front tyres and elevated Sauber to the giddy height of fourth in the constructors' table. Its haul of 21 points equalled the sum of its previous three seasons combined.

"The regulations today are a lot more restrictive to those kinds of ideas," he says. "The rules tell you where you can and can't put components, so it's more difficult, but you still have people like Force India who are punching above their weight. They created a car that has good ideas in it."

"When you're copying everybody else, you will never be able to beat them," says Ryton. "You have to be able to lead to win. And you don't have to have a lot of money to lead, you can come up with things that make cars faster that don't cost a lot of money if you go back to the raw principles of stiffness and lightness."

Lotus founder Colin Chapman is revered for championing those principles, but he didn't get everything right. In his book *Inspired to Design*, Nigel Bennett reveals that Chapman once summarily fired 10 Lotus employees when he discovered that Tyrrell only had 35 staff. All this served to accomplish was to leave the fabrication department overworked and understaffed. Designing F1 cars on a budget demands the careful shepherding of human resources as well as innovative ideas. ■

THE LAST BUDGET F1 CAR

HRT's troubled crusade collapsed at the end of 2012 when Formula 1's V6 turbo hybrid regulations were confirmed, making it the last true shoestring effort

BY JAKE BOXALL-LEGGE



A

s Formula 1 continues its relentless progress into pioneering technology, it's refreshing when a real throwback enters the fray. The little

HRT team that ran aground in 2012 was most definitely one of them; staging a full F1 season on a €46million budget, F1's first Spanish team was a modern homage to the mass of tiny outfits battling for a space on the grid in the late 1980s and early '90s. After three years of toil with little reward, it met a similar fate to the likes of Simtek, Pacific and Forti when its owner Thesan Capital was unable to sell the team.

Triggered by the collapse of Lola's F1 dream in 1997, the FIA had tightened up

the entry requirements to join F1, requiring any entries seeking to join at the turn of the new millennium to pay a bond of \$48m, later repaid in instalments, to demonstrate financial security. This virtually priced all except manufacturer teams out of the market and, in the immediate years after, only Toyota emerged from scratch, as the large start-up costs put off even the largest marques from lodging new entries, instead electing to take over existing outfits.

In 2008 and '09, the global financial meltdown and ensuing exodus of manufacturer teams gave F1 and the FIA the job of replenishing its dwindling grid, amid the unfulfilled promise of a cost cap. Of the four teams admitted, Lotus Racing and the Manor-run Virgin Racing squads made it, US F1 was a stillborn project,

while Campos Racing's entry went through a difficult birth and ultimately ended up with adoptive parents.

From the very beginning, the team toiled with financial pressures. Having budgeted for the cost cap, owner Adrian Campos's dream looked dead in the water, but a last-minute reprieve by Jose Ramon Carabante's Hispania Group provided the impetus to make the grid for the Bahrain 2010 season-opener – just, in the case of Karun Chandhok's hastily assembled machine – with ex-Midland chief Colin Kolles drafted in to run the day-to-day operations.

Although its Dallara-built chassis were underdeveloped and lacking pace, the team managed to avoid the wooden spoon at the end of its first two seasons, beating the Manor-Virgin outfit to 11th in the



HRT'S LAST HURRAH



Neither Karthikeyan nor de la Rosa qualified in Oz



MOTORSPORT IMAGES/FERRARO



MOTORSPORT IMAGES/LUNDIN



De la Rosa shows FIA president Jean Todt around HRT's Madrid HQ

SUTTON
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"I knew it was going to be hell, but it was hell with a group of very committed people"

constructors' standings in both years.

Midway through 2011, Carabante sold up to Madrid-based investment company Thesan, which came in with the goal to drive HRT up the order while demonstrating a clear Spanish identity. Relying on Kolles's personnel to go racing, Thesan gave the Romanian his marching orders and went on a recruitment drive to bring more elements in-house. Ex-Minardi driver Luis Perez-Sala took up the reins as team principal, while the team moved its headquarters from Murcia to a new facility in Madrid.

On the driving front, Narain Karthikeyan was re-signed for a second year having been benched mid-season to allow Red Bull to blood Daniel Ricciardo, while the experienced Pedro de la Rosa was signed

to lead the team, bringing a wealth of knowledge from testing duties with McLaren and Pirelli to develop the car and boost the team's commercial presence.

"I learned a lot from the management side and how complex an F1 team could be," recalls de la Rosa, who now works as a sporting and technical advisor to DS Techeetah in Formula E. "I was not just focusing on racing, because there were many other things I had to help with; I had to try to look for sponsorship, and there was also the fact that we moved the team to Madrid, which I also had to help with.

"I remember the first time people asked me why I was going to HRT, and there were two reasons. The first was to continue racing, and the second was that it was a Spanish Formula 1 team. That was unique,

[and if] I didn't help establish it then it might not happen again. I knew exactly where I was going and the difficulties we would be facing. I knew that it was going to be hell, but it was hell with a group of very committed people."

The F112 was hardly a significant departure from its predecessors, although some time had been spent in the vehicle dynamics lab to understand the F111's chronic lack of grip. Nonetheless, it was late in arriving – HRT attended pre-season testing with the old car, as the new design failed the roll-hoop and lateral nose crash tests needed to run.

