GP RACING

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EXCLUSIVE

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Charles Leclerc has already seen off one world champ. Here's how he'll take on the greatest

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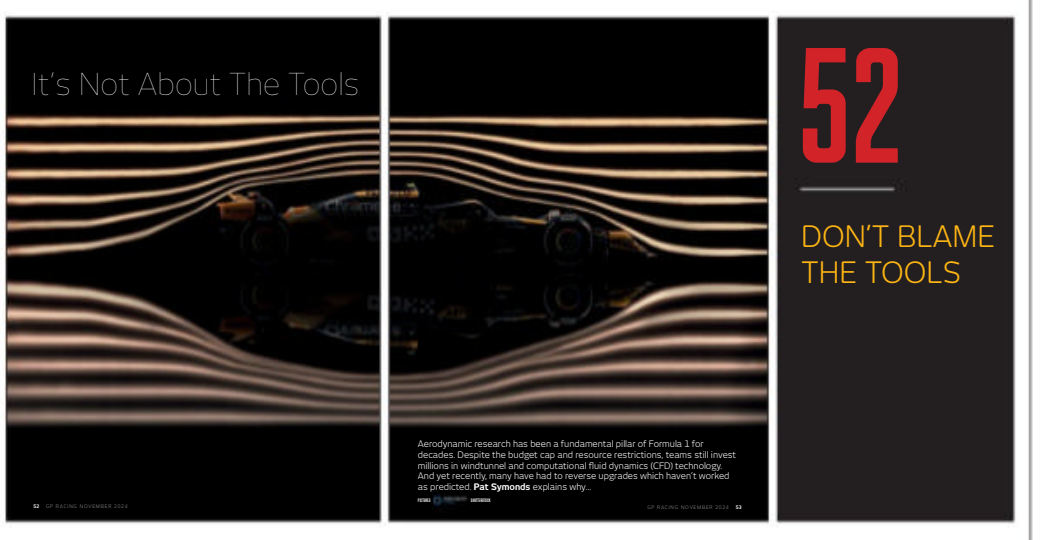

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F1 PRO

IGNITION

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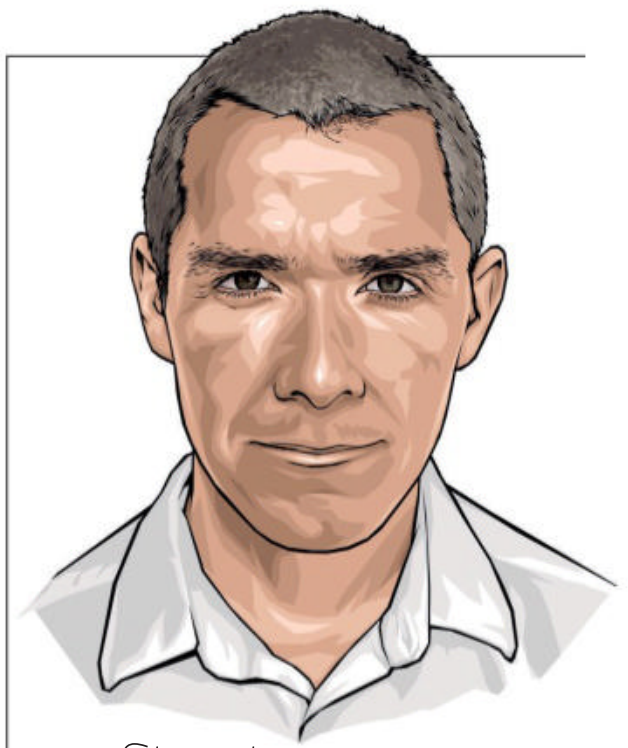

Stuart Codling
Editor

Mind your language

As pointless brouhahas go, the veritable storm-in-an-eggcup over the extent to which expletives should form part of the F1 race broadcast was remarkable for several reasons. The way it hogged the headlines over and above the excitement of the championship run-in was most peculiar – although, since what it actually represented was the rumble of old fault lines grinding against one another, perhaps we shouldn't be too surprised.

As Alex Kalinauckas points out on p106, this is fundamentally yet another example of the FIA and its president making a valid point but the wider world, and particularly F1's competitors, contriving to miss that point because it wasn't communicated clearly enough. The fact that a perfectly reasonable observation about sub-optimal communication was communicated so sub-optimally is an irony even Alanis Morrisette (the singer who, famously, dedicated an entire single to adumbrating a number of supposedly ironic scenarios which were actually just bad luck or the result of poor cutlery procurement practices) would grasp.

Words have power. That's why Winston Churchill's "we will fight them on the beaches" had a powerful rallying effect at the time and continues to resonate through history. Had he merely stood up, shuffled his papers, then mumbled "Eh, sorry, I've got my notes mixed up. Spiff spaff. Anybody been to Peppa Pig World?" the result might have been altogether different. See also Abraham Lincoln's Gettysburg Address – not even scheduled to be the headline oration of the day and just 10 finely crafted sentences long, it has remained fixed within the fabric of history. Edward Everett's two-hour bum-number, which preceded it, has not.

So, given the potency of words, we should be mindful of how we deploy – or, indeed, report them. Mohammed Ben Sulayem was voicing a reasonable point when he highlighted that widespread broadcast of expletives – albeit bleeped out – normalises a particular mode of expression, especially when the people doing it are influential role models. Had he phrased this better, and not freighted it with a needless comment about rap music which became a sideshow in itself, the point might have landed without exploding. After all, in saying that there's too much swearing on TV these days Mr President is by no means alone.

Whether or not English is their first language, a racing driver in high-pressure situations is likely to express themselves pithily. The commercial rights holder's desire to maximise drama ensures such soundbites will be picked for broadcast ahead of a discussion on going up a notch on the front wing. In *GP Racing* we accurately report what people say – but our choice is based on relevance to the matter rather than cheaply dialling up the shock and awe.

GP Racing has a podcast!
Search for 'Flat Chat with Codders' in your podcasting platform of choice

Contributors

OLEG KARPOV
Oleg has co-authored this month's Charles Leclerc cover feature (p32) as well as talking to Paddy Lowe for a *Long Interview* (p62)

PAT SYMONDS
In addition to his column (p24), Pat explains why some teams have introduced less-than-successful upgrades this season (p52)

ALEX KALINAUCKAS
As the title battle hots up Autosport's GP editor mulls over the part Oscar Piastri could play in the final destination of the trophy (p44)

DAMIEN SMITH
For *Now That Was A Car* this month Damien looks at the P160, the last car produced by British Racing Motors to win a GP (p72)

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‘Brightling’

Despite its 10.95mm height, the Trident C60 Pro 300 ‘Lumiére’ leaps from your wrist. (Just like it jumped off this page.) Its brightness results from proudly protruding indices and the logo they encircle. Featuring facets finely machined to tolerances of 0.03mm, these mini-monoliths are super-legible in daylight. But it’s the Globolight®, the unique luminous ceramic from which they’re hewn, that produces their astounding, super-brilliance at night. And inspired this timepiece’s name. The light show doesn’t end there. Carved from titanium, the 41mm case incorporates a second sapphire crystal displaying its super-accurate movement. But it’s not the back of this beautiful tool watch you’re buying into. Is it?

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F1 PARADE
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An off-day for Lando

Having watched Friday's track action in Baku, you wouldn't necessarily have put money on a McLaren winning. Neither car topped the times in practice and Lando Norris had a very scrappy FP2. I wasn't on hand in the right spot to capture him giving Pierre Gasly the finger after a near-miss elsewhere on track but I did get this moment when he ran wide at the final corner.

When the F1 circus isn't in town this bit of road feeds on to a big roundabout so the markings give an interesting graphic effect. The light is also right at this time in the afternoon as the sun dips behind the Heydar Aliyev Foundation building on the right.

Photographer
Simon Galloway

Where Baku, Azerbaijan
When 5:04pm, Friday
13 September 2024

Details Nikon Z9
24-70mm lens, 1/4000th @ F5

F1 PARADE

motorsport IMAGES

Zooming in on Russell hustle

If the weather's with you in Baku then you get some great light for the late-afternoon track sessions. It takes on a slightly warm cast. Among the quirks, the alignment of the pit buildings overlooking the main straight is slightly south-south-east so at this time of day you get some pools of shadow to play with as well.

Like many current F1 cars there's a lot of black on the Mercedes but it also has that nice loop in the Petronas colours as well as the red of the Ineos logo on the rear wing. This shot also worked out well in that the rear lights were illuminated, along with a timely flick of dust in the pool of light as George came in after his first Q3 run.

Photographer
Simon Galloway

Where Baku, Azerbaijan
When 4:54pm, Saturday
14 September 2024

Details Nikon Z9
400mm lens, 1/3200th @ F4.5


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F1 PARADE
motorsport IMAGES

Locking up and learning

It's been interesting to watch Williams rookie Franco Colapinto grow through his first three grand prix weekends. He's obviously pretty confident and not afraid to explore the car's limits, but he gets there in quite a methodical way. Obviously in Singapore he had to learn the circuit – but here the first practice is mostly in daylight anyway so it's not representative of race conditions.

By FP2 he was starting to push, as you can see here. The Williams was oversteering on the soft tyres but looked better on the hards. This venue's artificial lighting makes the smoke of a lock-up that bit more dramatic provided you expose it correctly to dial down the harshness.

Photographer
Simon Galloway

Where Marina Bay, Singapore
When 9:48pm, Friday 20 September 2024

Details Nikon Z9
400mm lens, 1/1000th @ F4.5

F1 PARADE

motorsport IMAGES

Reflection on a victory

One of the perks of being a team photographer is that you get to be in parc fermé when it wins. In some circumstances this limits your angles on the podium but in Singapore you get a pretty good shot from below, provided your driver stands in the right place.

There are other factors which make this shot, apart from the unusual angle. The organisers switch the main lights off and then fix a spotlight on the winning car; the driver then gets some of the reflection plus there's the giant LED screen behind them. The effect is like something from a Ridley Scott movie. Plus the look on Lando's face, just for a fraction of a second, as the magnitude of this victory sunk in. Singapore is a really significant race to win.

Photographer
Steven Tee

Where Marina Bay, Singapore
When 10:03pm, Sunday
22 September 2024

Details Canon EOS R3
400mm lens, 1/4000th @ F2.8


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F1 PARADE

motorsport IMAGES

Fireworks from the flyover

We like to capture all possible angles of the Singapore Grand Prix and, this being a street circuit, that takes a lot of planning and co-ordination. To get away from street level we work with the race organisers to have at least one photographer in the right pod on the Singapore Flyer, another in a hotel room overlooking the circuit, and here in the slightly unromantic location of an overpass leading off the highway.

Once you're up here there's no easy or quick way back so you accept you're here for the duration. I captured the race start from this angle, then to add some variety I zoomed in slightly for this one of Lando Norris taking the chequered flag. Timing was important because of all the fireworks!

Photographer
Simon Galloway

Where Marina Bay, Singapore
When 9:44pm, Sunday
22 September 2024

Details Nikon Z9
24-70mm lens, 1/400th @ F4

F1 INSIDER

motorsport IMAGES

WHY RICC'S RACE WAS RUN

01 RED BULL RESHUFFLE
Ricciardo loses out to Lawson

It came as no surprise that Ricciardo, unable to provide the Red Bull heirarchy with the consistency they wanted, was replaced after the Singapore GP

01 **Odds of seeing sparkling white** wine gulped straight from a shoe on a Formula 1 podium any time soon have diminished considerably following the official announcement that Daniel Ricciardo will be replaced by Liam Lawson for the remainder of the 2024 season. The Australian's journey in F1, at least as an active driver, appears to have come to an end with his departure from the RB team.

The announcement came as no surprise in any meaningful sense, since it was not only widely expected, but also fairly straightforward to explain. Ricciardo's return to the Faenza team last summer was meant to serve as an audition for a seat in the main Red Bull F1 team, and ultimately he failed to impress the bosses – leaving them with no choice but to conclude said audition.

As early as Monza, word in the paddock was that the Singapore race would be Daniel's last – and, in the week leading up to the GP at the Marina Bay circuit, this was echoed in a number of media reports. In fact, the only surprise about the subsequent announcement was its timing. A few days after Singapore RB issued an official confirmation that Ricciardo's seat would be handed over to Lawson, which left a bittersweet taste: the winner of eight grands prix had been ushered through the exit door without getting a proper send-off.

But he himself had played a part in the awkwardness surrounding his dismissal, insiders suggest. It's claimed Ricciardo was made aware before the Singapore race that it would be his last for RB – and that, for reasons that remain unclear, he and his management team decided not to make any announcements in advance. One explanation for this could be that Daniel himself believed until the very end that he could change the situation and keep his drive with a good result in Singapore. This theory is backed up by the fact that on the Thursday before the race weekend he denied that a decision had been made about his future.

"I really don't know what's gonna happen," he told reporters. "What's crazy about this sport is – and then this is me just now talking a bit of shit – but I go and get a podium this weekend, and then I'm probably the hottest thing in the sport. And I know it can change so quickly. I'm aware that things are hotting up, so to speak, but I just have to try and get my head down this weekend and kick some arse."

After qualifying, however, with no arse-kicking in sight as Ricciardo was eliminated in Q1, his tone changed to one of deep pessimism. And after the race, in which he finished 18th, no official confirmation was even really necessary – in his numerous interviews he made it pretty clear he knew his F1 driving career was essentially over (though other opportunities are likely to come his way, as Mark Gallagher outlines on p29).

Speaking later, Red Bull Racing boss Christian Horner revealed that the threat of Ricciardo's sacking had been hanging over his head since the Barcelona race in June. Dr Helmut Marko, the organisation's 'driver advisor', had pushed for Lawson to be put in the car after that weekend, and it was Horner himself who extended Daniel's season by a few months. Given the known tensions between Marko and Horner, this intelligence came as little surprise.

However, even Horner, who was instrumental in offering Ricciardo an F1 lifeline after McLaren dropped him, admitted Daniel hadn't delivered what had been expected of him. Fourth in the Miami sprint remained the only real highlight of his year; on average, he was slower than Yuki Tsunoda. Red Bull bosses have made no secret of the fact that Ricciardo was brought back with the idea of him being a potential replacement should

02 VIRY BAD THINGS
Renault shutters F1 engine programme

03 ROOKIE RACE OFF
Sprint idea postponed

Lawson's last appearance for AlphaTauri in 2023, in Qatar, wasn't great but it didn't affect his standing with Red Bull

Sergio Pérez no longer suit the team as Max Verstappen's partner. However, even though Pérez has had a torrid season, Ricciardo didn't impress enough to pull the trigger on that.

"It was the lack of consistency," explained Horner. "He started the season roughly and then Miami was a weekend of two halves. The Friday and Saturday morning was fantastic, and it looked like the Daniel of old defending against Ferraris and outdriving the car. But then the Saturday afternoon and the Sunday were disastrous."

Intriguingly, Lawson has only been confirmed for the remainder of 2024, and RB's announcement made no mention of next year. It's understood Red Bull had to guarantee him an F1 seat in order to keep him under contract – but a confirmed 2025 promotion would have probably ticked that box. This adds intrigue to the decision to put him in the car now.

THE THREAT OF RICCIARDO'S SACKING HAD BEEN HANGING OVER HIS HEAD SINCE THE BARCELONA RACE

Why? Well – and there are echoes of Ricciardo's situation this time last year – Lawson's six races with RB are seen by many as an audition for a bigger role. Pérez's seat remains in jeopardy unless his results improve, and it seems Red Bull sees Lawson as a stronger candidate for a promotion than Tsunoda.

"Last year, Liam jumped in and beat Yuki in Singapore and Japan, and was quick from the outset," Horner said of Lawson's prospects. "He's a tough racer, we know that he's very adaptable. And certainly, the testing that he's done for us in the Red Bull Racing car this year has been very, very encouraging."

"Obviously, [ideally] Checo finds his form and rediscovers the shape that he was in at the beginning of the year and nothing changes. But, in this business, two weeks is long-term."

Ricciardo's future remains unclear for now. Marko has already confirmed Red Bull is "interested" in continuing to work with him if he wants to stay with the brand in another role. Rather like former Haas team principal Guenther Steiner, Ricciardo enjoys a public profile perhaps disproportionate to recent on-track results courtesy of his larger-than-life persona being amplified on *Drive to Survive*.

"We have had a conversation and it is clear we're interested," Marko told *GP Racing's* sister publication *Formel1.de*. "He is one of the most popular F1 drivers, especially in the United States. But he wants time to consider his entire future. I don't think he will enter any other racing category. And on the other hand, if he's no longer actively racing, will he still want these PR activities at all? Ricciardo also has a lot of money in the bank and I would say it's a life decision for him to decide how he wants to shape his future life." ▶

Helmut Marko with Liam Lawson earlier this season. Marko, Red Bull's special advisor, wanted Lawson in at RB after the Spanish GP

Christian Horner with Ricciardo. Horner helped extend Dan's season but eventually could do no more to avoid the Australian getting the chop

PICTURES: SAM BLOXHAM; MARK SUTTON; ANDREW FERRARO; LIONEL NG

After eight wins and 257 starts it seems the 2024 Singapore GP has provided the full stop on Ricciardo's F1 career

F1 INSIDER

RENAULT BOSS BLAMES FRANCE FOR ALPINE STRUGGLES

Renault CEO Luca de Meo has bemoaned a lack of French backing for the team that he wanted to make into the French Ferrari

02 **It's official: Renault will stop** producing Formula 1 engines at the end of 2025. The Viry-Châtillon factory, which has been at the heart of Renault's F1 journey since it introduced the turbo in 1977, will be transformed into an engineering centre for the development of new technologies for the French car manufacturer.

Rumours have been circulating since July that Renault might abandon F1 engine activity. Even those in charge of the Alpine racing programme made no secret that this was the plan. Owing to employment law the final decision was kicked down the road until the end of September and, in the weeks leading up to it, Viry-Châtillon staff tried to persuade management to change its mind. However, neither arguments that closing the programme would undermine Renault's F1 ambitions, nor assurances the power unit being developed for the new regulations should actually be competitive, convinced the company bosses. A demonstration organised during the Italian GP, in which 100 employees from Renault's engine division travelled to Monza to voice protest, did not help either.

De Meo (above, with Ocon) has confirmed that Alpine's Renault engine programme (below) will finish at the end of 2025

Luca de Meo, CEO of the Renault group, made no secret of the fact that his main argument was numbers. The in-house programme costs hundreds of millions of euros a year, whereas a customer engine can be bought for as little as €15-20m.

"I am a manager. I run a listed company," he explained in an interview with *L'Equipe*. "And I have to rethink the F1 project, to finally win. So I'm looking for shortcuts to achieve this. Another two years like this and the project would completely deflate. We've been on a downward slope for three seasons. We had to shake all that up. With a financial logic in mind. Real enthusiasts are not concerned by this calculation. I am."

At the same time, De Meo has no evidence that Viry-Châtillon can, at least in the short term, produce a product comparable in performance with Mercedes – other than the promises of the employees.

"The transition to the hybrid era required powerful investments that were underestimated at the time. We operate, structurally, with three cylinders when others have eight. When I arrived four years ago, the group wanted to stop F1. If it's still there, it's because I saved the thing. But we don't have the structure to be at the forefront of battery chemistry development, software management, energy recovery."

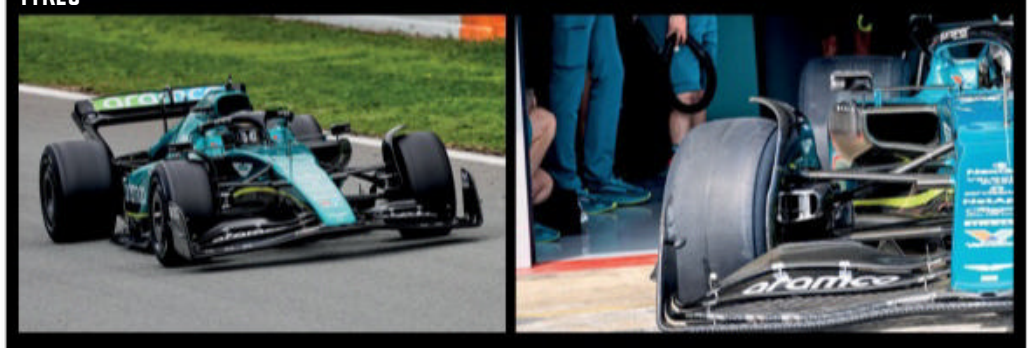
If this sounds like the boss is giving up on the project, it's because that's exactly what's happening. But as well as pointing out the company's own missteps, De Meo also blamed France for failing to support the national team in F1.

"I wanted to make a French team, the French Ferrari," he said. "I put two French drivers in the seats: they crashed into each other. Take a tour of an A524 with me, there's not a single French sponsor. Not one! I knocked on many doors."

What is not yet official is the imminent switch to Mercedes engines – but that is only a matter of time. Reports of negotiations between Alpine and Mercedes HPP emerged almost simultaneously with the first rumours of the possible closure of Renault's own F1 engine programme. ▶

NEWS IN BRIEF... NEWS IN BRIEF...NEWS IN BRIEF...

TYRES



BARCELONA-CATALUNYA was the venue for the first test of the resized Pirelli tyres to be used in 2026. The wheels stay at 18 inches, but the width and external diameter of the tyres will be reduced by 25mm at the front and 30mm at the rear. Felipe Drugovich completed 865 miles over two days in an adapted AMR23.

SPONSOR

Luxury brands such as Louis Vuitton and Moet will be present in F1 from next year after Liberty Media agreed a 10-year global partnership with LVMH, worth a reported $1billion. Its brand TAG Heuer will replace Rolex as F1 official timekeeping partner.

HIRE

McLaren has signed Red Bull's chief strategist Will Courtenay as its new sporting director. Courtney has been Red Bull's's head of race strategy for the past 14 years. At McLaren he will report to long-time racing director Randeep Singh.

RIP

Rupert Keegan, hailed the next James Hunt due to his playboy lifestyle, has died at the age of 69. Keegan started 25 GPs from 1977-1982 and, like Hunt, began his F1 career with Hesketh. His other starts came with Surtees, in a privately-entered Williams, and March.

PICTURES: SIMON GALLOWAY; MARK SUTTON; PIRELLI

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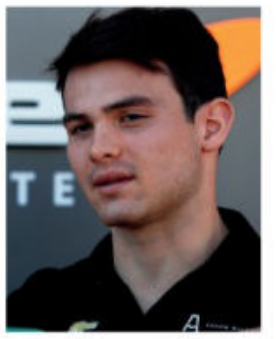
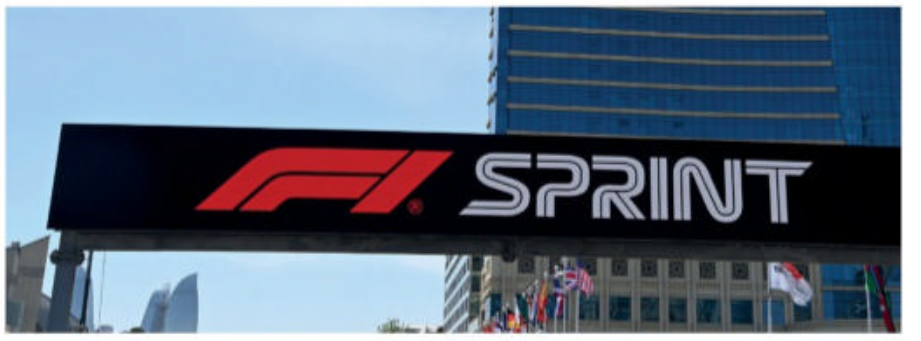
NO SPRINT FOR ROOKIES

03 **Formula 1 had a promising idea** everyone liked and supported: a post-season race for young drivers, giving them the chance not only to experience driving F1 machinery, but also to compete. Given how rare such opportunities are in the sport today, the proposal gained momentum and was almost approved… only to be put on hold.

The idea, first mooted by the F1 teams over the summer, seemed perfect. Since there's already a post-season test session in Abu Dhabi, why not have a short sprint race at the end of the day? It could become an additional and exciting event for F1. The elements were quickly put in place: each team would enter one car, creating a ten-car race. And although the concept had the unanimous support of almost everyone involved, including the teams, the FOM and the FIA, the project stalled before it could be rubber-stamped.





Robert Shwartzman, Pato O'Ward and Felipe Drugovich (top, left to right) could all have been potential entrants into a rookie sprint race at the end of this season

"The concept of a 'rookie race' to be added to the 2024 post-season test schedule at Abu Dhabi was discussed," an official report from the F1 Commission meeting at the beginning of October stated. "While the concept received widespread support, it was determined that due to timing and organisational constraints, the event would not take place in 2024, and discussions will continue to formulate a potential concept and plan for 2025."

Obviously, there were several major obstacles and the solutions proved too complex. F1 simply ran out of time to put the event together. The main problem, it appears, was a lack of funding. Attempts to find a sponsor for the 'rookie sprint race' failed, partly due to time constraints – and, according to insiders, the teams refused to pay for the event out of their own pockets. There were also problems with the organisation of television broadcast. While FOM wanted to film the race to the usual F1 standards, it also had to ensure that international broadcasters would want to air it, which proved difficult. A race with only ten cars and drivers unknown to the wider public was unlikely to generate much excitement in prime time on a Tuesday after the final round of the world championship.

The idea hasn't been scrapped altogether, just postponed until December 2025 for now.

F1 SIMPLY RAN OUT OF TIME TO PUT THE EVENT TOGETHER. THE MAIN PROBLEM, IT APPEARS, WAS A LACK OF FUNDING

F1 MASTERMIND

Your chosen specialised subject: the world's greatest motorsport

Q1 Argentina's 38 GPs wins have been shared between three drivers. Who are they?

Q2 How many times has Lando Norris failed to finish in the top 3 in 2024: 5, 6 or 7?

Q3 Logan Sargeant and which other three drivers do not have a Q3 appearance in 2024?

Q4 True or false: Ferrari never won an Australian GP held at the Adelaide street circuit?

Q5 Carlos Sainz has five GP pole positions to his name, but which is the only race where he didn't convert pole into at least a podium finish?

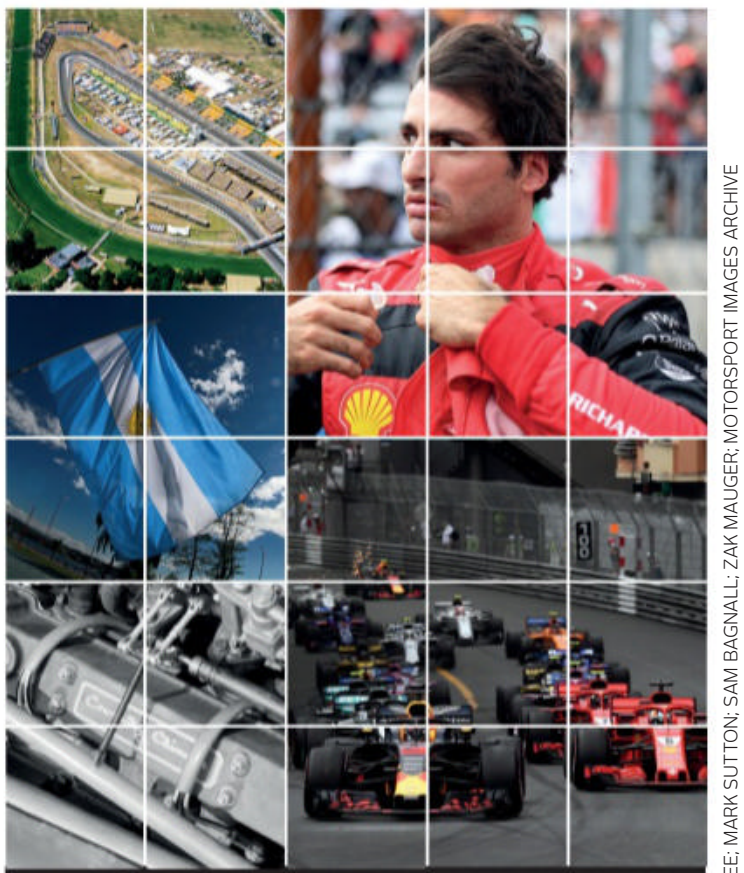
Q6 Who am I? I started 157 GPs from 1994 to 2005 for Ligier, Prost, BAR and Toyota, claiming one win and four other podiums.

Q7 The first Dutchman to score a world championship point did so in the 1962 Dutch GP. Who was it?

Q8 Two of Daniel Ricciardo's three pole positions were achieved at Monaco in 2016 and 2018. When and where was the third?

Q9 Sergio Pérez is currently eighth in the drivers' standings. When did he last finish lower than that?

Q10 Coventry-Climax engines powered which three marques to world championship GP wins?



PICTURES: STEVEN TEE; MARK SUTTON; SAM BAGNALL; ZAK MAUGER; MOTORSPORT IMAGES ARCHIVE

1 Juan Manuel Fangio (24), José Froilán González (2), Carlos Reutemann (12) **2** 7 **3** Zhou Guanyu, Kevin Magnussun, Oliver Bearman **4** False. Gerhard Berger won in 1987 **5** 2022 US GP **6** Olivier Panis **7** Carel Godin de Beaufort **8** 2018 Mexican GP **9** 2019 **10** Cooper, Lotus, Brabham

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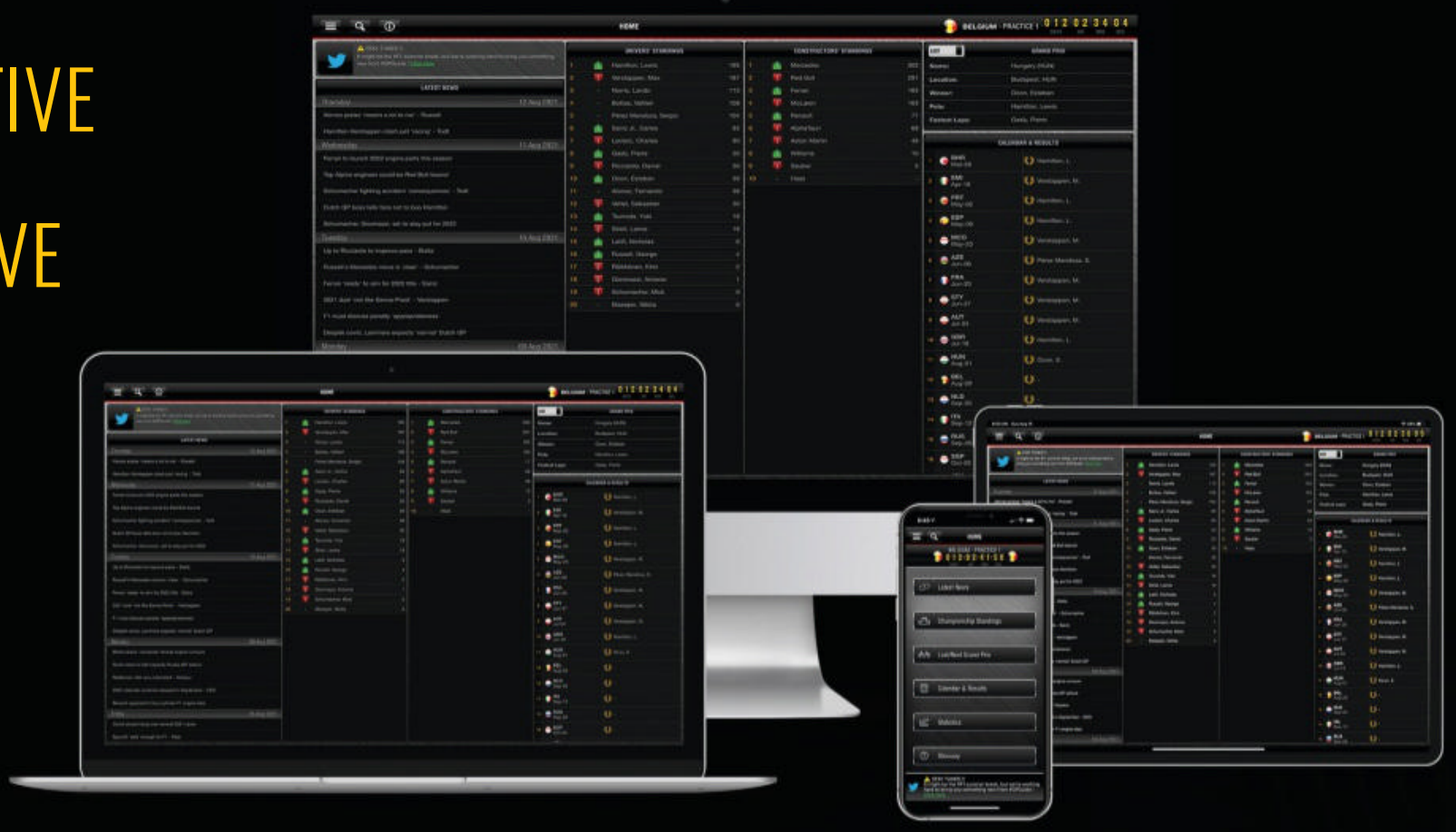

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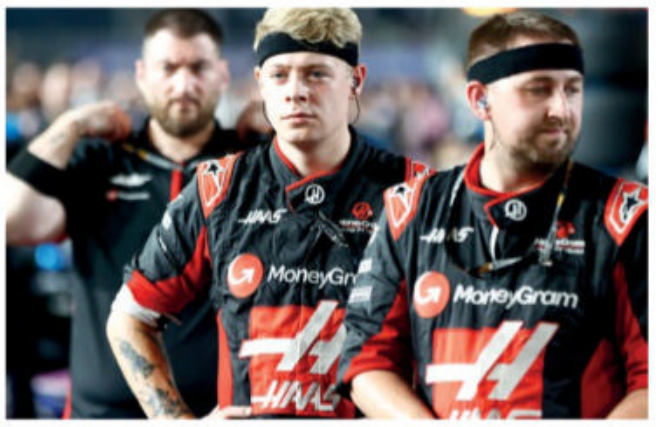
WHY THREE ISN'T ALWAYS THE MAGIC NUMBER

The final quarter of the 2024 F1 season is about to kick off with a particularly intense burst of action. A triple-header in the Americas is followed by a two-week gap before the last three races are held on consecutive weekends, travelling from Las Vegas to the Middle East. For drivers fighting for a higher position in the championship it will be a hugely engaging period. Yet for mechanics and team staff who have to plan, arrange, shift equipment and recreate a pit garage every time, it is going to be an even tougher run towards Christmas.

Former McLaren mechanic Marc Priestley is very aware of the stress that the latter part of the season can create for everyone involved.

"I used to think of it as being like the end of term when you're a kid," Marc remembers. "Everything becomes more of a struggle, a bit of a drag. By the end of the season you're desperate for it to be done. Yes, it changes if you have the motivation for a championship fight, but when you're stuck in the midfield it can become harder and harder."

The mental aspect of working within Formula 1 gradually became a key aspect for Marc and he now lectures and podcasts on the positives he discovered partly through the work of Aki Hintsa. A medical doctor and a pioneer in the field of human high performance, Hintsa's background included stints in Ethiopia in the 1990s, where he observed the training process of the country's celebrated long-distance runners, including Olympic medallist Haile Gebrselassie. This fuelled the theories he developed into an award-winning book, *The Core*, and the theory of 'the circle of a better life' he took to McLaren. Team boss Ron Dennis recognised how focusing on the mental well-being of people would lift the team's output to another level.



The effect on staff of triple-headers at the end of the season can depend on where the team stands in the championship scrap

"We started a project with Aki in the mid 2000s called McLaren Lab," Marc explains, "and we put a lot of time, effort and resource into working on preventing people becoming tired, demotivated and stressed. We did a lot with the Olympic institute in Finland, working with coaches from other sports, learning how they dealt with stress."

That was at a time when triple-headers hadn't yet become a part of F1 but the schedule was already arduous. Three consecutive races in 2018 proved unpopular with teams and the commercial rights holder said 'never again' – but the circumstances of 2020, which started in July owing to Covid-19, meant several triple-headers were required to ensure enough races were contested over the year to fulfil contractual demands with broadcasters. Since then the three-races-per-fortnight format has become commonplace as F1's calendar expands further.