It was another difficult birth for the team, and the long-awaited F112 finally made its on-track debut in a Barcelona shakedown. Dressed in a white, burgundy and gold ▶

livery, HRT's new chariot was a very conservative, functional design with little in the way of innovation.

This was hardly surprising given its diverse roots, having been outsourced across Europe. The design, development and construction had been produced by Munich-based Holzer, and the chassis was put together by UK-based Formtech Composites. Stress-analysis simulations were carried out in Portugal, leaving HRT's new technical chief Toni Cuquerella to tie everything together from various European industrial parks. It was far from ideal to lift the team off the back of the grid.

Avoiding the aesthetically challenged stepped noses of the time – a result of the FIA's lowering of the front crash structures – the car looked a lot more clean-cut than some of its counterparts, but just overwhelmingly basic in comparison.

In particular, the front wing seemed to have changed very little. In 2012, the complexity of the designs began to increase as aerodynamicists started to explore the realm of element curvature and vortex tunnels. Conversely, HRT's wing featured a trio of slats, still rooted in designs akin to those seen in 2009 and looking rather utilitarian against the competition.

There was also performance left on the table through packaging, most noticeably

at the rear end. Most teams had emerged from the 2012 off-season with a pronounced Coke-bottle effect at the back as the sidepods tapered in around the rear wheels. Even with a Williams-produced gearbox on board, which was kept as small as possible for the FW34's tight rear packaging, HRT's geometry was considerably more chunky.

However the rear wing was completely overhauled, dispensing with the long-chord top flap for something smaller to boost the airflow attachment across the wing – especially in transient conditions when the DRS was activated.

Having briefly considered a switch to Ferrari power, budget constraints ensured that HRT continued with the cheaper Cosworth engines – derived from the fast-but-fragile units used by Williams in 2006. Like back-of-the-grid rivals Manor, now renamed Marussia and also using Cosworth power, HRT chose not to complicate its car with the addition of KERS.

"I was quite surprised by the Cosworth," de la Rosa says. "It was very reliable. I would say the engine was not on our list of issues. OK, it had less power than the Mercedes and probably the others as well, but if you put that engine in a competitive car it would have been a decent package."

"Let's not forget that we didn't have KERS either, and that was at a time

when everyone was running KERS. But we thought that the extra few tenths it was giving you was not worth the €1.8m, because we had other time gains to invest our limited budget on."

Those gains appeared in the form of a new aero package at the Spanish Grand Prix, after the team had propped up the field in the opening flyaways – and failed to qualify both cars at the Melbourne season opener for a second successive year.

The front wing featured a larger, more shapely top flap, yielding more contemporary airflow management ahead of the front wheels. Sure, other teams had ventured into three-element wings, but HRT was now consistently closer to the Marussia cars with the upgrade – which also included a new bargeboard package and revised rear-wing endplates to control vortices.

"In terms of set-up," recalls de la Rosa's race engineer Mark Hutcheson, who had joined the HRT rebuilding project from Marussia, "it was OK, a normal car from that point of view. The main limitations in all these teams is that you have ideas, but you can't implement those ideas in the same way as everybody else because you've got a budget limitation."

"HRT was very limited. We maybe only had one floor update through the year and three front-wing updates. If you consider in the same year Red Bull were on front-wing update number 30 or 40, you can see the difference. It's not that the team doesn't know what to do or have any ideas, but there's a limit to what you can do."





resource to continue its development, having outsourced the entirety of its aerodynamics department, so began to turn its attentions to 2013, with de la Rosa and Hutcheson both set to continue. Development of the F113, intended to be an evolution of the '12 car, began in earnest under the guidance of new chief designer Mark Tatham.

banking crisis and it was very difficult to get any sponsors at all. Everything conspired against us.

"I feel very sorry about it, because I knew that if that project died, I would never in my lifetime see another Spanish F1 team. When I told Ron Dennis I was leaving for HRT, he didn't even know what the name of the team was! Then

"The biggest regret I have is that the turbo era caught us in the middle of the project"

"We had a €46m budget and 85 people," adds de la Rosa, "including the marketing department and administration – it was incredible to have a team running with this budget. The group of people I found there... if people ask me, 'What is the difference between HRT and McLaren?' I say the quantity. The quality of people in these teams is outstanding."

Next time out at Monaco, where HRT's shortfall in downforce was at its most pronounced, de la Rosa plonked himself ahead of Marussia's Charles Pic in qualifying and within two tenths of Pic's team-mate Timo Glock, producing "one of the best laps I've done in my F1 career". It counted for nothing though, as his race was over on the first lap after Pastor Maldonado rode over the HRT's rear wing. Karthikeyan, meanwhile, rescued the team's best result in a twice-lapped 15th place.