"One of the big impacts is that we all have our own lives outside of racing; many of us have families, children, friends and outside hobbies," says Marc. "They're a big part of your life but on a triple-header all of that disappears for almost four weeks. You effectively disconnect from that major part of your life. It puts you under an extra level of pressure when you then have to immerse yourself in a team of people without a break and with the F1 demands."

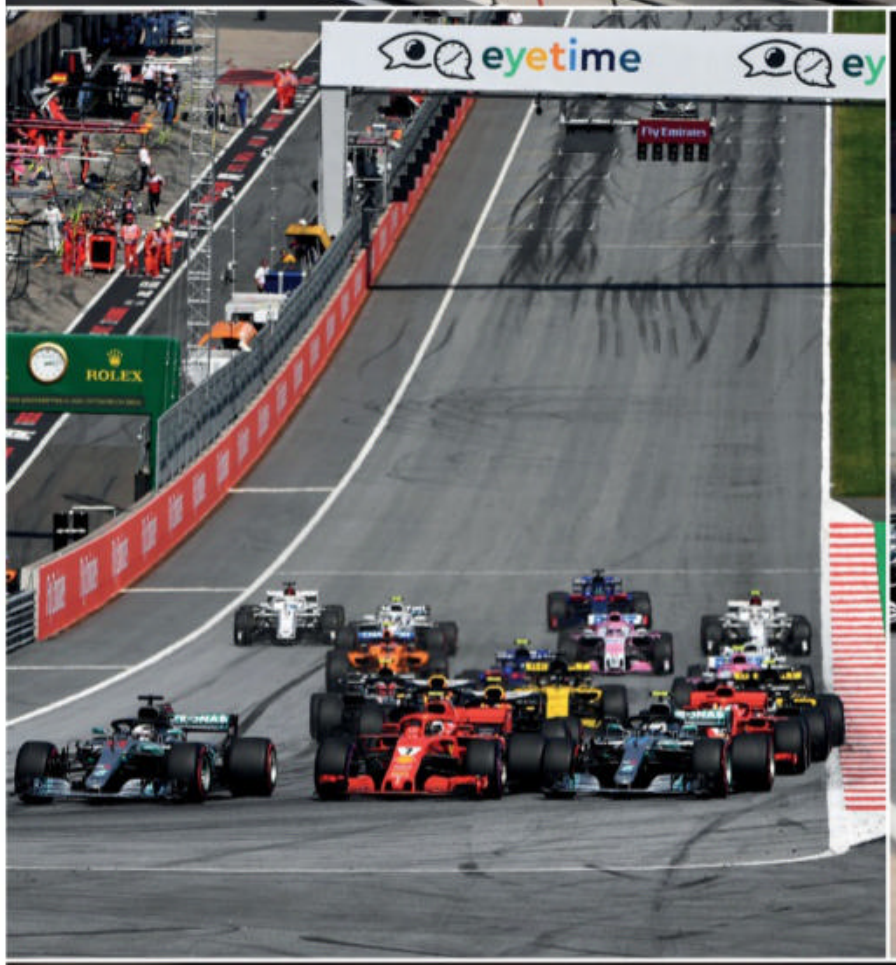
Marc was a sociable individual with many friends in the team and yet, even before triple-headers were a part of F1, he'd learnt to create a space for himself to maintain his wellbeing.

"I'd go for dinner on my own, or I'd build in a routine such as I'd have at home like meditation and physical exercise in the morning before the F1 day began. It gave me familiarity with my regular life so I didn't feel like I'd lost touch with everything else. I think the teams today are much more aware of this necessity, with departments dedicated to the staff, and there are specialised positions to ensure people are comfortable and fulfilled."

Four years ago the teams were virtually unanimous in declaiming triple-headers as unsustainable. Now they've seemingly reached a grudging acceptance that they are inevitable, given the demand for races. Mitigation of the effects is now an area of focus.

Some teams are rotating staff between events to provide opportunities to take a break. It suits some more than others, especially as younger team staff without family life want to be involved in every step as they continue to learn. There are teams that are happy to have that full-on involvement from key characters but it causes some conflict on the grid.

"The FIA may need to mandate the rules so that certain team personnel aren't allowed to do every race," Marc reckons, "so a staff member's F1 pass will perhaps have access to 20 races and then the team has to manage the rotation of people. The system may be developed so that a team can be safe from themselves and be fair across the board."



France (above), Austria (left) and Britain (below) in 2018 were F1's first triple-header. It caused widespread resentment but they are now a regular thing...

Dr Aki Hintsa with Lewis Hamilton when Hintsa worked with McLaren. Hintsa was one of the first to recognise that mental well-being was crucial to an individual's output

The schedule takes its toll on everyone and teams may be mandated to restrict the number of races staff attend

PICTURES: STEVEN TEE; ANDY HONE; MARK SUTTON; ANDY HONE; MOTORSPORT IMAGES ARCHIVE. ILLUSTRATION: BENJAMIN WACHENJE.

UNDER THE HOOD

PAT SYMONDS

PICTURES motorsport IMAGES

WHY FLUID DYNAMICS IS STILL AN INEXACT SCIENCE

Elsewhere in this issue we discuss the difficulties of relating experimental aerodynamics to what is happening to the physical car on track, and how our tools for aerodynamic research all have their limitations (p52). During this we refer to computational fluid dynamics, or CFD, as a primary tool of discovery – but what is CFD?

Physical processes such as the bouncing of a car on its springs or the flow of air around a car, and the consequential forces that those systems exert on the car, can be described mathematically by a series of equations. The big difference between the two examples given is that while the motion of a car on its springs is relatively easy to write the equations for, and hence to solve, those determining the flow of air are extremely complex and require vast computing power to solve. Even then, they're subject to some approximations.

While many people may have heard of Daniel Bernoulli and his equations of fluid flow, the work of Claude-Louis Navier and George Stokes in the early nineteenth century is the basis for the majority of CFD codes. The theory of how a wing develops downforce is often incorrectly explained by use of Bernoulli's theorem. In what's called the equal transit theory it's said that particles of air travelling a greater distance over the curved surface of a wing will travel faster than those travelling on the less curved surface, the top surface in a vehicle wing. This is incorrect – there is nothing to say that two particles of air arriving at the front of a wing need to join up again when they get to the trailing edge of a wing.

CFD isn't limited to aerodynamics. Red Bull Powertrains announced that it would be using Converge CFD software in February 2023

The real answer to this relatively simple example of fluid flow relies on understanding the momentum of the air particles and how they're affected by pressure, temperature density and the viscosity of the air. Rather than just assuming the relationship between velocity and pressure is all that matters, as Bernoulli proposes, CFD ensures the rules governing conservation of mass, conservation of momentum and conservation of energy are all respected – and therefore Newton's second law and the first law of thermodynamics aren't broken. It's this need to consider many aspects that leads to the complexity we need to use partial differential equations, the manipulation of which needs to take into account the many variables simultaneously. This makes solving the equations rather complex.

The way they're solved is to consider the total flow field as a huge number of much smaller flow fields, and solving for each of these while acknowledging the effect each of these small cells has on its neighbour. In practical terms we take a CAD model of the car, and we surround it with a virtual mesh. The size of the cells in the mesh can be variable. They will be fine where there are rapid changes in flow properties and coarser where the flow is better conditioned. One can imagine that the flow around an open-wheel race car is far more complex than around, say a sleek glider, and hence the number of cells needed is vastly increased.

Once this mesh is established, we use our computer code to solve the many equations. But, since the solution for each cell will affect the initial conditions for its neighbour, we need to run the simulation multiple times with the answer changing each time. Eventually the result will tend to converge – in other words it will stop changing significantly. At this point we may believe we've achieved a solution. This may occur after many more than one thousand iterations solving each of the many thousand ▶

PICTURES: RED BULL CONTENT POOL; WILLIAMS; SHUTTERSTOCK. ILLUSTRATION: BENJAMIN WACHENJE

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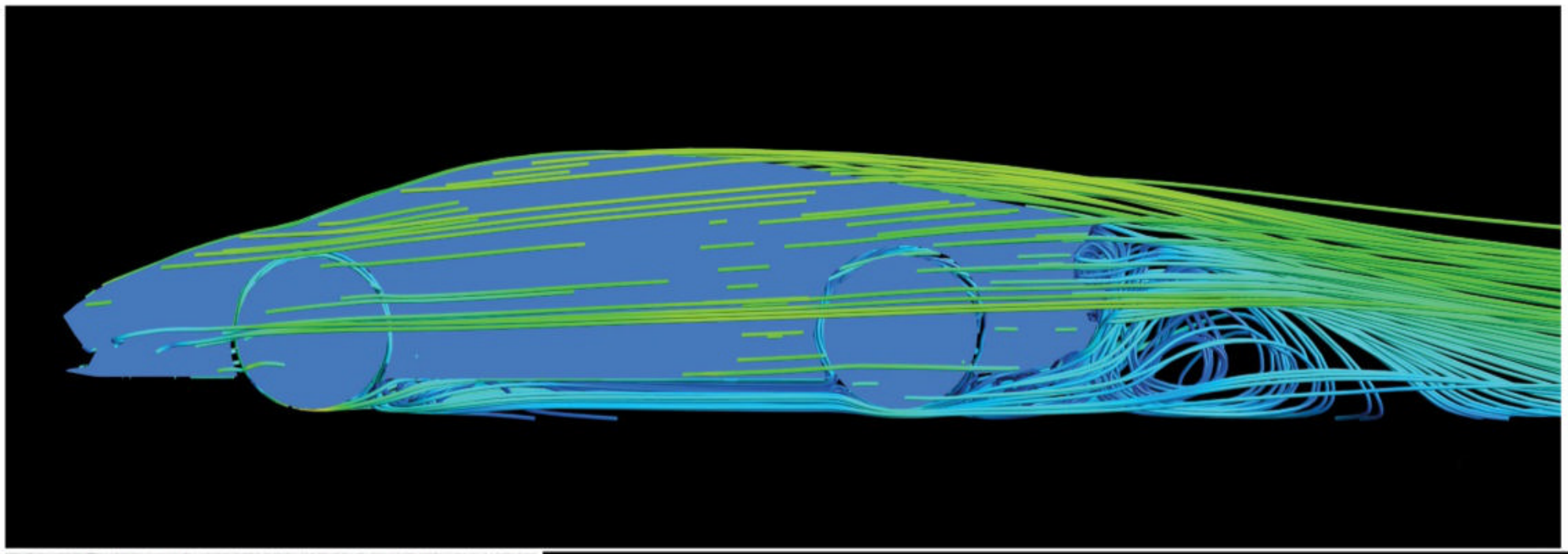
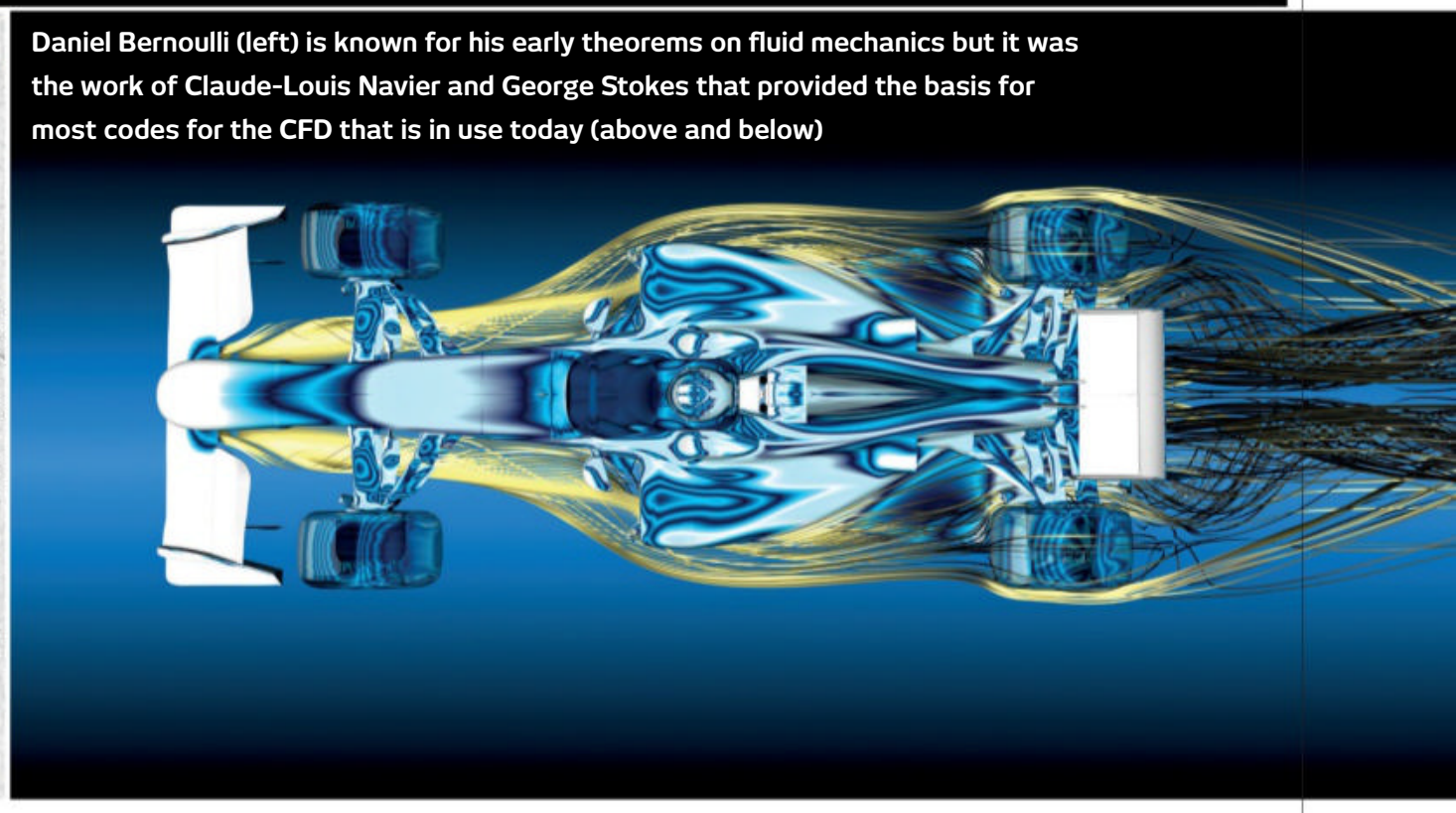


Daniel Bernoulli (left) is known for his early theorems on fluid mechanics but it was the work of Claude-Louis Navier and George Stokes that provided the basis for most codes for the CFD that is in use today (above and below)



cell equations. One can understand how this eats computer power. It's similar to a sculptor chipping away at a piece of stone until a form of what they're aiming at emerges. The more stone they remove, the nearer the stone becomes to the final image until the sculptor decides that their creation is recognisable to others, even if not photo-realistic, and at this point they stop.

It would be nice to think that after such a complex mathematical manipulation we fully understood the flow around our car. Unfortunately that's not completely true: there are various simplifications and assumptions that have to be made in order to be able to solve our problem, and by far the most troublesome is turbulence. A Formula 1 car has far more turbulent flow around it than it does laminar, or smooth, flow. Turbulent flow is even more complex. Just look at the water vapour from a car exhaust as you follow it on a cold morning. It appears to be completely random and never following a repeatable pattern. The modelling of this, even after 30 years of commercial CFD development, is still hotly debated with various solutions in use even in F1.

The Navier-Stokes equations are aimed at getting a pragmatic solution to an extremely complex physical problem and they do this by using some approximations, and above all by time averaging the results. This type of solution is known as RANS or Reynolds Averaged Navier Stokes. It's attractive in that it is reasonably accurate and efficient on computer core hours. A half car can be simulated assuming symmetry, and a model with around 100 million cells will solve in around five hours on a 192-core cluster. But for a better understanding of turbulent flow, other methods are favourable from a point of view of accuracy, if not computing time.

Large Eddy Simulations (LES) and Detached Eddy Simulations (DES) will give better solutions but will require around 300 million cells and, on the same machine, will take 35 hours to solve. For this reason they're used sparingly.

A big advantage of CFD over other experimental techniques is that it produces a vast amount of data which can aid understanding of how the forces are developed. The real strength of the analytical approach is when multi-physics can be explored. Imagine the wind blowing through a tree. The air flow moves the leaves, and the moving leaves affect the air flow. Ideally we would model the structure of the tree as well as the air movement. This is multi-physics and can take simulation to new areas of fidelity. It's complex but enables investigations and understanding beyond those achieved with physical scale modelling in a windtunnel.

A BIG ADVANTAGE OF CFD OVER OTHER EXPERIMENTAL TECHNIQUES IS THAT IT PRODUCES A VAST AMOUNT OF DATA

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F1 PRO

Essential guide to the business of F1

STRAIGHT TALK

MARK GALLAGHER

@_markgallagher

PICTURES motorsport IMAGES

DANIEL RICCIARDO: IT'S ONLY JUST BEGUN

Don't feel too sorry for Daniel Ricciardo. Having survived the risks and rigours of 14 seasons competing in Formula 1, the ever-likeable Aussie can now enjoy the freedoms which come with a fortune most people can only dream of.

On top of that he has much to look forward to.

For some time to come, let's say the next year at least, there is always the tantalising prospect of him returning to the fight, drafted in to deputise for someone who has fallen off their bike in pre-season testing, stumbled on a tennis court or tripped down the steps of their private jet. It's happened before.

Then there's his future in wider racing. Plenty of teams in lots of categories would love to have Daniel drive their cars, wow their fans and help court their sponsors. He's that attractive beast, a quick driver who appeals to both sporting and commercial directors alike.

It's not hard to imagine Cyril Abiteboul's bosses at Hyundai being eager to allow the Frenchman to renew the partnership they enjoyed at Renault in 2019-20, this time in WEC.

Ricciardo's easy-going nature was a boon to F1. His 2022 Austin paddock entrance was a perfect example of that

No matter how Dan felt in the aftermath of his final race in Singapore, an introduction to Le Mans will allay any fears he will not get quite the same buzz out of racing beyond F1. It may not be 24 GPs, but 24 one-hour sprints around La Sarthe usually opens the eyes of drivers who previously thought excitement only lay within the F1 bubble.

F1, its broadcasters and sponsors will also beat a path to Daniel's door. Liberty Media knows a brand ambassador when it sees one and it's hard to think of a recent F1 driver who enjoys such widespread popularity as Daniel. No one hates him.

The world championship has 24 commercial partners and many of those have limited access to team drivers. Some will now turn to Daniel to help promote and leverage their involvement in the sport.

Broadcasters will be tripping over themselves to have him join their line-up of pundits to provide a mix of highly articulate, up-to-date insights with the easy humour to which we have all become familiar. Expect to see him on a screen near you soon.

Then there is life beyond racing, beyond F1 and the world that he has focused on throughout his adult life.

He will find lots of people coming to him with business ideas, eager to relieve of him of some of that well-earned fortune, but if he follows his passions and works with people he trusts then a newly minted entrepreneur could emerge. The Ricciardo brand is strong, whatever direction he chooses to take it.

There will be endorsements, public and corporate appearances far beyond the paddock. While there are 300-plus sponsors in F1, the corporate market for an ex-F1 driver is many times larger.

The only limiting factor will be Daniel's interest in keeping the work-rate at F1 levels.

This, in the end, will determine matters. I've seen plenty of drivers retire from Formula 1 and fizzle into the sport's history books because they opt to take the 'year off', sit back and relax, enjoy their money. It's a mistake because, when you try and come back two or three years later, hot opportunities will have turned cold.

I'm sure the Honey Badger won't make that mistake. He has loved F1 and, no matter the role, F1 loves him.

PICTURE: CARL BINGHAM. ILLUSTRATION: BENJAMIN WACHENJE

THIS MONTH

Stephanie Carlin

F1 Business Operations Director, McLaren Racing

After nearly two decades working at one of the most successful junior single-seater teams in the world, Stephanie Carlin joined McLaren at the beginning of the year and continues to support young drivers who are part of the team's Driver Development Programme

INTERVIEW JAMES ROBERTS

CV

2024-present
F1 Business Operations Director, McLaren Racing

2023
Team Principal, Team X44

2022-2023
Deputy Team Principal, Carlin Motorsport

2011-2022
Commercial Manager, Carlin Motorsport

2006-2011
PR and Marketing Manager, Carlin Motorsport

2005-2006
PR and Communications Officer, A1 Grand Prix

2004-2005
Assistant Press Officer, Society of Motor Manufacturers and Traders

GP Racing: Is it true you spent some time in the Houses of Parliament before you started your career in motorsport?

Stephanie Carlin: Yes, I studied politics and did work experience in the Houses of Parliament as I was initially thinking about a career in political journalism. But I always had a love of cars and motorsport, so my first job was actually at the Society of Motor Manufacturers and Traders (SMMT) which acts as the voice of the motor industry, promoting its position to government and supporting the UK automotive industry at home and abroad. The person I replaced at the SMMT had left to become PR manager for the new A1GP series and I soon joined them for the launch and inaugural season of A1GP in 2005.

GPR: How did you find the transition from working for a championship to going to Carlin, a team competing in it?

SC: It was exciting to go from a championship where you didn't cheer for anybody – you just hoped enough people turned up on the Sunday – to having a vested interest. The transition occurred very quickly, and I've noticed it again when I joined McLaren at the beginning of the year. At Carlin one of my jobs was to be responsible for helping shape the team's brand, by creating a feel and a culture within the organisation and it was exciting to be a part of that.

GPR: You've worked with an incredible number of drivers who have come through the Carlin ranks and been successful in Formula 1, including Sebastian Vettel, Takuma Sato, Daniel Ricciardo and more recently Lando Norris. Can you quantify what separates a great driver from an also-ran?

SC: It was amazing to be part of the story for so many drivers, but I think that's a difficult question to answer because every racer is so different. Some drivers are very technical, others are naturally talented but don't understand why. You get drivers who work hard and apply themselves.

But I think one rule of thumb is that they work to bring a team around them and appear good-natured – until they put their helmet on. Then there is an edge that you don't see at any other time.

GPR: One of your remits with McLaren is to work with the young talent in its Driver Development Programme, which includes up-and-coming stars such as Gabriel Bortoleto [a frontrunner in Formula 2], as well as Alex Dunne and Martinius Stenshorne in Formula 3. What does the programme offer?

SC: Drivers require different levels of input and assistance. It might be as simple as having a driver coach, or perhaps providing them with mental or physical training. Others might benefit from time in the simulator to develop skills. Or with Gabriel [Bortoleto] we've been working to help him better communicate with his race engineer. The junior support series to F1 has very little track time, so it's important to help a driver describe what he's feeling in the car in a timely and precise way. When we apply the correct processes, then it's easier to come by results.

The challenge with the Driver Development Programme is to identify where the gaps are and to fill them to produce the perfect racing driver. Another youngster we look after is European karting champion Dries Van Langendonck. He's a really exciting prospect, with not only the results he's achieved on track, but in the way he talks and understands racing and where he knows he can make improvements. He has a lot of potential.

GPR: As a former team principal and with a remit over Bianca Bustamante, McLaren's entrant in F1 Academy, how impressed have you been with female engagement across the whole sport and the value of F1 Academy in particular?

SC: There are so many more women in motorsport compared with when I started: female engineers, mechanics and, at McLaren, in a number of senior management roles too. But what's so important about F1 Academy is that it has helped bring female drivers into the conversation of every Formula 1 team. It also means those drivers are directly benefitting from the investment and resources of the teams. And it's accelerating the progress of females participating in racing, as they have access to teams' engineering methods, simulators, data and all the additional programmes that run alongside F1 Academy. It's great to see these new role models backed by the industry.

PICTURE: STEVEN TEE


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THE ONE AND ONLY

Ferrari's 2025 driver line-up is a dream come true for racing purists: **Charles Leclerc**, the golden boy, a nailed-on future champion alongside seven-time world champion **Lewis Hamilton**. But how is it going to work out in practice? Leclerc's raw speed and steely edge broke four-time champ Sebastian Vettel in 2019 – and as we reveal, Charles has only got stronger in the five years since then...

WORDS OLEG KARPOV, STUART CODLING
PICTURES motorsport IMAGES

PICTURES: FERRARI, SAM BLOXHAM

Whisper it – but sharing a garage with a seven-time world champion could mean *less* rather than more pressure on Charles Leclerc in 2025. That's because Leclerc, according to those close to the team, has nothing to lose unless Hamilton regularly beats him by a huge margin – and, going on recent form, that's unlikely.

Hamilton's presence actually puts Leclerc in an enviably strong position: if he wins races, even the championship, he's beaten one of the greatest drivers of all time. If he doesn't, well – being overcome by a multiple world champion is a lesser-order loss than being beaten by any other team-mate. Indubitably his reputation will be diminished less than on those occasions when Carlos Sainz has got the better of him in recent seasons.

Leclerc has already – much earlier in his career – got the better of a four-time world champion. And yet questions still remain: will it be a fair fight? Will the car be quick enough to win races and titles? And is Lewis, now approaching his 40th birthday, still the complete competitor who broke long-cherished records held by his hero, Ayrton Senna?

How good will Ferrari be in 2025?

While the general perception is that Hamilton is banking on Ferrari to be on top when the rules change in 2026, his best chance of achieving his desired outcome – winning an eighth title – may actually be next year.

In terms of car concept, Ferrari has been relatively strong out of the blocks in the last two rule revisions,

the 'wide-body' change of 2017 and the return to ground effect in 2022. But certain key engineers involved at those inflection points – notably David Sanchez and Enrico Cardile – have subsequently moved on.

More significantly, the 2026 technical package involves major changes to aerodynamics *and* the power units – indeed, active aero will be relied upon to counterbalance a reduction in overall power as electrical deployment plays a greater role.

The presence of more than one major variable could lead to a 2014-style scenario in which one team or engine manufacturer has a big advantage. 2026 may not be a "lottery", to use the words of one well-informed paddock insider, but many uncertainties remain.

Nevertheless Ferrari is confident enough in its development capabilities that it chose not to get involved in a bidding war with Aston Martin for Adrian Newey's services this summer. That may seem counter-intuitive, given Ferrari's mid-season performance was such that Hamilton went into what can only be described as a sulk when asked – during the British Grand Prix weekend – whether he still felt he had made the right choice. But actually, while the Scuderia's form has fluctuated through 2024, the trend line is going in the right direction.

Ferrari's progress has been masked to some extent by the attention lavished upon McLaren's rapid ascent to championship-challenger status. Ahead of the final six races its points tally stood at 441, 119 more than at the 18-race mark last year. This put Ferrari just over 30 points behind Red Bull, which had 704 points after 18 races last year. Perceptions have been skewed thanks to the events of late spring and early summer: while McLaren's big Miami upgrade proved very successful, Ferrari's new floor (added in Barcelona) was only partially so, generating more downforce but making the rear end more prone to 'bouncing' 2022-style.

Nevertheless, Ferrari bounced back after the summer break, with Leclerc winning at Monza and then coming close to another victory in Baku. Insiders put this down to a breakthrough in understanding, allied to a summer shutdown of the windtunnel to replace the old-fashioned metal-based rolling road with one that more accurately simulates an asphalt surface (see p52).

And that could be the key for both Leclerc and Hamilton in 2025. With Ferrari only a few tenths behind McLaren on average, it's the Scuderia, not Red Bull, that is seen in the paddock as McLaren's potential number one rival next year. Those close to Ferrari are certain that even if the team is still behind McLaren at the start of next year's campaign, it won't simply capitulate and shift resources to the 2026 project.

The question then is which of the drivers is better placed to maximise the opportunity. Leclerc begins with the advantage of having deep-rooted working relationships within the team, despite this season's somewhat cryptically communicated change of race engineer at Imola. He knows the quirks of the organisation as well as the car. All of these Lewis

THE QUESTION THEN IS WHICH OF THE DRIVERS IS BETTER PLACED TO MAXIMISE THE OPPORTUNITY. LECLERC BEGINS WITH THE ADVANTAGE OF HAVING DEEP-ROOTED WORKING RELATIONSHIPS WITHIN THE TEAM

PICTURES: STEVEN TEE, STEVE ETHERINGTON, MARK SUTTON

Charles and Lewis will be alongside each other at Ferrari next season, but as with all F1 drivers, will be desperate to be the Scuderia's top dog

Looking ahead to 2026 Ferrari has, in the recent past, done well in the first season of a major F1 reboot such as 2017 (left) and 2022 (above)

will have to learn quickly.

Hamilton is famous for thriving when he has the right car and there's a big result on the horizon – and the prospect of not just an eighth title, but a Ferrari one, can surely rekindle the killer instinct that many believe he's starting to lose. But to beat Leclerc, Lewis would have to be at the top of his game.

A qualified success

Among the more regrettable trends of the past season or two has been a regression towards processional races. A key target of the shift to ground-effect was to generate more overtaking by enabling cars to follow one another more closely through corners. But ongoing development has made the cars more disruptive to those following in their wake, and the sensitivity of the Pirelli tyres continues to be an issue. The majority of overtaking moves are now enabled by DRS – which the architects of ground effect hoped would be redundant by now.

Qualifying has therefore become a bigger arbiter of results again – and here, apart from a difficult spell earlier this season when he struggled to bring his tyres to the

Qualifying could be a big area of difference between the pair. In the new generation of cars Hamilton's only pole came in Hungary in 2023

right temperature, Leclerc is king.

Given that Hamilton has achieved more pole positions in his career than any other driver, including Ayrton Senna and Michael Schumacher, this statement requires some (pardon the pun) qualification. A prime caveat is the relative underperformance of Mercedes during the ground effect era – Lewis has registered just one pole position for a grand prix since 2021. But there are other reasons and Hamilton is the first to admit that he has struggled to hit previous heights.

On Saturday in Monza, he was particularly frustrated with himself. "The chance I've got to fight for a race win is out the window," he lamented after qualifying sixth.

"I just didn't do the job. I didn't extract the maximum. Just absolutely ridiculous from my side, completely unacceptable. And that is totally me, nobody else.

"I've got to find myself in qualifying. My race pace is great. I just need to figure out how to get back to my old self."

This was all said after Lewis was just 0.073s slower than George Russell on his Q3 lap – but as F1's battle at the top gets ever tighter, two drivers squeezed into the tiny gap between the Mercedes duo. And that's largely been the story of Hamilton's qualifying this year.

When Russell first arrived at Mercedes in 2022, it was Hamilton who had the upper hand in qualifying over the season as a whole, although the picture was skewed by Lewis pursuing experimental setups early on in a bid to 'debug' the troublesome W13. In comparable sessions Hamilton outqualified Russell 11-5. But now it's Russell who is ahead most of the time – 12-9 last year and 13-5 in 2024.

The margins are small. Not only in Monza, but also in Australia, in both the sprint shoot-out and qualifying in Miami, Monaco and Austria, Russell was less than a tenth of a second quicker, and in most of the other sessions the gap was around 0.2s.

Discounting cretinous online conspiracy theories accusing Mercedes of sabotaging Hamilton, what is behind this small but significant disparity? Is Russell getting faster or is Hamilton getting slower, owing to age and this generation of cars not suiting his style? Again, there are questions of perception here since George has only had a consistently frontrunning car once – when he substituted for Lewis at Sakhir in 2020.

"George has always set a very high bar in qualifying," insists Mercedes' Andrew Shovlin. "And as soon as he was in F1, he was impressing. Even in the Williams, he was doing some pretty impressive qualifying sessions, so we know that he's very quick.

"Lewis hasn't disguised the fact that Saturdays were his tough day. He's struggled with this whole generation of car, really, not suiting his style.

"He's been working on how he drives. But we had a huge amount of work trying to get the car to be quicker – it just hasn't been quick enough – but also with a handling balance that the drivers can actually attack the lap on Saturday."

This echoes what Lewis himself said after qualifying in Hungary.

"It is just with these tyres for some reason, I don't like the way they drive," he explained. "I have sucked in qualifying for quite a while. I am still working at it to try and improve. But at some stage, it will come. Just keep working at it.

"I would say in my career, I would never say I have had massive problems with the tyres. But I'm not sure it is necessarily the tyres, I think it is the type of car. The car is more on a knife-edge than ever and it doesn't like when you brake late, deep and make a corner a 'v'. You have to brake early and roll the speed in. I hate that, it's just not me and not my kind of way of driving the car. I find that really frustrating."

If you believe James Allison it's almost as if Lewis is trying too hard.

"The current car tyre combo, not just us, across the pitlane: it doesn't like being hustled," Allison explained recently in relation to Hamilton's qualifying struggles. "You almost get the best lap times when you're not trying. And every weekend, in some session or other, you'll see some car and you think, 'How did that get there?' And then they don't do it again. It sort of disappears in the mist straight after. And I think in qualifying it's quite hard – where you're all pumped up and you're wanting to get the best from it – to do a lap that is sort of relaxed enough to get the best out of the car.

"When the car is producing good laps, the drivers are almost like, 'I wasn't expecting that. I was almost cruising'. And when it's qualifying, the pressure's on and it's time to deliver, I don't think those are the circumstances that get the best from quite fussy tyres."

Whatever it is, Lewis knows he needs to sort it out sooner rather than later, because not only will the cars stay essentially the same next year, but in Leclerc he will have a team-mate regarded as among the best qualifiers on the grid.

Is Leclerc cut from the same cloth as Gilles Villeneuve?

It's not just Leclerc's qualifying speed that Hamilton must take into account, but his overall form and growing maturity.

Leclerc's 2024 campaign is by far his strongest to date. He quickly reached an understanding of those early qualifying problems and cured them by improving his attention to detail on out-laps. In the first eight races of the season he finished no lower than fourth and the decline that followed coincided

The tifosi will be salivating at the thought of these two battling for wins in 2025 and 2026. All that is needed is a truly competitive car...

PICTURES: STEVEN TEE, ALEXANDER TRIENITZ; MOTORSPORT IMAGES ARCHIVE

Leclerc has been compared with Ferrari legend Gilles Villeneuve in the way that he takes extra risks if the car beneath him is under-performing

with Ferrari's most troubled phase of the year. This included a couple of mistakes in qualifying, a strategy gamble that went wrong at Silverstone, and a generally poor weekend in Austria.

The Ferrari faithful like to draw parallels between Leclerc and another driver beloved of the Scuderia, Gilles Villeneuve. Certainly Leclerc's formative years in F1 have demonstrated great speed allied with a tendency to step over the limit – notably in the first half of 2022 when he seemed to be in contention with Max Verstappen for the championship. And while Villeneuve's heroics are woven into the tapestry of F1, he has his detractors who believe his desire to win every lap came at the cost of winning races and titles (though these claims discount the fact that in the only full season in which he had a properly competitive Ferrari, 1979, he played dutiful team-mate to eventual champion Jody Scheckter).

"He [Leclerc] is a very courageous and very... he's a very risky driver," says veteran *La Gazzetta dello Sport* journalist Pino Allievi, who also knew Villeneuve in his pomp. "If he knows the car is 90% he tries to find inside himself the missing 10%. He takes a lot of risk – but he is obliged to because he doesn't have a competitive Ferrari, this is the problem."

Ex-Ferrari team principal Mattia Binotto was among the first to make the Villeneuve comparison – albeit in a positive way – when defending Leclerc as the 2022 campaign began to misfire.

"When I look at Charles, it's the way he drives, his talent and above all the passion that the fans have for him," Binotto said. "Belonging to Ferrari means strengthening the myth of the Cavallino. There are few drivers who can do that and I think

Charles is one of them, as is Gilles [Villeneuve]. Gilles was fantastic. He may have only won six races, but he remains the driver par excellence for all Tifosi and the Cavallino. It was his way of driving, his way of behaving. It's the passion that he showed.