The team had neither the budget nor the

Then reality started to bite. A perfect storm of Spanish financial meltdown, the banking crisis, and a hangover of the global recession continued to unwind into 2012 and quelled HRT's attempts to find solid sponsorship. Looking towards '14 and the introduction of turbo hybrid V6 power units, HRT's financiers were considerably turned off by the massive investment required. With no low-budget option available – Cosworth had decided to pick its ball up and go home rather than try to compete in a high-budget exercise – and no other investors forthcoming, Thesan Capital pulled the plug.

"The biggest regret I have is that the turbo era caught us in the middle of the project, and the big Spanish crisis of 2012 hit us hard," says de la Rosa. "There were many factors, but we were really in serious conversations with [potential Spanish sponsors] and then in '12 we had the

he said to me, 'You must be nuts!' and he left the room. But that's what I wanted to do! [He was] right, but I think there's a time in life when you have to do what you think is right and that's why I don't regret it."

The remainder of 2010's 'new teams' passed in the succeeding years. Caterham (formerly Lotus) bit the dust at the end of '14 despite a concerted crowdfunding effort, while Manor survived falling into administration only to bow out two years later when Sauber snatched 10th in the '16 constructors' championship by one point. With costs of the current powertrains sky-high and the level of engineering needed to be competitive also requiring massive capital, talk of a budget cap persists.

Unless hell freezes over and the sport's grandes fromages agree to cut and limit costs, could the HRT F112 be the last true budget F1 car? As things stand, it certainly looks like it. ■



ULRICH BARETZKY AUDI'S ENGINE ARCHITECT

Meet the driving force behind Audi's sportscar success,
who never wanted to be an engineer

BY JAMES NEWBOLD

F

or some engineers, the lure of a life spent tinkering with engines in pursuit of power, efficiency and reliability means they are destined for

a career in motorsport. But despite his enviable track record at the Le Mans 24 Hours – a strike rate of 78% between 1999 and 2016, claiming 13 wins with Audi and one with Bentley in '03 – that wasn't the case for Audi Sport's long-time head of engine development Ulrich Baretzky.

Based at Audi Sport's Neckarsulm site in Baden-Württemberg, 120 miles north-west of the Ingolstadt HQ where the Team Joest-run R8, R10, R15 and R18 juggernauts originated, Baretzky is an engineer whose contribution to Audi's successes in touring cars, prototype racing and GT3 cannot be gauged in sheer numbers alone.

The 64-year-old developed the 3.6-litre V8 turbo for the original R8R prototype that became Audi's first purpose-designed race engine since the Auto Union days of the 1930s, added direct injection in 2001 that improved power, driveability and fuel economy, then pushed for the introduction of diesel power, which proved an instant hit in '06, winning

"I never wanted to become an engineer. I wanted to be an architect"

on its debut in the Sebring 12 Hours and finishing on the podium at Le Mans every year until Audi's swansong 10 years later. Yet that was never part of Baretzky's plan.

"I never wanted to become an engineer. Seriously, I wanted to be an architect," he says. "Everything was planned [to study it] and then I don't know how, I found out that being an architect, I would be forced to build houses I wouldn't like."

"I was never enthusiastic about racing as such – I enjoyed it, but I can live without it."

It was only after completing a mechanical engineering course at the University of Munich – "OK, I wasn't going to be an

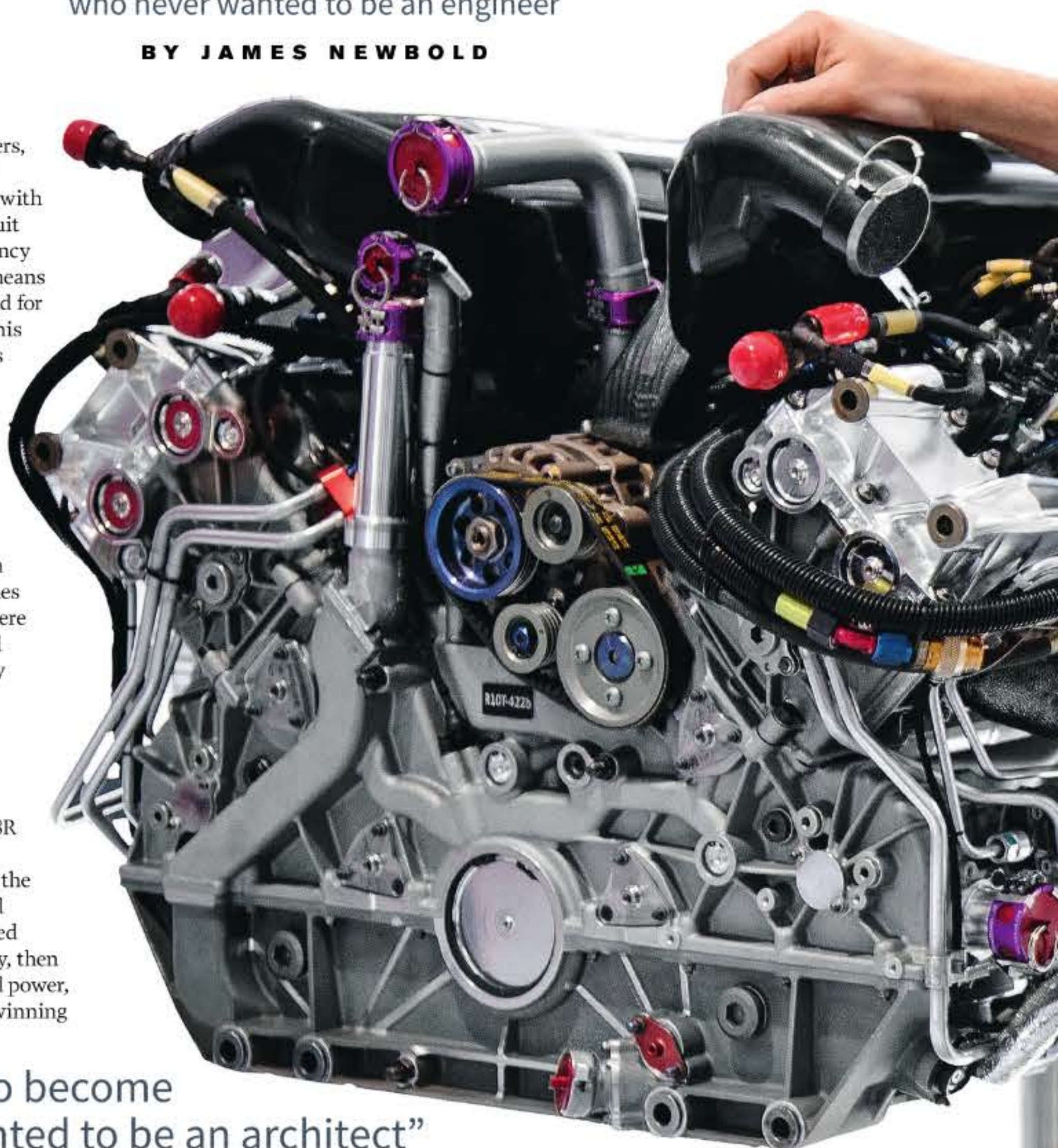
architect, but I wanted to design something" – that Baretzky, whose father owned a bodywork shop, stumbled onto the path his life would take.

Invited to an interview at BMW Motorsport in 1982, he presented plans for an engine he had designed while at university and was hired on the spot by legendary engineer Paul Rosche. After nine months spent working on high-performance engines for BMW's road division, Baretzky was moved across to BMW's motorsport arm for '83 to assist development of the M12 turbo in the back of Gordon Murray's Brabham BT52 – which, in the hands

of Nelson Piquet, became the first turbocharged Formula 1 car to win the title.

"I was responsible for the exhaust, turbocharger, wastegate and all kinds of stuff like that," he says. "There was one designer and I was the number two – you cannot imagine this today in Formula 1. It was crazy, you had to make the design – no CAD – all the drawing, calculations, even organise the purchasing of the parts, so you are working day and night. We became world champions and I got a bit of a taste for motorsport."

Baretzky was appointed project leader for 1984, but frequently butted heads with



AUDI'S ENGINE ARCHITECT

STAT

100%

A car with an engine overseen by Baretzky finished on the Le Mans podium every year from 1999 to 2016



Rosche and departed for Audi as head of race engine design two years later.

"We were a bit too similar on one hand, so we always argued with each other and I was always the loser because he was the big boss," reflects Baretzky. "Having won the world championship, he was a hero of course. I was just a young engineer, compared to him I was nothing."

Having scaled back on its motorsport involvement after the collapse of Group B, things started slowly at Audi, but Baretzky found success in the US with the Bob Tullius Group 44-run Trans-Am project in 1988 and in IMSA a year later. Attentions then ►



Stuck's DTM title in 1990 came with production-based V8

AUDI



Audi's first race engine since the 1930s finished third at Le Mans in 1999

MOTORSPORT IMAGES/COLLINS



Le Mans win with new V12 in 2006 was the first for a diesel in event history

CAPILTAN
motorsport
IMAGES

turned to the DTM and developing a production-based V8, the first normally aspirated engine he had ever worked on.

"We had exactly six months until the first race, April 1 1990. I will never forget that," he says. "We started in November [89]. It was a nightmare!"

Driving the big V8 quattro, Hans Stuck won the championship at the first time of asking after the guesting Mercedes of Michael Schumacher tangled with BMW's championship leader Jonny Cecotto at the first corner of the Hockenheim season finale, giving Baretzky the satisfaction of beating his old employer on its home turf.

But this was only the start of Audi's success in touring cars. After Frank Biela made it back-to-back titles in 1991, Audi departed the DTM amid protests over the legality of its new crankshaft, but made an instant impression in the two-litre Super Touring category and won in French Supertourisme with Biela in '93. By '96, Audi had swept all seven series it entered, including the British championship, despite having to carry draconian weight penalties for much of the year.

"I stopped designing because I was engaged in organisation and management

— how to produce 300 engines in a year and to make sure there is an engine on every weekend wherever it is needed," says Baretzky, who was appointed to his current role in '93. "This [Super Touring] was a very good apprenticeship of organisational things, how to structure the department, the purchasing and all of this stuff. This we did until '97."