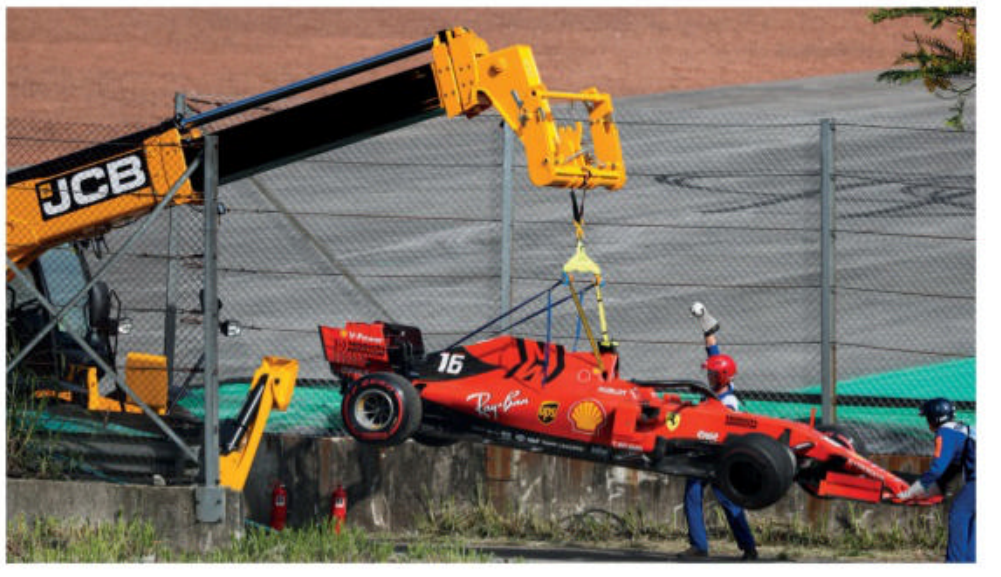
"And I think Charles has that too, and that's a great thing. We're also very passionate ourselves and we hope he wins more than six races."

Romance and drama aside, are the parallels between Leclerc and Villeneuve that strong now? Post-Barcelona dip aside, Charles has been both fast and incredibly consistent this season, never putting team boss Frédéric Vasseur in the uncomfortable position of having to explain his choices: in almost all the races where both Leclerc and Sainz have finished this year, Charles has been in front.

If questions remain over Leclerc's ability to string together race wins into a successful title campaign, surely the same cannot be said for a seven-time champion?

Well, there are those who point out that six of Hamilton's drivers' championships were built on the foundation of having the best car on the grid – and that in 2016, the one that got away, he became paranoid to the extent of openly suggesting

THE REALITY IS THAT VASSEUR WOULD BE FOOLISH TO SACRIFICE LECLERC'S AMBITIONS FOR HAMILTON, SINCE CHARLES REMAINS THE CENTREPIECE OF FERRARI'S LONG-TERM PLANS



PICTURES: SAM BLOXHAM; GLENN DUNBAR

Hamilton will have to avoid just trying to beat Leclerc. Vettel did that in Brazil in 2019 (above). The pair collided and Leclerc retired (top)

Key engineers that helped Ferrari start well in 2017 and 2022 Enrico Cardile (left) and David Sanchez (right) are no longer with the team

that his engine failures were the result of malign interference by unspecified parties.

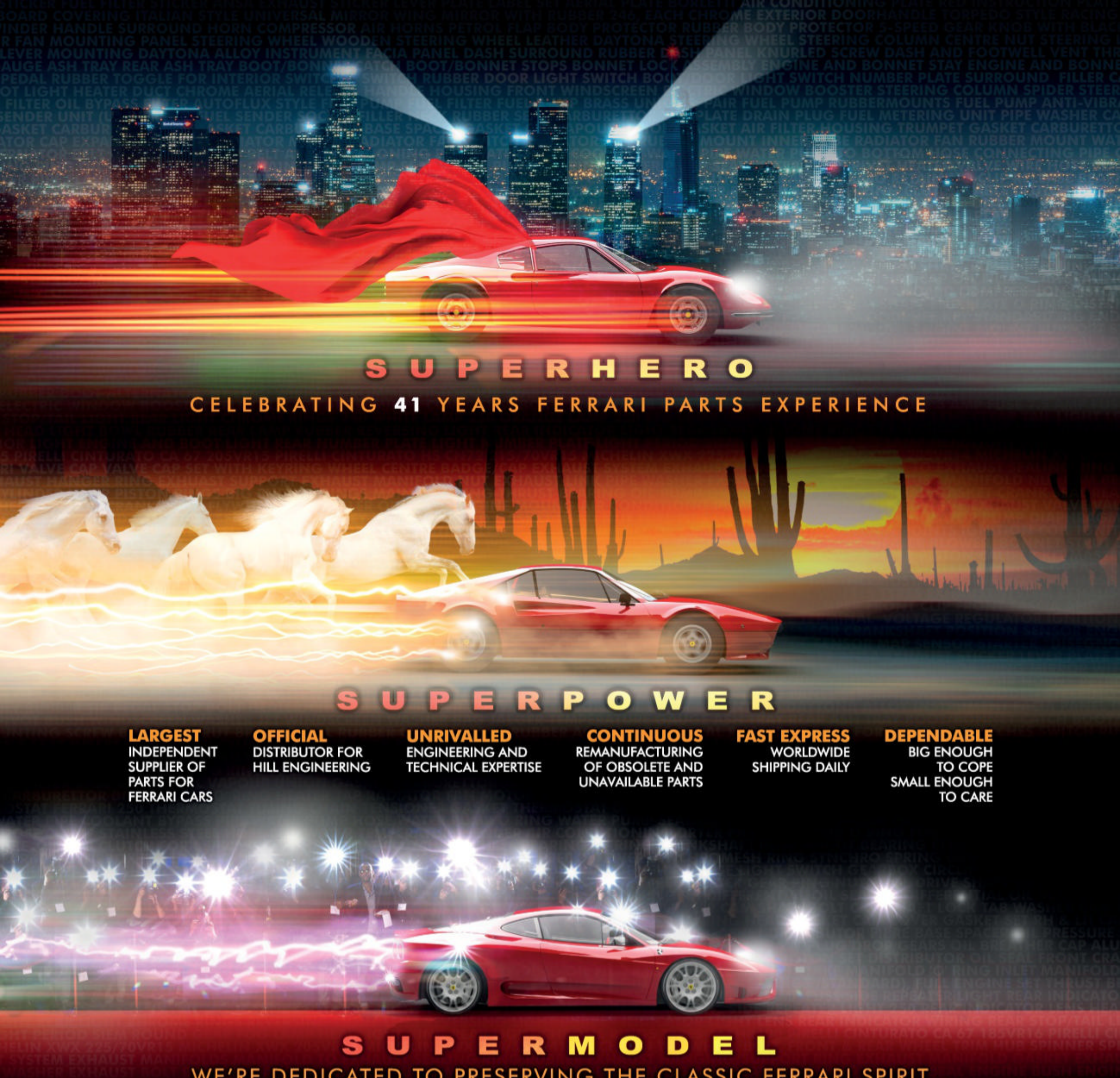
However, as Gilles Villeneuve's son Jacques ably proved by making very heavy weather of the 1997 world championship, gaining full benefit from the best car is a skill in itself. Apart from those well-publicised struggles to make the car work for him in qualifying, Hamilton continues to execute races well. Scrappy weekends such as Imola 2021, when he was lucky to escape a clumsy-looking off-track moment in the wet, remain outliers that are memorable for being exceptions rather than a rule.

Equality street

Among the more vexing questions is one of treatment: can Ferrari support two number-one drivers? This scenario is always easier to achieve when the car is below-par – drivers who have just become team-mates can bond over its inadequacies and more easily co-operate to improve it. With a fast car, fireworks ensue as they scrabble to get an edge – witness how Hamilton and Rosberg, supposedly childhood friends, became bitter enemies once equipped with frontrunning machinery.

In public at least, Ferrari has committed to equal treatment. There has been talk of putting "maximum effort" into helping Hamilton win an eighth world championship – though insiders say this just encouraging noise for the new signing and a gentle nudge to Leclerc to give his best. The reality is that Vasseur would be foolish to sacrifice Leclerc's ambitions for Hamilton, since Charles remains the centrepiece of Ferrari's long-term plans.

Leclerc had been part of Ferrari's young-driver ladder before he joined the team in 2019, only his second year in F1, almost instantly making it his own – at the expense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PICTURES: ANDY HONE; SETEVE ETHERINGTON; SIMON GALLOWAY

Ferrari's return to form after the summer break – as shown by Leclerc's Monza win – could be crucial to the hopes of both drivers in 2025

of his new team-mate, Sebastian Vettel, a four-time champion. He swung the team his way through sheer performance as Vettel in effect went to pieces. Tensions between the two built to the point where Seb virtually inked in his own firing from the team when he precipitated a race-ending collision with Leclerc in Brazil that year.

Beneath Leclerc's outward appearance of ingenuous bonhomie is a steely competitor – as demonstrated at Monza in 2019, when Charles had been given a 'tow' by Seb in the first Q3 runs but then took advantage of other competitors running slowly to avoid returning the favour. That earned Leclerc pole position and a stern rebuke from Binotto – all forgotten in the glow of his victory a day later.

HAMILTON'S HIRING WAS THE PET PROJECT OF NO LESS AN EMINENCE THAN FERRARI'S EXECUTIVE CHAIRMAN JOHN ELKANN

Hamilton once engaged in such shenanigans at the beginning of his F1 career (see p48) but has built a well-earned reputation for 'racing clean' ever since, and would take a poor view.

Another key difference from the 2019 scenario is that Vettel was always on unsteady political ground at Ferrari, having been hired by Luca di Montezemolo – who was ousted by Fiat chairman Sergio Marchionne before Seb joined. Hamilton's hiring was the pet project of no less an eminence than Ferrari's executive chairman John Elkann, Marchionne's successor and scion of the Agnelli dynasty which once owned Fiat and Ferrari.

While this will afford Lewis a high degree of protection politically, he must still avoid the mistakes both Vettel and Sainz have made. Both those drivers at various times became so focused on beating Leclerc that they imperilled team results. Most recently Sainz's tussle with Sergio Pérez in Baku came close to taking both Ferraris out of the race.

In a few months there will no doubt be a glittering team launch at Maranello, during which the inevitable questions will be asked about how Lewis and Charles will work together. They will reply with polite bromides about putting the team first.

And then, on or before race one, the gloves will come off.

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INTO THE HOT SEATS

FIA F1 communications manager **Roman De Lauw** gives a guided tour of the press conference room

INTERVIEW OLEG KARPOV
PICTURE SIMON GALLOWAY

"Let me start with the obvious, the press conference is where the international and local media can interact with the drivers and get some quotes from them or the team representatives.

"This picture was taken in Baku on Thursday. We usually have four press conferences during an F1 event. One on Thursday with six drivers in two groups, then one with the team bosses on Friday, which is usually between two practice sessions, and two more with the top three drivers after qualifying and the race on Saturday and Sunday."

1 "The journalists are divided into two groups. From this year, we've decided to hold the press conference together for both the broadcast and written media, to make the media time more efficient for the drivers. The broadcasters are on one side of the room, on the left, and the written press is on the right. The photographers are also on two sides. Just before the press conference starts we allow them to take a few shots from the middle, but then we need that space for our volunteers to pass microphones to the journalists."

2 "We usually have two volunteers handing out microphones. When a journalist wants to ask a question, they raise their hand and then I point to who's next."

3 "The microphones are controlled by the sound engineer. She operates both the MC's and the drivers' microphones, so she raises the volume every time one of them speaks, and she's also responsible for raising the volume when one of the journalists asks a question. Fun fact: two of the microphones have different coloured rings, yellow and pink – so she can see which side is in use."

4 "We have three cameras in the middle. One is for the wide shot – it doesn't change during the conference. And another one is for close-ups.

"And because we have broadcasters in the room, there's also a rear-facing camera that allows us to get shots of the journalists when they're speaking – because the press conference is now being broadcast by a number of TV companies around the world, as well as being shown on F1 TV, so we wanted to get the journalists on screen as well. This camera is remotely controlled by the director in the broadcast centre."

5 "This is [former *GP Racing* staff writer] Tom Clarkson, who is the MC of the press conference with the drivers. Tom has been doing this for as long as I can remember. His main job is to prepare questions for the drivers to sort of warm them up. He usually has two questions for each

driver at the start, and they tend to be about the main topics the journalists will want to know about.

"We put him on the set to make it a bit more comfortable. We feel that when he was behind the camera, which is what we used to do, the drivers were a bit more in a confrontational position and therefore closed – and when they're sitting next to him they feel more open and answers tend to be longer, nicer and more open.

"On Thursday, we have two groups of three drivers each in the press conference for 30 minutes, and we do that on a rotating basis. We try to make it as newsworthy as possible when we choose the drivers, but we also have to have an equal rotation between teams. We can't always have the big names there, so at the end of the season we try to have a balance so that each driver has been an equal number of times."

6 "We always try to get a white couch that's angled so we can have all the drivers facing the audience, but be able to look at each other. We used to have just a bench, but it was hard for them to interact with each other – and we found that if they were slightly angled, they could have more of an exchange with each other, which helps with the relaxed atmosphere and therefore better answers.

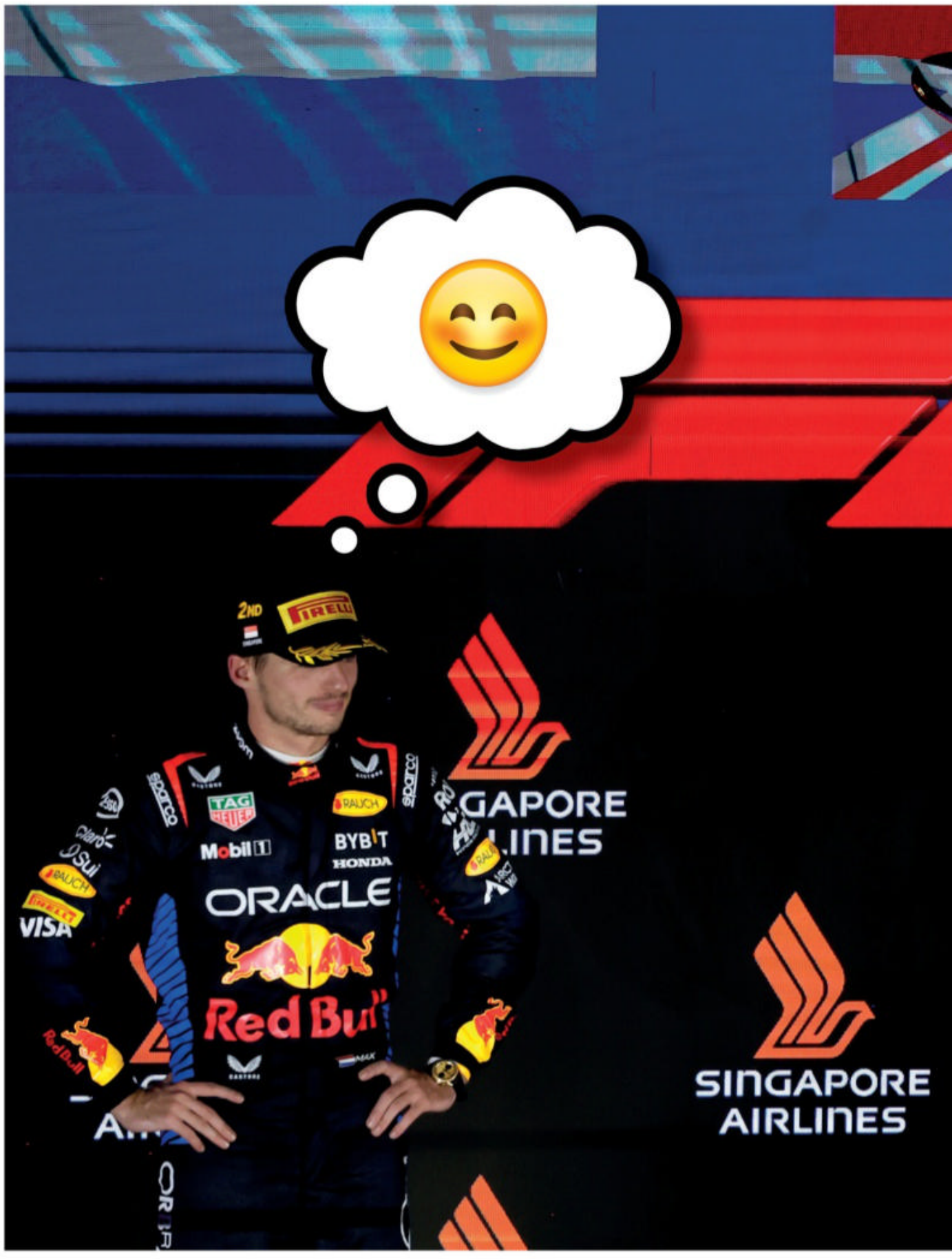
"Another fun fact: the couch doesn't travel with us. Because it's so bulky and heavy, it's actually easier to have a different one at each race – which we ask the organisers to keep for future events."

7 "On the side, you can see me. My first job is to keep an eye on the time: starting with the time that Tom asks questions to make sure we leave enough time for the journalist's questions. When we get to the questions from the floor, it's my job to decide the order and who gets to ask a question. There are some regulars who travel to most of the races and we try to have a mix of questions from them and the local journalists, who are very important for each individual event."

OSCAR PIASTRI: MAX'S

As this issue of *GP Racing* hits the streets, **Max Verstappen** hasn't won a grand prix in four months. With Red Bull seemingly in crisis, Max's championship lead is looking beatable – just about. But McLaren's apparent dithering over team orders has made **Oscar Piastri** the kingmaker who could be **Lando Norris's** greatest ally – or ensure he fails...

WORDS ALEX KALINAUCKAS
PICTURES motorsport IMAGES SHUTTERSTOCK



Obfuscation is an innate part of the F1 game. Teams are, utterly understandably, unwilling to allow any more insight into their designs or decisions than is strictly necessary into the public realm. Lest rival squads use any of that information for their own gain.

At McLaren, preserving the squad's 'intellectual property' is a hot topic for team principal Andrea Stella. This makes his erudite media appearances all the more impressive in that he explains things in so much depth, all while guarding those precious secrets. It doesn't hurt that he's unafraid to call less sensitive things exactly as he sees them too, such as a fastest lap-chasing pitstop from one team benefitting its senior squad, or Max Verstappen's 2021-like driving against new title rival Lando Norris in Austria.

The necessary clouding of the picture is a key part of McLaren's controversial approach to team orders in 2024. It must be characterised as such because of how this has divided fans and F1 observers, but more significantly because of the strain it has wrought on the team itself. Indeed, there is a very real chance that points lost to a *laissez-faire* team orders strategy means McLaren misses out on the world title double it could yet claim this term.

The specifics of F1's fastest-lap bonus point – heavily scrutinised after now former RB driver Daniel Ricciardo stopped Norris claiming it in that crushing Singapore win – and the fluctuating form of Ferrari, plus Mercedes, can't be discounted as factors in where the drivers' title ultimately goes. But McLaren argues it is currently in pole position to beat Red Bull to the constructors' championship (it now leads by 41 points heading into the season run-in) precisely because it has allowed Oscar Piastri so much free rein in racing against Norris.

THE TEAM COMES FIRST

In fact, in all the media frenzy that followed Charles Leclerc stunning the McLaren pair to win at Monza, it was reinforced how – to McLaren – the biggest issue with Piastri's mighty pass

SECRET WEAPON?

on his team-mate in that race's opening corners was how it gave Ferrari a chance to win the race against either McLaren driver.

"Lando, myself and Oscar," Stella said at the next round in Baku, "we all agreed that entering a chicane in P1-P2 and exiting P1-P3 is just not acceptable. Because it's infringing our first principle, which is the team interest comes first."

The focus on McLaren's team orders goes back much further. To Hungary, and Piastri's first F1 victory scored amid the awkwardness of him passing polesitter Norris at Turn 1 (with an unhealthy dose of Verstappen on the outside) and then needing to have that position handed back when McLaren's final pitstop sequencing put Lando unexpectedly into the lead again.

Immediately, memories stirred of what other teams of past eras might have done in this scenario. It's not hard to imagine Rubens Barrichello just being expected to accept Michael Schumacher remaining ahead if the early 2000s Ferrari superteam found itself in that position. Such thoughts would have been more vivid for Stella – Schumacher's performance engineer, and later race engineer for Kimi Räikkönen and Fernando Alonso at the Scuderia.

He'd made an interesting point post-Monza – how in the early 2000s or 2010s Ferrari team orders cases the "successful driver was successful because he was gaining the success on track".

The tussle at the second chicane at Monza, which saw Norris ultimately relegated to third, has resulted in the 'papaya rules' being updated

This highlights the difference between these and today's case. That Norris just isn't far enough ahead of Piastri both in terms of points and pure performance to lead McLaren into a position where it has a natural number 1 and number 2 pecking order.

Not that the squad of Ayrton Senna versus Alain Prost would ever use such terms, but there is a strong case that Norris would be significantly better off if it had.

SWING WHEN YOU'RE NOT WINNING

Leaving aside the points lost to strategy calls in Montréal and at Silverstone, and the Spain start – plus his own part in the Austria shunt and his misfortune to be wiped in the Miami sprint – we can calculate an 18-point swing in Norris's favour with favourable team orders from much earlier in 2024. This is if Piastri had remained behind in that final Budapest stint and not challenged Norris at the Monza start – and assumes Norris would have gone on to win there.

The form of Mercedes (above) and Ferrari (above, right), while not consistent, is something that Norris needs to guard against

Suddenly, a 34-point advantage for Verstappen to defend over the upcoming events in Texas, Mexico, Brazil, Las Vegas, Qatar and Abu Dhabi – with sprints at Austin, Interlagos and Losail too – looks much trickier.

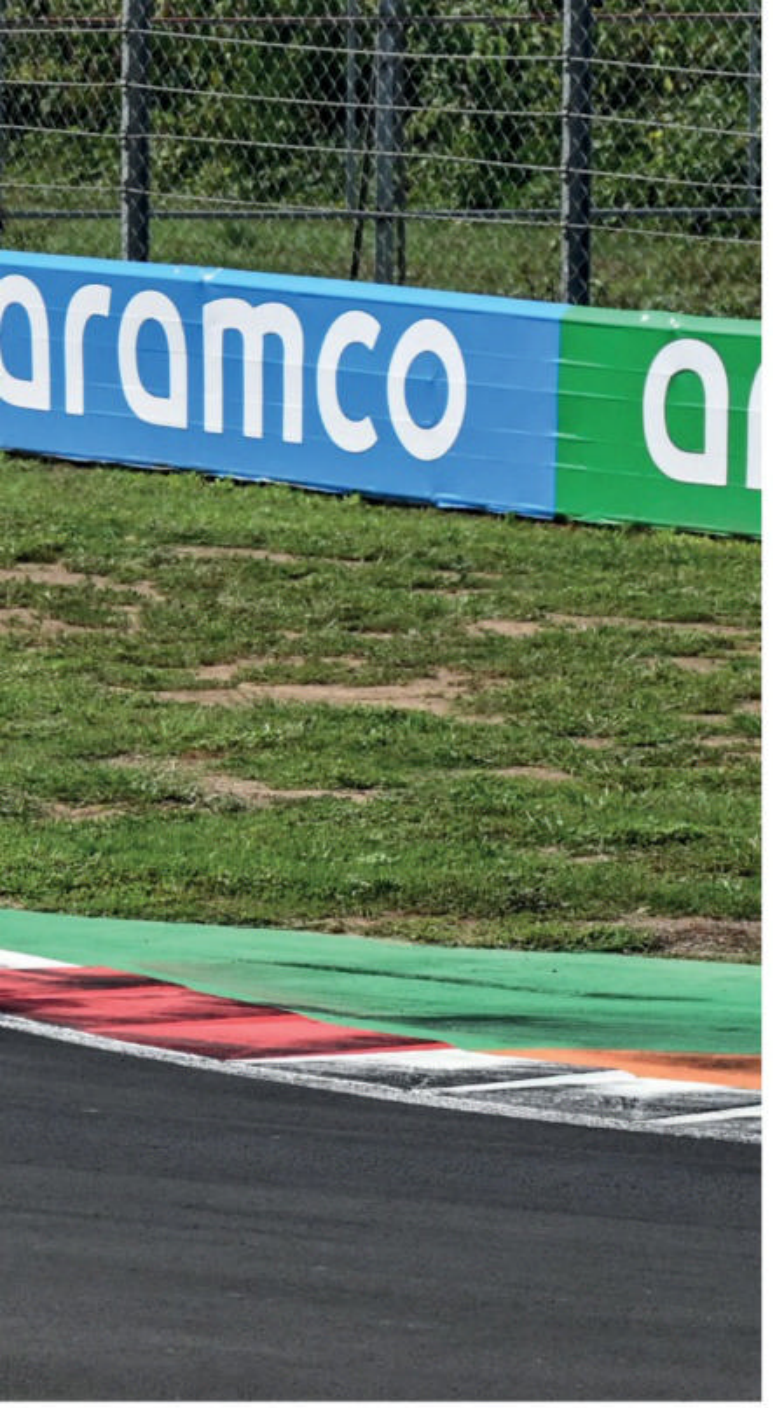
"CHECO KNOWS 100% WHAT HIS ROLE AND JOB IS"
CHRISTIAN HORNER

But, as ever in F1 and as much as hyper-partisan fans and click-chasing columnists may struggle to grasp, complex situations such as these cannot just have simple outcomes. McLaren would have a big problem if it had tried to force Piastri into a supporting role much earlier in the season.

First, we're discovering the extent to which the team is re-learning the art of winning regularly at the front of the F1 pack after over a decade in the midfield doldrums. This includes, as Stella revealed in Singapore, how McLaren has now been "discussing that we should adjust our weekend schedule because we need to have many more conversations, even with the drivers, in terms of internal competition".

"Something that in the past wasn't part of the going racing," he added.

And, as part of such delicate discussions, McLaren must also to look to the long-term. It has worked very hard – to the point of going to court to secure Piastri's services, having pried



him away from Alpine – to install what is among the best-balanced driver line-ups on the current grid.

Lewis Hamilton joining Leclerc will probably give Ferrari the slight edge on this front in 2025, but that's based on historic achievement more than anything else. Norris-Piastri can take on the raw speed of Leclerc and Verstappen and, based on those Zandvoort and Singapore performances, are now a match for Max and Lewis in the vitally important discipline of tyre management. That only one Red Bull driver is being mentioned to this point highlights the massive problem the world champion squad has been unable to solve for years now.

THE CONTRACT STILL INTACT

Both Norris and Piastri are contracted until the end of 2026 – although the deal Norris inked in early 2024 likely contains provisions to go on beyond that. Piastri's, however, explicitly expires at the end of a 2026 campaign that really isn't all that far away. And, while the wild churn of the driver market has cooled ahead of next year, it's a fragile peace. There could yet be major change on the driving front at Red Bull and Mercedes, while Aston Martin – with a view to taking a leap in competitiveness now Adrian Newey is coming on board – will surely be on the lookout for a long-term solution to its own driver line-up imbalance.

All would snap up Piastri if the chance arose – something his management, former F1 ace Mark Webber and his wife, Ann, know all too well.

There has been much speculation that it is from these quarters that Piastri has been forcefully prepared to show he's "not bad for a number two driver", to quote Webber himself. But that nothing has publicly seeped out on this front (Webber helps front Channel 4's coverage in the UK and has made regular appearances on other platforms) speaks volumes too. There is a united front in the Piastri camp and, after such an impressive second F1 win in Baku, his stock is only rising.

The Azerbaijan weekend is another critical part of this whole tale. McLaren had arrived there finally confirming that it would show "bias" – in Stella's words – towards Norris's title tilt. But when the drivers faced the media, they confirmed that Piastri wouldn't be pulling over to cede victories.

The order after qualifying in Hungary, Unfortunately for Norris the positions were *eventually* reversed on race day

Again, the need for simplicity elsewhere clashed with the complexity within McLaren. The team's strict "principles", again per Stella, meant that while it wants Norris to earn maximum points, it's still not prepared to offer Piastri up as sacrifice. Norris also doesn't want that – insisting "I also don't want to be given a championship". What this all boils down to is that the pair will leave more margin in terms of intra-team overtaking – and a della Roggia wrestle from Piastri wouldn't now be repeated – in updated 'papaya rules'. And if they run line-astern in places away from 1-2, then Norris would be moved ahead.

This contrasts with Red Bull's focus on Verstappen. Team boss Christian Horner's "Checo knows 100% what his role and job is" made that clear. But both McLaren drivers are buying into the new arrangement – as evidenced

Verstappen, Norris and Piastri in Hungary. Oscar will need to be ahead of Max as often as he can if Lando is to be crowned champ

WHEN TEAM-MATES GO BAD

ITALY 1956
With title contender Juan Manuel Fangio marooned in the pits, Luigi Musso was called in to hand his Ferrari over to the team leader. He refused and drove off.

BRAZIL 1981
Carlos Reutemann won from Williams team-mate Alan Jones in contentious circumstances, ignoring increasingly insistent signals from the pitwall including a sign reading 'JONES-REUT'.

SAN MARINO 1982
With its cars safely running 1-2 in the final laps, Ferrari signalled both drivers to slow down. Gilles Villeneuve obeyed, team-mate Didier Pironi didn't – and overtook him.

FRANCE 1982
Réne Arnoux ignored Renault team orders to allow Alain Prost through to win. To add insult to proverbial injury, in a case of mistaken identity that evening a petrol station attendant congratulated Prost on beating "that little prick Prost".

PORTUGAL 1985
Jean Alesi took exception to being ordered to let team-mate Gerhard Berger past; in retribution Ferrari engineered Berger ahead by giving Alesi a deliberately slow pitstop. Afterwards Alesi raged to Italian TV that team boss Jean Todt "is breaking my balls".

HUNGARY 2007
McLaren team policy was to give drivers priority on track position during the 'fuel burn' phase of qualifying on alternate GP weekends; here Lewis Hamilton disobeyed and wouldn't let Fernando Alonso past. Alonso riposted by blocking him in the pitlane before the final runs.

MALAYSIA 2013
A scenario that will be etched in the mind of Oscar Piastri's manager Mark Webber. With Webber leading a Red Bull 1-2 the team gave its coded 'Multi-21' radio signal to stay in that order. Sebastian Vettel overtook him anyway.

by Norris in Baku, delaying Sergio Pérez enough to prevent a critical undercut on Piastri. That alone could make a difference in Abu Dhabi given Verstappen was so weak in Baku, Norris beat him home from nine places behind on the grid.

BUT WHATEVER HAPPENS WHEN THE FIREWORKS ARE FLYING AT THE END OF THE SEASON FINALE, McLAREN IS ADAMANT IT WILL HAVE NO REGRETS. SO LONG AS THE CONSTRUCTORS' CHAMPIONSHIP IS SEALED, IT FEELS IT HAS DONE RIGHT BY BOTH ITS DRIVERS.

"We've reflected so much as a team around our mindset," Stella says. "This has penetrated very deeply and means that the mindset is genuinely onto the future.

"I'm pretty sure we will not fall into this temptation of looking back at the points that we don't have, but we will focus on to the points that are available in the future."

That bodes very well for McLaren in 2025. In terms of the here-and-now, while it might seem like the points Piastri has theoretically removed from Norris's total could thwart Lando's 2024 ambitions, given how much better McLaren's driver line-up is compared with Red Bull, he could yet be the critical kingmaker.

Given that Verstappen now needs only to score second places to win title number four, McLaren and Norris need someone to prevent him doing that. Whether Oscar chooses to do this or requires orders is what remains to be seen...

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PORTRAIT WILLIAMS

FRANCO COLAPINTO

The flag of Argentina is back on the Formula 1 grid for the first time in 23 years as the Formula 2 race winner and Williams Driver Academy protégé got the call-up to replace struggling Logan Sargeant for the rest of the season

How has your life changed since the day you were announced as the new Williams F1 driver?
Yes, it's changed a lot! The day before I was driving in Formula 2. It was obviously a big step, a dream come true and I am really happy to be here [in F1]. I am enjoying the opportunity. I knew it was going to be tough, but we're doing a great job as a team, building up the pace to get me through the learning process quickly. And I think we're doing a great job.

Is the life of an F1 driver what you expected?
Ever since I was little, my dream was to drive a Formula 1 car and be a Formula 1 driver. What I love is driving, everything else is extra.

And there are a lot of extras in F1...
There's a lot more going on. But that's the part that drivers don't enjoy so much. The enjoyment comes from driving the car and sitting there with the team, working with so many engineers. And the other part, of course, is all the things we have to do that we might not enjoy so much.

What has surprised you the most?
Just the amount of media, the amount of eyes on you all the time. That's something you have to deal with in F1.

How is it going with Alex [Albon]? He says your driving styles are very similar. Does he help you in any way?
Alex has helped me so much since I arrived in F1. To have a reference from a driver, who I think is one of the best on the grid, it's really positive and has helped me to do all these steps so much quicker since I arrived in Monza. I think it's a great way to start, to have a team-mate like that.

Were you surprised to be so close to him?
No. I know what I can do and I expected to be quick. And even though I didn't have a lot of experience with the car, that was the team's idea and that's why they put me in the car. So I'm happy to be helping the team. I think it's a step forward for Williams.

James Vowles said after the race in Baku that he was "incredibly proud" of you and that he felt "almost like a father"...
Well, imagine how much he helped me! I was in F2 and suddenly I got the call to race in F1 and he was the one who made my dream come true. So obviously I'm very grateful and it's very important for me to show that the trust and the opportunity he gave me is going well and in the right direction. It's a big step forward and I think having James by my side and supporting me has been a great way to go – and something that has really helped me since the start of my F1 career.

EVER SINCE I WAS LITTLE, MY DREAM WAS TO DRIVE A FORMULA 1 CAR AND BE A FORMULA 1 DRIVER

You have two of the biggest companies in Argentina supporting you. How important is it to see what's happening in the country, the reaction of the people and these companies that are joining you in this adventure?
I'm really proud. To be honest, since Williams announced I would be racing with them in F1, so many companies have called. More are coming, hopefully soon, which is great to see. And all the support I'm getting from my country is very special. To be working with Mercado Libre and Globant now, and them supporting me and the team on my way to F1, is something very nice.

I already had a lot of support in Formula 2, you know, when my car looked a bit too full with all the stickers. Obviously you can't have that here, but I'm very grateful. Globant was one of the first companies to help me get into Formula 2 and to have them on the car in F1 is very nice. And Mercado Libre is one of the biggest companies in South America and it's very, very good to see them involved.

What tracks are you most looking forward to on the remainder of the calendar?
I'm really looking forward to going to South America, Brazil. It's a very special place for me. Being from Argentina, it's almost my home race, so I'm looking forward to it, I think the fans will be very happy and there will be a lot of them. It's also a great track, very old, with very nice and funny corners. So let's see how it is there. It's also a track I don't know, so it's a nice challenge. Most of the tracks I don't know in the next few rounds. But again, it's a very nice challenge.

It's Not About The Tools

Aerodynamic research has been a fundamental pillar of Formula 1 for decades. Despite the budget cap and resource restrictions, teams still invest millions in windtunnel and computational fluid dynamics (CFD) technology. And yet recently, many have had to reverse upgrades which haven't worked as predicted. **Pat Symonds** explains why...

PICTURES motorsport IMAGES SHUTTERSTOCK

The sophistication of aerodynamic research techniques has grown immensely in recent years. When I started windtunnel testing in the 1980s, the models were crude, the tunnels small and the instrumentation limited to a simple balance to measure forces and moments as well as a manometer to measure a few pressures. CFD didn't exist, at least not in the realms of motorsport. The aerodynamics department consisted of two full-time employees and two others (me included) who also performed other duties.

Today an aerodynamic department will be the largest single engineering group in a team: around 100 people with jobs ranging from developing CFD tools and methodologies, through wind tunnel model design and build, to those actively engaged in developing the aerodynamic shapes and keeping on top of actual performance. With such expertise one might expect that something near perfection would be commonplace. After all, when a suspension component is designed and analysed for stress and reliability it rarely fails – what's so different with aerodynamics?

To answer this it's worth looking at the methodologies and tools employed in developing aerodynamics. Within a given set of regulations, the aerodynamicists responsible for putting performance on the car will focus on shapes that interact with each other to produce consistently high downforce levels at minimum drag. The operative word here is *consistent*. If we go back to our suspension comparison, if a load is applied to a suspension wishbone, we will ensure that the strain resulting from the load remains within the linear region of response. In other words, if we apply a load the wishbone will deflect a known amount and when the load is removed it will always return to its original condition.