Audi's next project was the big one. Baretzky and head of motorsport Wolfgang Ullrich were summoned by group CEO Franz-Josef Paefgen to the newly acquired ex-TOM'S base in Norfolk, where they were told that Audi was going endurance racing.

"He said, 'I have a dream'," recalls Baretzky. "'I want to win Le Mans and you tell me what you need to win'. I was shocked, to be honest!"

Paefgen was initially opposed to Baretzky's proposal for a 3.6-litre V8 but, despite concern over rising water pressure, the lead R8R finished third on its debut at Le Mans, the second car 14 laps behind in fourth. Both cars had also made the finish on the R8R's competition debut at Sebring — the lead car again finishing third, albeit three laps behind the winning BMW — a fact that greatly pleased the engine man.

"I was extremely proud of that," he says. "Before that, all race engines Audi had done were based on production engines, and it was a turbocharged one of course."

"Paefgen said, 'I apologise for having pushed you for the normally aspirated engine, you were absolutely right'. From this moment on, I had the full support in any direction I wanted, and I needed it again when I went to the direct injection. I didn't know how to do it, but I just said, 'We have to do it', and we somehow made it work."

By this time, Baretzky was managing an engine department of almost 40 people — up from 14 in 1993 — and had contributed to World Rally Championship programmes for VAG brands SEAT and Skoda, gradually building up his department to be ready for Audi's greatest challenge yet.

"I managed it a little bit like my own business, selling engines, trying to help here and there," he says. "I was always trying to get capacity to do more and more. It was the preparation maybe for the diesel."

TDI (turbocharged direct injection) technology had been used in Audi road cars since 1989, but never adopted for use in motorsport until Baretzky insisted, against the wishes of many on the board, that the greater fuel economy and massive torque produced by a diesel engine posed the best route for endurance racing.

"If I have a plan and I am convinced about it, I fight for it, no matter what it takes," he says. "This is something maybe which made my career such as it is, not being afraid of a challenge. We already had at that time half a dozen victories, but to win with a diesel would be something really special."

The project started in strictest secrecy in 2003 — although Baretzky didn't get the official green light to race a diesel at Le Mans



Much of the Audi board was sceptical about first turbodiesel project

MOTORSPORT IMAGES/ALECK



Baretzky was a fixture behind the scenes of Audi's LMP programme

'A PURE RACING ENGINE GUY'

RALF JUTTNER

Joest Racing
technical director

"He's a pure racing engine guy, no question. He works in a methodical way and organises his whole department the same, so we never had to wait for engines. No matter how late everything was when the latest R18 or R15 was about to be finished, the engine was always ready.

"He was very talented in convincing the board members who have to give the money that he needed so much time and so many engines, so we could make sure that once his engines were put into the race cars they were already running properly.

"We used to joke with him saying that the engines are not powerful enough or must be overly safe because we never have engine failures. He always went mad and would tell you, 'Of course we have engine failures, but we have them on the dyno where it should happen and not on the race track'. He was never afraid to try something new, but it was always proven before he put it on the track."



until the following year, when the first diesel-powered entry for over 50 years, a Taurus Sports Lola using the production V10 turbo from a VW Touareg prepared by Caterpillar, underlined the challenge he would face by lasting only 35 laps before the over-stressed transmission gave up.

But there was a problem – nobody in the Audi Sport competition department had any experience of diesel engines.

"I went to my colleagues in production and I said, 'You are diesel guys, explain to me what are the most important things I have to look after,'" Baretzky recalls. "They said, 'Simple – air, the more the better'. I said, 'OK, this doesn't really help me!' But the other one is capacity, that's another story."

Permitted to use up to 12 cylinders and 5.5 litres of displacement, Baretzky did just that and set about testing with a production-based diesel V8 – using a crankshaft that had a similar bore and stroke to the later V12 – to better understand the cooling, forced-induction and injection requirements for his bespoke aluminum design.

The production-based engine could achieve close to 650bhp and around 660lb ft of torque on the dyno, but there was never any question of Baretzky dropping his pet project.

"I had never made a 12 cylinder, I wanted to make a 12 cylinder, so I made it," he says. "It was curiosity and passion, it felt like somebody who has discovered a new island."

The first roll-out of the new R10 – the replacement for the R8 that had won Le Mans every year from 2000-05 except '03, when the Bentley Speed 8 LMGTP powered by a Baretzky-developed four-litre V8 turbo finished first and second – was completed by November '05, with its whispering V12 packing 650bhp and 750lb ft.

It won on its debut at Sebring the following March, despite dropping three cylinders by the finish, while its Le Mans bow brought further difficulties, as the injectors on the lead #7 car had to be changed in hour four. But the second R10 driven by Biela, Emanuele Pirro and Marco Werner ran unaffected and, using the same engine in the race as it had for practice and qualifying, swept to victory, the first of three in a row against ever-stronger opposition that from 2007 included Peugeot.

After missing out in 2009 to the French marque's 908 with the new R15, powered by a lighter 5.5-litre V10, Audi's updated R15+ more than compensated for the reduction in boost pressure and air restrictor limitations placed on the diesels by the ACO for '10 and

"I never wanted to become a star. I still don't want to be!"

smashed the 39-year-old distance record on its way to victory, managing a still unbeaten 5410.7km (397 laps).