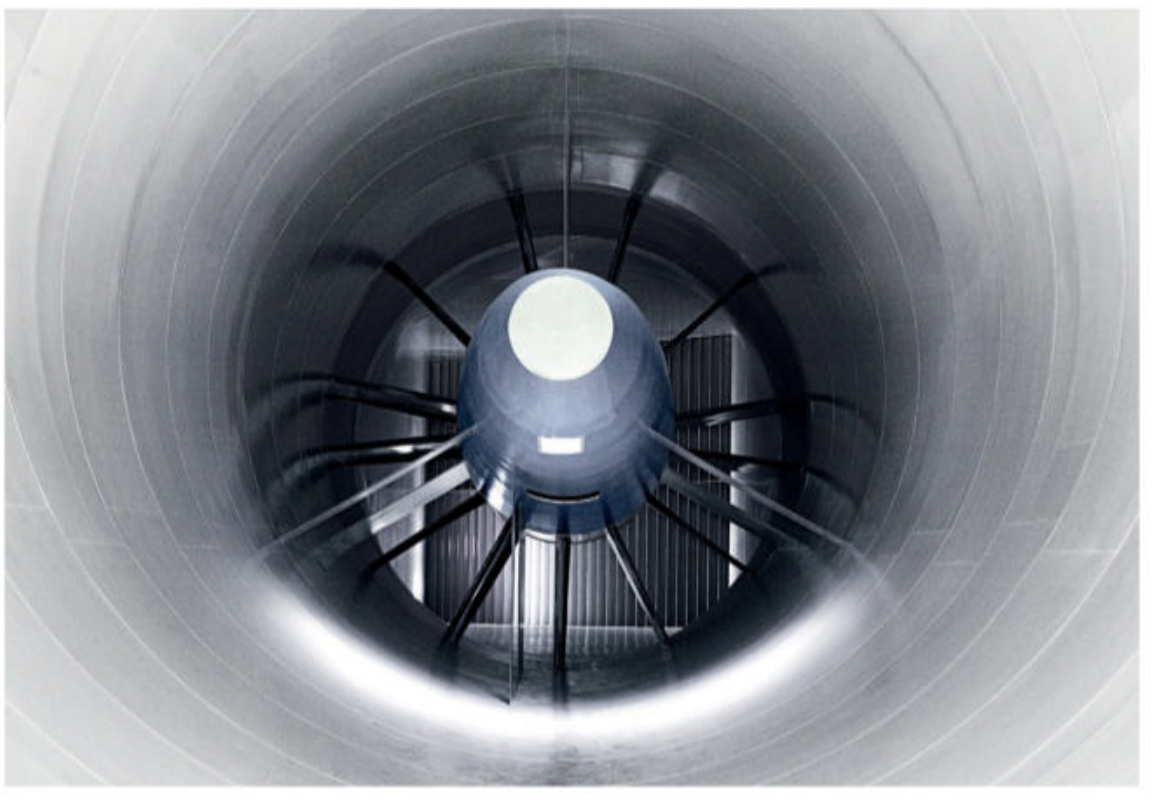
Aerodynamics, unfortunately, don't behave in such a predictable manner although our tools might have us believe they do. The starting point for development is normally the use of computational fluid dynamics, CFD. This is a powerful tool and the myriad of outputs from a simulation allow us to understand a great deal about the flow field around our components. Unfortunately, with the most common types of simulation, it gives a time averaged solution to something that's unsteady and therefore changes rapidly all the time (see p24). There are techniques that overcome this to some extent but they use a lot of computing time, which is limited under the F1 regulations. So these may only be used when there is some confidence to take the development through to the next stage.

Wind of change

This next stage will generally be windtunnel testing. Many people think this is a better arbiter of good and bad and to some extent it is – but it's still a simulation, albeit a physical rather than virtual one. One of the problems with windtunnel testing is that it assumes near-perfect conditions. The designer of the tunnel will spend a lot of effort to ensure that the flow in the 'working section' – where the model is placed – has very good flow characteristics, with low turbulence intensity,

Windtunnels have been in use in F1 since the 1970s. In 1996 this was the one used by Arrows (with boss Tom Walkinshaw standing in front of it)

Toyota's windtunnel model sits next to the full-size TF103 that the Japanese company campaigned during the 2003 Formula 1 season



Sauber's 2003 windtunnel. One of the issues with testing cars in windtunnels is that the environment assumes almost perfect conditions when testing

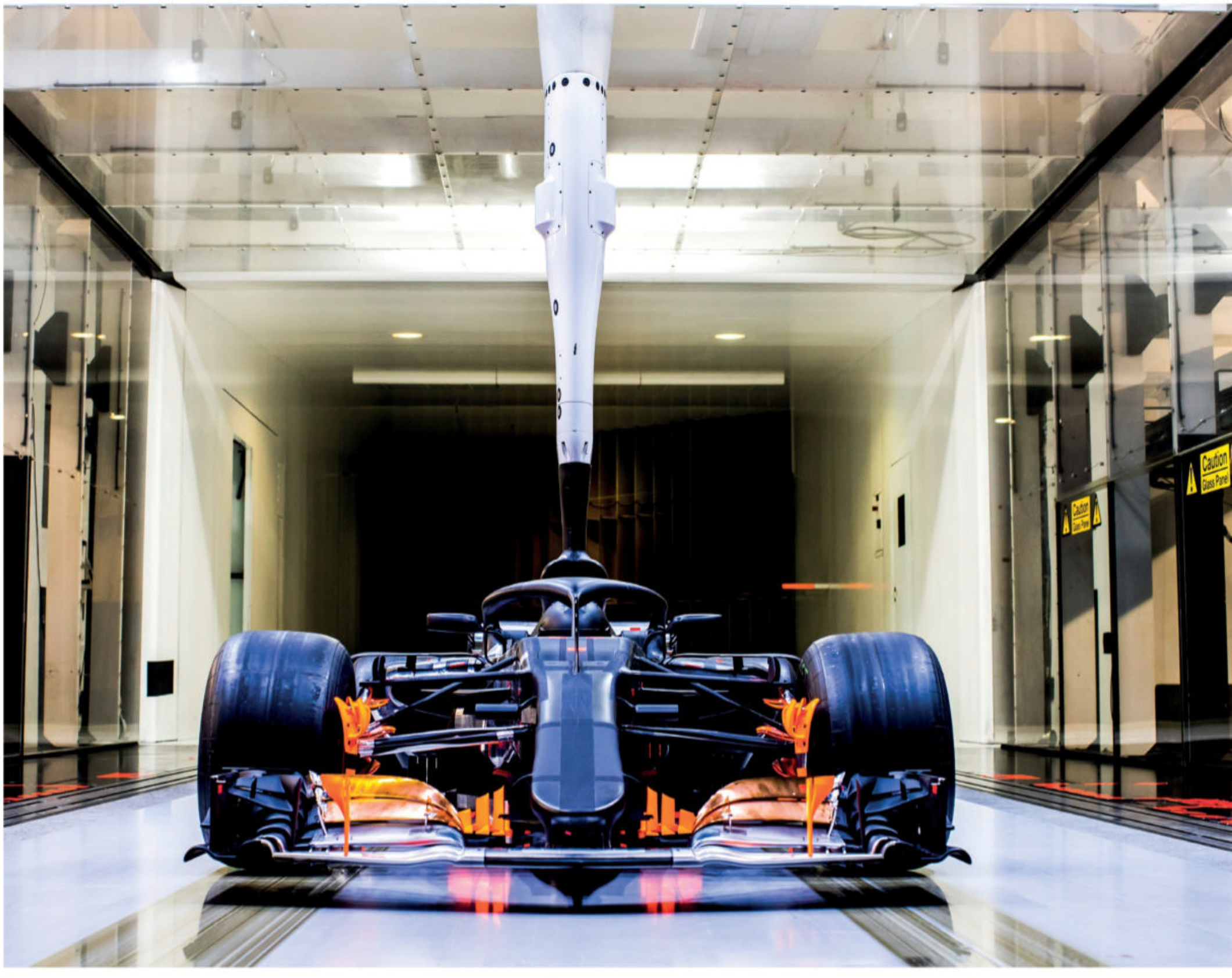
consistent flow velocity, and minimal ground boundary layer build-up. Unfortunately, a real racing car rarely, if ever, runs in these conditions. It will normally be exposed to atmospheric wind, wall effects from barriers, and particularly turbulence from a car in front.

Ground conditions are particularly important with the current generation of cars due to the amount of load generated under the floor. In the tunnel a large driven belt runs under the car to simulate the car moving over the track. For some years now this has been a flexible steel belt, which had a much longer life than the old Ammeraal PTFE-backed polyamide belts. Recently, however, the smooth steel belt has been called into question since it may not represent the roughness of the aggregate in a typical track surface. A number of teams are in the process of replacing these smooth belts with ones with a rougher surface.

In addition to these problems there is the likelihood that aeroelasticity will affect the results. As far as bodywork deflections go, these can be understood and to some extent compensated for. The deflection of the tyres is more difficult. Loading devices on the wind tunnel model will compress the scale pneumatic tyres to approximate the contact patch size and the sidewall shape, but simulating the tyre shape when it's deflected by lateral loads is far more difficult.

So if these two primary methods of aerodynamic development have their limitations, one might expect that the real answer lies in what's measured on the track. Red Bull team principal Christian Horner recently gave this credence, saying (in relation to his team's well-publicised issues with development parts): "It's not unusual that when something's not working on the car, you end up with different readings from your simulation tools and they don't converge, then you get three sets of data: you get CFD, you get windtunnel and you get track. Obviously the one that counts is track..."

In my view this is an aspirational simplification which doesn't tell the full story. The problem with track measurements is that a racing car isn't a laboratory instrument.



Modern windtunnels, such as the one used by Mercedes at its Brackley factory, are much larger and can now take a full-sized F1 car

Even with the sophistication of modern data acquisition it cannot measure to the standards of the simulation tools. While a huge number of pressure tappings can be installed in the floor and wings, which give a pretty good idea of what's happening, the actual load measurements are more difficult: measuring load directly through strain-gauged push- or pullrods only measures the loads on the body and misses the loads imposed by the wheels and hub assemblies. At the rear this is significant: the brake duct winglets and rear suspension contribute around 4.5% of the total load as well as aiding diffuser efficiency by interaction. In addition, drag is hard to measure since this needs to be done by coast-down tests where the car is allowed to decelerate freely and the subsequent speed decay analysed to separate rolling resistance and aerodynamic drag – not a particularly easy thing to do during a race weekend. The use of aerodynamic pressure measuring rakes and, to some extent, flow-viz paint on the bodywork help understanding but neither actually provides a measure of load.

The infernal triangle

So, we have three measurements – from CFD, the windtunnel and the car – but each has some deficiency. I term these measurements the 'infernal triangle' since, if we plot lift and drag from each method, we end up with a triangle of points. We hope the correct figure lies somewhere within the bounds of that triangle – but where? Even if we knew the answer to this vexing question we still wouldn't have a complete picture of what was going on. The reason for this is that in simplistic terms, if we consider load measurement, we will tend to do this on track at a constant speed. We would then compare the results with a CFD run done at the same ride heights and an extraction from the windtunnel map, again at the same ride heights. We would hope there isn't a side wind but, if there was, this can be measured on-car and corrections made. Drag measurements are a bit more complex because the coast-down test will involve changes of ride height as the speed decreases.

For this reason teams are often more interested in pressure measurements made at multiple positions on the floor. Integrating these values over the area of the floor can give a better understanding of the load the floor is producing – which, after all, is the majority of the aerodynamic load. Pressure taps on the wings can be used in a similar way and both give a dynamic reading throughout the lap. Pressure measurements can also give an idea of when the aerodynamics start to behave in an unexpected manner.

To appreciate the significance of this, it's important to understand that the aerodynamics of a racing car run much closer to stall conditions than one would ever find on an aircraft. That's because this is where maximum performance is found. Also, unlike an aircraft, Formula 1 cars rely a lot on vortices to enhance downforce. The strakes at the entry to the floor, just below the radiator inlets for example, are critical to setting up vortical structures that encourage flow under the floor in a coherent manner.

Measuring aerodynamic loads on a car can be tricky but when brake duct winglets (and rear suspension) make up nearly 5% of total load it is important

The trouble with both these factors, particularly the use of vortices, is that they can be very critical to operating conditions. A vortex that's encouraging strong flow under the floor, and behaves perfectly in the refined conditions of the windtunnel, may burst in the rapidly changing dynamic conditions caused by movement of the chassis relative to the ground as the car negotiates small bumps.

Data taken at the track is collected from pressure tappings installed on the car, but pressure measure rakes (below) and flow-viz paint are also used

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McLaren took one of the biggest single-race upgrade packages seen in recent seasons to Miami, where Norris won and the narrative started to shift

Appearance vs reality

This season it appears that the lack of correlation between the directions suggested by the development tools and the behaviour of the real car is more common than in previous years. But is this a fact or a combination of circumstances?

The season started with expectations that Red Bull was again going to dominate the championship and, apart from the problems in Australia, it maintained great performance even when introducing a floor upgrade in Japan. The turning point was Miami but no changes were made to the Red Bull car for this race. Instead, McLaren produced one of the biggest upgrades seen for a long time: a completely new front wing; altered front suspension geometry; revised brake ducts front and rear; and a heavily revised floor which required changes to bodywork, engine cover, sidepod inlets and rear suspension.

Since then the balance has swung in McLaren's favour and it's evident that subsequent upgrades have worked well. The real question is whether Red Bull has lost performance or just stayed still. On the surface one might think the team has gone backwards since Max Verstappen has been vocal in his complaints – something we hadn't heard in the previous season. However, in competition all things are relative. If you have a car noticeably faster than the opposition then, once out front, in relatively clean air, the driver can dictate the pace, looking after his tyres and maybe driving just a few tenths off the car's maximum. This makes a world of difference since he never has to explore the limits. As soon as the car is pushed towards those limits, maybe now in dirty air since it's no longer leading, the inadequacies of the handling become apparent. Is this simply what Red Bull is now experiencing?

McLaren's Miami upgrades were made to look even better when Red Bull didn't take any tweaks to the first American race of the season

We can't ignore correlation problems – but what do we mean by correlation? To many it means that forces measured on the car replicate wind tunnel forces, but we've already explained that is not possible. To me, correlation means that if a positive incremental change is found in the aerodynamic tools, then that positive increment also shows up on the car.

Equally we need to consider the full aerodynamic map. For convenience we may express aerodynamic performance as single, weighted sets of numbers, but the reality is that the car undergoes not just a trajectory through a corner but also a trajectory through the aero map as it traverses that corner. The aerodynamic map is a multi-dimensional representation of the load developed front and rear at any given condition of ride heights, roll, steer and yaw. A secret of good aerodynamics is understanding that path and ensuring the car maintains a similar aerodynamic balance of front and rear load as it enters the corner at high speed, drops speed to the apex, and then accelerates out of the corner. If the balance is changing too much, particularly in the wrong direction through the corner, then the driver may feel the front and rear are disconnected – a phrase we've heard a lot from Christian Horner recently.

So, have our trusted tools suddenly let us down – or is the closer and more intense competition this season demanding a more exacting set of solutions to the inevitable questions simulation is required to provide? While there's an element of both, I think the answer leans more toward the latter.

True, we've seen indecision about the fidelity of upgrades from RB, Ferrari, Red Bull and Aston Martin, but this isn't a new problem. At Renault we won the championship in 2006 but were less competitive at the end of the season than at the beginning. On reviewing the situation post-season, we established that many of our upgrades had in fact detracted from performance.

This year the extreme rivalry leaves nowhere to hide both on the track and in the engineering office. Just as the drivers need to be on the limit and will occasionally exceed it, so too will the aerodynamicists and their extremely sophisticated tools.

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LAURENT MEKIES

10 THINGS I LOVE

The VCARB boss on his favourite pink jacket and the right and wrong time for a cappuccino

The mountains

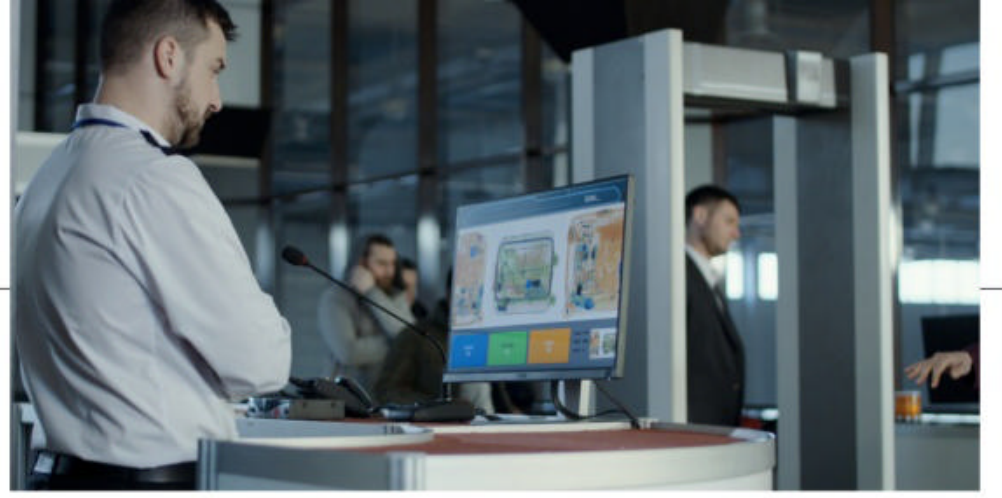
The perfect escape for me is to go to the mountains. I love the mountains and take every opportunity to go and spend some time away from the noise of everyday life. It doesn't happen often but, when it does, I enjoy going to a completely remote place – somewhere in the Italian Alps, for example – where there aren't even small villages nearby, just to enjoy the peace and quietness. I love that. And I hope the family enjoys these occasions too.

Staying at home

I think I speak for everyone who works in F1 when I say that the moments you actually get to spend some time at home are invaluable. Because we travel so much, we spend a lot of time in hotels but, even when you get back, your family wants to go out with you! So the time you actually spend at home is very, very limited. And my wife also has to travel a lot for her job, so it really is like that with us. We even have a sort of running joke with the kids: when we get home, I open the door and I say to them, "OK boys, you know what this is? This is home. Home is a place where you never spend more than two days in a row." And we all laugh. But that's our life!