But it's the 2011 race, only the second competitive outing for Baretzky's 3.7-litre V6 after delays had caused the new R18 coupe to miss Sebring, that he highlights as the most emotional of his career. The last remaining Audi held off a bevy of Peugeots to win by just 13 seconds. It was also the last non-hybrid win for the foreseeable future, Audi's R18 e-tron Quattro beating Toyota in '12, '13 and '14.

Against ever-tighter restrictions on fuel usage, Baretzky was still finding gains until Audi's withdrawal from the World Endurance Championship in 2016, and regrets that the latest iteration of the four-litre V6 diesel – with consumption figures he brands a "huge achievement" – was never raced.

Twenty years on from the debut of the prototype programme that rewrote the history books, Baretzky remains modest about his contribution.

"I never wanted to become a star, I still don't want to be," he says. "If someone said, 'You're a legend', I said, 'No, forget it, legends are dead, I'm still alive and I want to be for a longer time!' It's not down to me personally, it was my department that made it work, that made the design accurate. It's always a group that is making that."

Asked for his keys to success, Baretzky highlights being humble and modest, not being afraid of big names, and making decisions based on reason and not deviating. The third part of his answer is illuminating – had he followed it to the letter, he wouldn't have had a career in motorsport.

Audi, not to mention sportscar racing, would have been much the poorer for it. ■

GETTING THE MOST FROM YOUR VEHICLE WITH **HP TUNERS**

The European aftermarket and performance tuning market has a major new player, one that has a proven 15-year track record in the USA and Australia

"The performance market is absolutely huge. I was recently at the Essen trade show in Germany, which is open for nine days and attracts over 350,000 people interested in tuning and aftermarket products. Everything from buying a set of wheels to an entire engine build, you name it, you can get it."

These are the words of HP Tuners' European Director of Operations Rob McIntyre. Performance vehicle tuning has a significant presence closer to home, too.

"In Stevenage, not far from where I live, on a Thursday night there's a club meeting and up to 200 cars turn up," McIntyre continues. "The police are fine with it provided they don't hoon around and do anything silly. The enthusiast turnout is just eye-opening..."

And this is where HP Tuners comes in, offering a user-friendly way of extracting greater performance from your vehicle's engine or transmission, all via the OBD2 (onboard diagnostic) port. For HP Tuners' MPVI2 hardware interface, together with VCM Suite software, this is just the start.

The company was formed in 2003 when a few car enthusiasts decided to take on the immense challenge of improving the calibration product offerings

on the market. Starting primarily on GM vehicles, then Ford and Dodge platforms in the following years, today HP Tuners supports everything from Mercedes to Audi, VW, Toyota, Nissan, Jaguar, Land Rover and more.

Based in Chicago, HP Tuners is now well-established in the USA and Australia, with thousands of dealers around the globe. Now it has turned its sights towards the UK and Europe, starting with a presence at the Autosport International show from January 10-13.

HP Tuners' products are flexible enough to offer support for the motor enthusiast all the way to a dedicated track vehicle. McIntyre actually has a racing background, having run professional karting teams and crossed paths with the likes of Lewis Hamilton, Anthony Davidson and Sam Bird. Regardless of need, everything from diagnostics and logging, or to the serious recalibration of the engine and transmission, all are available from one sophisticated piece of hardware and software from HP Tuners, and all via connection with the OBD2 port.

Although tuning fans can be stereotyped as the 'pimp my ride' crowd who "want to lower the car's suspension, springs, big wheels, change the turbocharging, change the intercooler, the injectors", McIntyre explains that the demographic of car tuners is wider than one might think,



DUTCH PHOTO AGENCY



HP Tuners sponsors Oscar Piastri, who was eighth in the Formula Renault Eurocup with Arden in 2018



DUTCHPHOTOAGENCY

encompassing people of all ages and backgrounds.

"Sometimes it's the people that are just fed up with the same boring company car," McIntyre says, "and they want to do something different to it. Our customer base is quite wide and varied."

The same principle applies for the range and type of cars tuned. In Germany, for example, tuning is more commonplace with new cars, while in Eastern Europe the typical vehicle tuned can be significantly older, allowing the enthusiast an easier entry into the performance market.

But for HP Tuners, the primary goal is simple. While many tuning products focus on supplying a CAN-based standard tune, a one tune for all, that is not the company's primary aim.

"HP Tuners is all about providing the most powerful and simplest-to-use tools to automotive enthusiast market," says McIntyre.

Its flagship product, MPVI2, works by plugging it into a car's diagnostic port, which connects to the factory ECU or TCU – in effect, the engine or transmission's brain. In turn, it is connected to a laptop equipped with HP Tuners' VCM Suite, made up of VCM Editor and VCM Scanner software tools, which allow the user complete control of the car's electronic calibrations to tune for performance, fuel economy, or adjusting transmission shift points.

"You can fine-tune fuel mixtures, timing, or something as specific as what temperature the cooling fans turn on, and so on, then you reprogram the ECU in the vehicle with your changes,"

McIntyre explains.

The first and most obvious change for an enthusiast is to optimise engine performance to better tailor the engine settings to the car's location, since standard engine control protocols tend to be broad enough to operate anywhere from the extreme cold of Sweden to Africa's much higher ambients and lower fuel quality. But its utility stretches far beyond that.

HP Tuners' key advantages over its rival offerings are three-fold – flexibility, speed and ease of use.

The user can alter a single car as many times as they want without spending any more money in search of the optimal configurations for the vehicle, since each 'flash' typically takes between 45 seconds and a minute. By contrast, some rival products can take up to five or 10 minutes to transmit the new parameters back to the car, leaving the dyno static.

"When you give it to a tuner and they've not used it before, once they start using it they go, 'Wow, it's that easy,'" says McIntyre. "It's very intuitive, it's very easy to use, it gives a lot of flexibility, you can keep tweaking and tweaking it until you're happy."

HP Tuners is determined not to

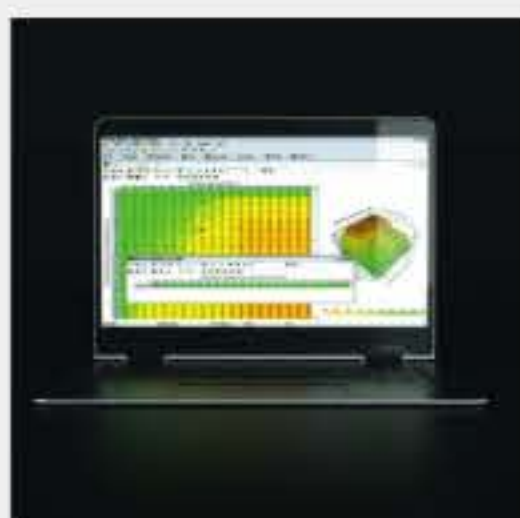
underestimate the challenge of the European market. Multiple vehicle ownership is less common than in the US, and HP Tuners is currently in the process of developing software for vehicles that are more popular on this side of the Atlantic, such as various diesel models.

"For instance, we don't have any BMW software at the moment, so that is high on our list to start developing," McIntyre says. "We are working with some major brands and some major names."

The European arm of HP Tuners has set up shop in Cambridge, where it is developing a dedicated engineering team and customer support base, plus carefully selected distributors to utilise and sell the products to users.

"The market in Europe is growing massively," McIntyre continues. "Our customer support is first class and we aim to respond within 24 hours to all customer enquiries and challenges."

"The aim is to service the customer, we're going to develop HP Tuners' product for Europe in Europe by Europeans. We can look after you, we're going to be in the same time zone give or take an hour or two, and we're going to do a fantastic job."



HOW TO BE AN ACE ENGINEER

Tino Belli reflects on his rise to prominence in IndyCar

BY JAMES NEWBOLD



hen Ed Carpenter became the third driver with a Chevrolet aerokit in five days – after Helio Castroneves and Josef Newgarden – to suffer an airborne accident

while practicing for the 2015 Indianapolis 500, IndyCar officials took the unprecedented step of delaying qualifying to consider the impact of the radical new oval package. At the centre of the storm was Cardiff's Tino Belli.

As IndyCar's director of aerodynamic development since 2014, he had overseen the introduction of kits from Honda and Chevrolet, so would be tasked with finding a more permanent solution to keeping cars on the ground than simply cutting boost.

Together with kit manufacturers Pratt & Miller (Chevrolet) and Wirth Research (Honda), Belli reintroduced a domed skid-plate and developed beam-wing flaps for the rear wing, designed to deploy at 130 degrees and increase downforce when cars spun backwards. After destructive testing at Texas A&M University to ensure the flaps could withstand extreme loads, the changes were successfully implemented for 2016.

The decision to drop the expensive manufacturer aerokits in favour of a universal bodykit to assist overtaking for 2018 then gave Belli a whole new set of challenges to overcome.

Perhaps then it's little wonder that the ex-Andretti Autosport and Panther Racing technical director has found setting the agenda more rewarding than simply responding to it as part of a team.

"I spent one week in every three from January [2017] until May in Italy windtunnel-testing ideas and trying to get the styling across," reflects Belli. "It was exciting to say, 'There are no rules, we want it to look really nice and hit these performance criteria'."

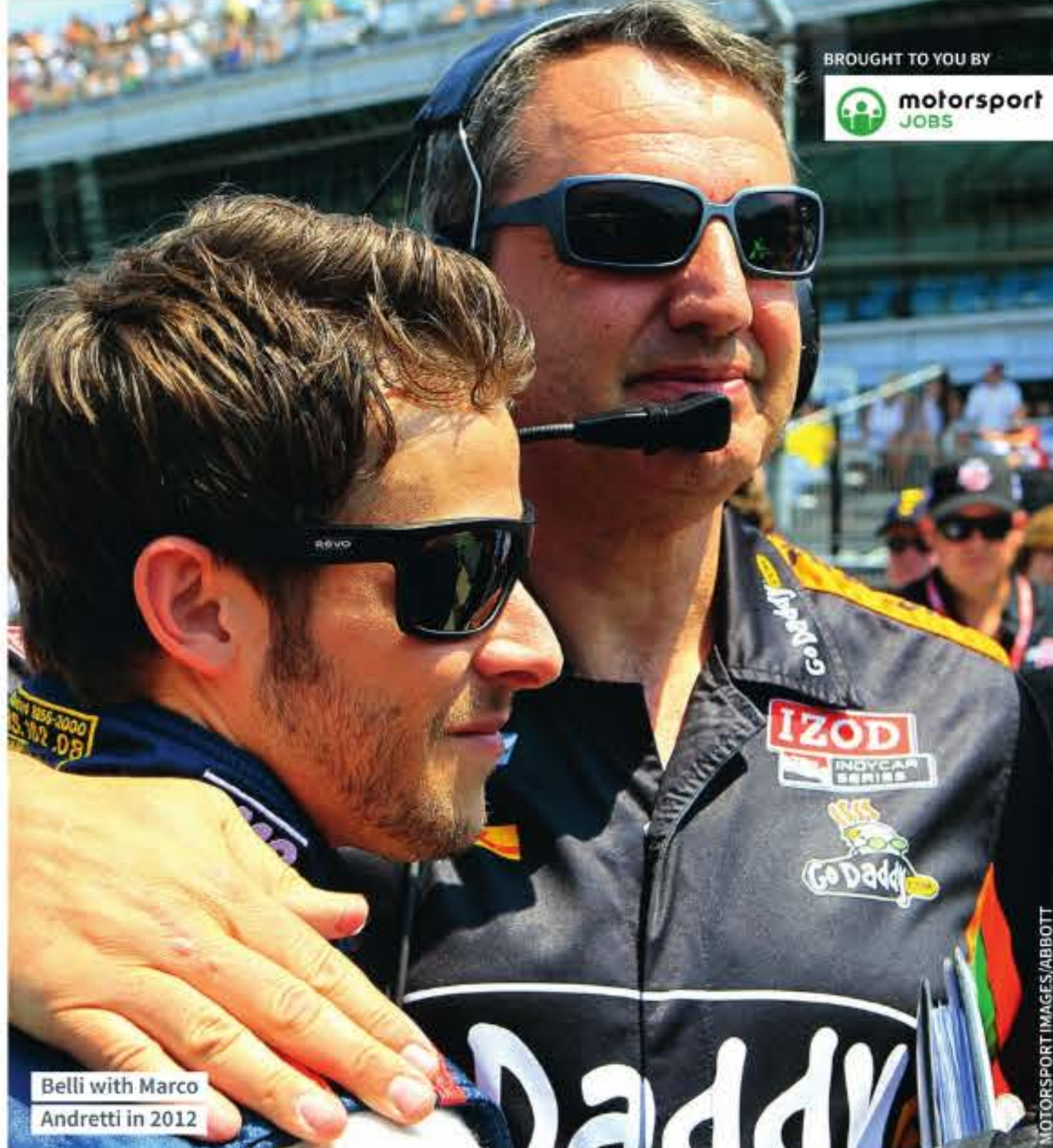
The shift from poacher to gamekeeper came at the behest of then-IndyCar president Derrick Walker, once a colleague on the ill-fated Porsche IndyCar programme, who saw in Belli a well-rounded engineer.

Having started his motorsport involvement while a student at Imperial College London, where he rallied a Fiat 128, Belli progressed to March Engineering as the head of aero, alternating between the Bicester drawing office, working on the following year's IndyCar and F3000 designs, and race engineering Michael Andretti at the Barry Green-run Kraco team. After transitioning into the Porsche project, subcontracted to March and run by Walker in the US, Belli followed March boss Robin Herd into Formula 1, where he penned

Fondmetal and Larrousse machinery on a tight budget – Belli estimates Fondmetal spent around \$2million in 1991. But design wasn't his only forte – he also turned his hand to writing lap time simulation software, windtunnel testing and track support.

That experience served him well for a long career in IndyCar, where lateral thinking between driver and engineer can go a long way. Teaming up with Green once again after Larrousse went bust, he stayed with the team through its Andretti buyout and achieved four drivers' titles (2004, '05, '07 and '12) by prioritising rotation of engineers to ensure he always had experienced cover. For Belli, that's a crucial trait of a successful team – particularly in a series with such a diverse range of circuits.

"We didn't pigeonhole our engineers, we let our aero guys be aero guys for some years and then cycled them through design and development," he says. "You have to have sympathy for people doing other tasks, and the only way that you can get that is by doing that task yourself." ■



Belli with Marco Andretti in 2012

MOTORSPORT IMAGES/ABBOTT



Olivier Beretta pushes hard in Belli's Larrousse in 1994

TOP TIPS FOR ENGINEERS

- If you want a career in racing, you need to start racing. Competing is important because it makes you realise how much effort you have to put in.
- Always be receptive and collegiate. As Robin Herd used to say, 'There's no monopoly on good ideas', so listen to everybody and judge for yourself.
- The old guys have made a lot of mistakes already so you can avoid doing the same by being open-minded and seeing if they have a valid point.

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