Pink jacket

I have a pink jacket that I really like, but it's probably a bit too bright for the office. When I was at Ferrari and my office was opposite Mattia Binotto's, he'd always say, "Seriously, that jacket?" So I ended up only wearing it when I knew he wasn't in the factory – which was also funny because in the end, when people saw me wearing it, they knew it meant Mattia wasn't in the building!



Modern airport scanners

It's something I'm sure a lot of F1 people can relate to... But I love these modern scanning machines that they have at airports around the world now – the ones that save you the hassle of taking out all your liquids, your laptop and all your other gadgets. They are just wonderful and save you from a lot of stress. We have this running joke with Yuki. As he lives in Faenza and we often travel together, we always wonder if we'll have the pleasure of 'meeting' one of these machines. There are a few in Bologna now and we absolutely love them..

Football

I'm not a typical football fan in terms of having a team to follow and support. If there's one team I always cheer for, it's the French national team – but otherwise I don't follow the sport that much. But I love the feeling of switching on the TV before a big game and just watching.

Racchettoni

It's a beach tennis game. Very popular in Italy. If you haven't tried it, it's a cross between padel and beach volleyball. The racquets are similar to the former, the court is similar to the latter. And if the ball drops, you lose a point. Faenza is very close to the Adriatic coast, and one of the peculiarities there is that the beach line is very, very wide, down to hundreds of metres. So there are a lot of beach club facilities: you have restaurants, bars, all that sort of thing – and you also have dozens of these beach tennis courts. There used to be a couple of courts just behind the factory in Faenza and I'd cancel every meeting if I had a match scheduled! I don't play as much now, but I still love it.

PICTURES: SIMON GALLOWAY; RED BULL CONTENT POOL; SHUTTERSTOCK

Shutdown time

We have a nice family tradition that I have to thank my wife for. During the F1 shutdowns, when the factories are closed and we're not allowed to work, we have family holidays: in winter with my side of the family, in summer with hers. So it's always a lot of people, a lot of kids – going somewhere together, just spending a lot of time as a family. And it's always something special. She puts a lot of effort into organising it and putting it all together to make sure we enjoy that time. We go to different places, but it's always a lot of fun, hectic, lots of kids all playing together and spending time with their cousins. I'm not sure we get much rest! But these two holidays are always highlights of my year.

Watching my kids play

I have three boys – ten, four and one years old – and just spending time with them, watching them play, teaching them things and interacting with them is something that's precious to me. And I also appreciate them telling me the hard truth – be it about lack of presence or our race results. They just don't lie and that's what I love about interacting with them.

Cappuccino

I've been living in Italy for a long time now, so I have a lot of Italian habits. And cappuccino is one of them. But you have to do it right! There are a lot of Italian jokes about cappuccino, mostly about how you can't drink it after a certain hour in the day. If you order a cappuccino in Italy after 10 o'clock in the morning, people will look at you strangely. If you order a cappuccino after 12 o'clock, they'll think you're a tourist. So I do it right. Cappuccino is for very early in the morning!

Early starts at the office

I love arriving at the office early in the morning. I wouldn't say I'm the first to get there, but I like the early hours when there aren't a lot of people there, and the people who are there are there for a reason – because they're working on something that's really important for the team. And it's great to meet them and catch up and then just spend a few quiet hours thinking and planning before the day really starts. It allows you to spend more time with the people who need input from you – and because you've been there early, you're organised, you're ready. That's the feeling I love.

THE LONG INTERVIEW

THIS IS PADDY LOWE

Born in Africa, he discovered engineering via fixing bicycles with his brother. The motor racing bug arrived in the form of passing rally cars... and led to a life of transforming F1 through active suspension, traction control, selective braking and passive aerodynamic trickery which drove rivals wild

WORDS OLEG KARPOV
PICTURES MOTORSPORT IMAGES

THE LONG INTERVIEW

PADDY LOWE

He's worked with Nigel Mansell, Ayrton Senna and Mika Häkkinen as well as Lewis Hamilton and Jenson Button, but this quietly spoken and unassuming engineer has flown below the public radar for much of his Formula 1 career. Nevertheless Paddy Lowe has had a hand in winning 12 world championships as well as over 150 grands prix.

From active suspension to McLaren's 'F-duct' – the banned invention which paved the way for the Drag Reduction System – Lowe has been a restless innovator. Now, as head of Zero Petroleum, he's creating fuel out of thin air...

GP Racing: Paddy, you were born in Kenya, weren't you?

Paddy Lowe: Yes. My parents actually lived in Sudan. They were missionaries. My dad trained local people to be clergymen. And my mother was a doctor. There were complications at birth, so she was airlifted to Nairobi and I was born there. And when I was about two years old, the Sudanese army came – they didn't want Europeans in the country anymore – and we went to live in Uganda.

It was an interesting childhood. My brother and I used to cycle around all the time. I actually rebuilt an old bicycle for myself – because we didn't have much money, almost nothing we had was new. So we found an old bike and made it functional, and then I learnt how to ride it.

GPR: How did motorsport come into your life?

PL: At that time there was this East African Safari Rally – it went through Kenya, Uganda, Tanzania. It used to go right past our house. I remember – because sometimes it was at night

By 1993 Lowe had moved to McLaren looking for a new challenge but also swayed, in part, by Ron Dennis's chequebook

and I wasn't allowed out – you would hear these cars coming and going every two minutes. And I used to follow it on the radio, I'd have all the merchandise you could get.

Then we moved and I went to school in Ireland for a couple of years before my parents settled in Kent. And for as long as I can remember, I was into rebuilding things – bicycles, motorbikes, lawnmowers, anything with an engine. People used to come to me at school to fix their mopeds. I actually made a bit of money that way!

If there was an F1 race on TV I'd watch it – but it wasn't something I really followed. When I finished university, one of my friends said, "Why don't you work in F1?" And I thought, "Well, they're making the cars, so they must need engineers."

GPR: Obviously!

PL: I wrote to three teams and the only one that replied was Williams, and it was from Frank Dernie. He needed people to help with the active suspension. They decided to race it in 1988 but they realised they didn't have anyone to do it. Well, they had about two people, but they thought they needed more.

It wasn't my first job. I'd worked as an engineer before but I came to Williams to apply myself in a completely different context. The easy part was that they didn't know what they were doing, so there were no other experts to judge our plans and ideas. They also hired a guy called Steve Wise and together we built up the whole electronics and software department.

GPR: Do you remember your first day at the track?

PL: I think it was late 1987, with a mule car. It was Nigel Mansell's first time back in a car after his back injury in Japan. Day one, run one: we're on the pitwall and David Brown, his race engineer, says: "First time around, he's going to come out of that corner backwards. I bet you." And Nigel did! Because he always pushes. Nigel just didn't know how not to push.

My first race was Rio in 1988. I went to all the races until we took the active suspension out in the middle of that season. And then I stayed at the factory for two or three years because we had to redevelop it. Nigel was so happy to get it off the car at Silverstone. That 1988 season was a complete disaster.

Lowe's first experience of motorsport was when cars from the Safari Rally passed close by to his parents' house

After Adrian Newey left for Red Bull, Lowe became McLaren technical director, although it was 2007 before he was officially called that

The engine was a catastrophe, the car wouldn't cool, everything was super unreliable, including this suspension system – and then the performance was weird, nobody really knew what was going on. Everything was just wrong.

GPR: Why did it take so long to redevelop it?

PL: When Frank Dernie hired us at the end of 1987, we tried to make the system they already had a little more robust. But it wasn't our system, we hadn't designed it or built it.

So what we did in 1988 was build all our own computers, software, electrical systems – from scratch. So the first real use of all that technology was the 1991 car, where we ran the first automatic gearbox.

> WE'D GOT ADRIAN NEWEY, WE'D GOT A VERY GOOD ENGINE FROM RENAULT. AND THEN WE HAD THE ACTIVE SUSPENSION. AND THEN THE ICING ON THE CAKE WAS THAT WE INVENTED TRACTION CONTROL AT THE END OF '91

GPR: So you spent all those years away from the track?

PL: Exactly. I don't think I went to any races during that period. Just the tests. I was running a test team. We had our own truck, our own car, our own mechanics. And we used to go down to the Pembrey circuit in Wales on a regular basis to test the active suspension, all our systems, electronics, gearbox, and a lot of other things which would come for 1992. By '93 they had anti-lock brakes. All these things were dependent on the platform, so it was the platform that required most of the work rather than the project itself.

GPR: That 1992 season must have felt incredible.

PL: You have to put it into context, that McLaren was winning everything. You just couldn't imagine what you had to do to beat McLaren. But we were making progress on all fronts. Aero with Adrian Newey, we'd got a very good engine from Renault. And then we had the active suspension, which worked properly. And then the icing on the cake was that we invented traction control at the end of '91.

And the active suspension, we pretty much proved it with back-to-back tests, was worth about a second per lap of performance. And then the traction control was worth another second of performance. It was a simple system, very elegant.

We tested it for the first time that winter at Paul Ricard with Damon Hill. I wrote the algorithm, one line of code. It was a run in the middle of the day, sort of, "Yeah, let's try this slightly crazy idea that the guys in the corner have come up with." In those days F1 was a mechanical sport. We were the geeks in the corner with wires and software. They didn't trust us very much! But we managed to convince them to put it on the run plan.

We sent him out and he came back and said, "I can feel it working. But it's holding me back." And we said, "Yes, it is. But you're a second faster."

The first F1 race Lowe attended was the 1988 Brazilian GP, but after that he spent a long time away from the track

GPR: How did the race drivers like all these systems?

PL: They thought it was awesome. The other element that came into 1992, which was also transformative, was that Nigel had spent the winter deciding this was his year. In '91 he and Riccardo [Patrese] were pretty close. But over the winter,

PADDY LOWE

Nigel had lost a lot of weight. When he got on the scales he was lighter than Riccardo – and that just destroyed Riccardo, because he thought it was his advantage.

This car really suited Nigel because it had massive performance, but you really had to believe in it. You had to commit to corners almost with blind faith that this downforce would arrive. That perfectly played into Nigel's hands. His whole philosophy of driving is, "I'll push it to the limit and beyond, and I'm so skilled that I will pull it back if it's wrong." That's how he drives. He had unbelievable reaction speeds.

So all that came together and suddenly we were just massively quicker than McLaren, to the point where you just couldn't believe it. McLaren hadn't done any of the same track tests over the winter as anybody else so, when we came to Kyalami, nobody had any idea how quick they were. And every session we were just faster. We just kept saying "they're sandbagging" because it was impossible to contemplate.

One of my favourite memories is when we came to Brazil, the second race, they brought six cars because they thought something had gone drastically wrong with the new one. They brought three old cars and three new cars, and at one point almost all of them were broken on the track! We were having so much fun because they were beating us for so long...

GPR: And then you moved to McLaren! Why?

PL: I did six years with Williams. That's quite a long time. I thought I'd achieved a lot. I thought there was an opportunity to develop in terms of my position in the team – and, frankly, the salary. With all respect to Frank [Williams], he wasn't big on getting out his chequebook – whereas Ron [Dennis] was the opposite. I got a decent pay rise, but it was more than that.

GPR: Ayrton Senna went the other way at about the same time. You had the chance to work with him for a short time, right?

PL: I overlapped with Ayrton for six months. I actually came with a very interesting project, we were developing a power braking system. I know that sounds bizarre because it's standard on every road car, but it wasn't on any F1 car except Williams, who had full ABS that year. But we didn't have the time to do ABS, we just did the power assistance. And I developed this system at McLaren, knowing that it would be illegal for the following year, 1994. But it was worth almost a second a lap when we tested it at Imola in early summer ['93]. We designed it, knowing we only had a window of three races to take advantage of it. And I'm personally very proud that this system helped him win his last few races.

When Lowe moved to McLaren the first car the team worked on without Adrian Newey was the 2007 car (above). His last full season with the team was 2012 (below)

When I arrived at McLaren, the mindset in the company was 'we just need to find that little thing we were doing wrong'. And it took them quite a few years to realise it wasn't just that. You have to get from denial to acceptance before you can rebuild.

GPR: How much did Adrian's arrival help this process?

PL: Adrian coming to McLaren was obviously a really good step on the aerodynamic side. But I think it's the same now. People think Red Bull will be lost without Adrian, but there are hundreds of people behind him. I've worked with him at


zero
Official Partner of

PADDY LOWE

Williams, I've worked with him at McLaren. He's a great part of the team. But I wouldn't say he's a team player, actually. He's a great contributor to the team and a great aerodynamicist. But then other people – and this was true in my time at McLaren – worked around Adrian to make it work and to deliver the car and performance in all areas. Adrian was also a big part of the improvements at McLaren, but there are other things we brought in, large and small. A larger one was brake steering...

With Adrian Newey in 2013. Lowe worked with Newey at both Williams and McLaren

GPR: Of course, the secret pedal...

PL: That was also worth like a second a lap! That was a great project because it was so simple and yet everyone thought it was so complicated. And again, it was a bit like Nigel and the active suspension. You needed a driver like Mika [Häkkinen] to exploit it. David [Coulthard] in the other car only exploited it because he understood what Mika had done. With Mika there was no instruction, we just sent him out. I said, "Here's a pedal, this is what it does, press it when you want to." I think the first time we tested it was at Silverstone. Nowadays Copse is an easy flat, but back then you had to lift and change down a gear or two. But Mika would tap the brakes on the inside at the right point, just to twist the car a bit more – at 170mph – and turn!

I loved working with Mika. Ultimately, I think he was better than Michael [Schumacher]. He'd beat him on equal terms. But the difference was that Mika had two championships and that was enough. He didn't want to do anymore. And Michael went on and got all the statistics.

> WITH MIKA THERE WAS NO INSTRUCTION, I SAID, "HERE'S A PEDAL, THIS IS WHAT IT DOES, PRESS IT WHEN YOU WANT TO." I LOVED WORKING WITH MIKA. ULTIMATELY, I THINK HE WAS BETTER THAN MICHAEL [SCHUMACHER]

GPR: You said McLaren was more than just a pay rise. What was the main attraction?

PL: I started as head of research and development, running all these R&D programmes, designing all these kinds of new systems, but also new infrastructure – like the simulator. We started working on that in about 1998 – a full 10 years before the simulator helped Lewis [Hamilton] win a championship as an active tool in 2008. And imagine the number of people who said "Oh, this will never work, waste of time"... including Adrian, by the way. And now you wouldn't be an F1 team without a simulator.

GPR: Then you succeeded Adrian as McLaren's tech director.

PL: I was actually technical director when Adrian left at the end of 2005, but they didn't call me that until I insisted on it.

Lowe in 2008 with Toyota senior advisor Frank Dernie. It was Dernie who gave Lowe his first job in F1 when Dernie was with Williams

What was really great was the opportunity for the team to come through and show what they could do. The 2007 car was our first car from scratch. We put everything into that car: all the lessons we learnt, all the freedoms we had up our sleeves or weren't allowed to do.

And we really developed this marginal gains approach where every single millisecond was counted and put into the programme. I remember we brought a piece – I carried it in my rucksack! – to Monaco. In the windtunnel it was worth about 80 milliseconds or something, and we put it on the car for Saturday and we got pole position with a lower margin, so that piece theoretically made the difference.

GPR: What did you like most about working at Mercedes?

THE LONG INTERVIEW

PADDY LOWE

PL: It was just great to have this performance. I liked working with Toto [Wolff]. He's an interesting character, but it's fun to work with him.

The engine was fantastic. Andy Cowell and his team did a mind-blowing job. But in terms of the car, nothing really comes to mind... Mercedes came up with that steering thing a couple of years ago, didn't they? What did they call it?

GPR: Dual-axis steering.

PL: That's the latest thing I can think of. That kind of innovation has been a big part of my career. I'd be pissed off if somebody came up with an innovation in another team.

I was quite proud of bringing new things into the sport. And then it was kind of a badge of honour when they got banned. Whereas now I don't think there are many opportunities. Most of them come from changes in the regulations, like the new power unit for 2026. But that's not really an innovation. I think the rulebook is so thick and so tight that, you know, I can't talk about my time at Mercedes in terms of "We did this spectacular thing". There have been a lot of micro-innovations that would be too boring to talk about.

GPR: Do you still get the same thrill from working on sustainable fuels?

PL: I love energy. F1 is really a manifestation of energy. And that's what creates the drama. We're not going to stop needing liquid fuels, but we're going to have to make them sustainable. And it's just very exciting to be working on that journey. And I think in 2030 people will look back and say, "Why didn't we do all this earlier?" It's not just about the climate, it's about a whole new model for energy where you don't dig it out of the ground. We need to move to circularity in general, in everything. We're a consumer civilisation – and that can't survive. We need to move to circular systems, and what better place to start than with energy?

GPR: So you've gone from fixing old bicycles in Uganda – through Formula 1 – to fixing the world...

PL: I never thought of it that way! I just love doing new things, learning. Here I'm learning chemistry. Real chemistry! And I like disruption, in a way. You look at all the innovations in F1 – they were disruptive technologies at the time. I just love that.

Lowe (with wife Anna) after his sustainable fuel venture Zero Petroleum was named as an official partner to the Stake F1 team

> I WAS QUITE PROUD OF BRINGING NEW THINGS INTO THE SPORT. AND THEN IT WAS KIND OF A BADGE OF HONOUR WHEN THEY GOT BANNED

I loved coming into the paddock with a new thing on the car, knowing how pissed everyone would be that we'd done it and they hadn't. The F-duct was probably the best. We designed it with no moving parts. But at first, of course, everyone was convinced there were moving parts in it, which is illegal. So they were all banging on Charlie Whiting's door, "These blokes are cheating!" It took them weeks to figure out there was another way to do it.

And I think we're doing a bit of that with fuel now. Because most people say, "Well, you can't make oil out of thin air." But that's exactly what we're doing.

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NOW THAT WAS A CAR

No132

WORDS
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The final grand prix winner from 'Britain's Ferrari' before it drifted into obscurity

BRM P160


YARDLEY B.R.M.
16

BRM P160

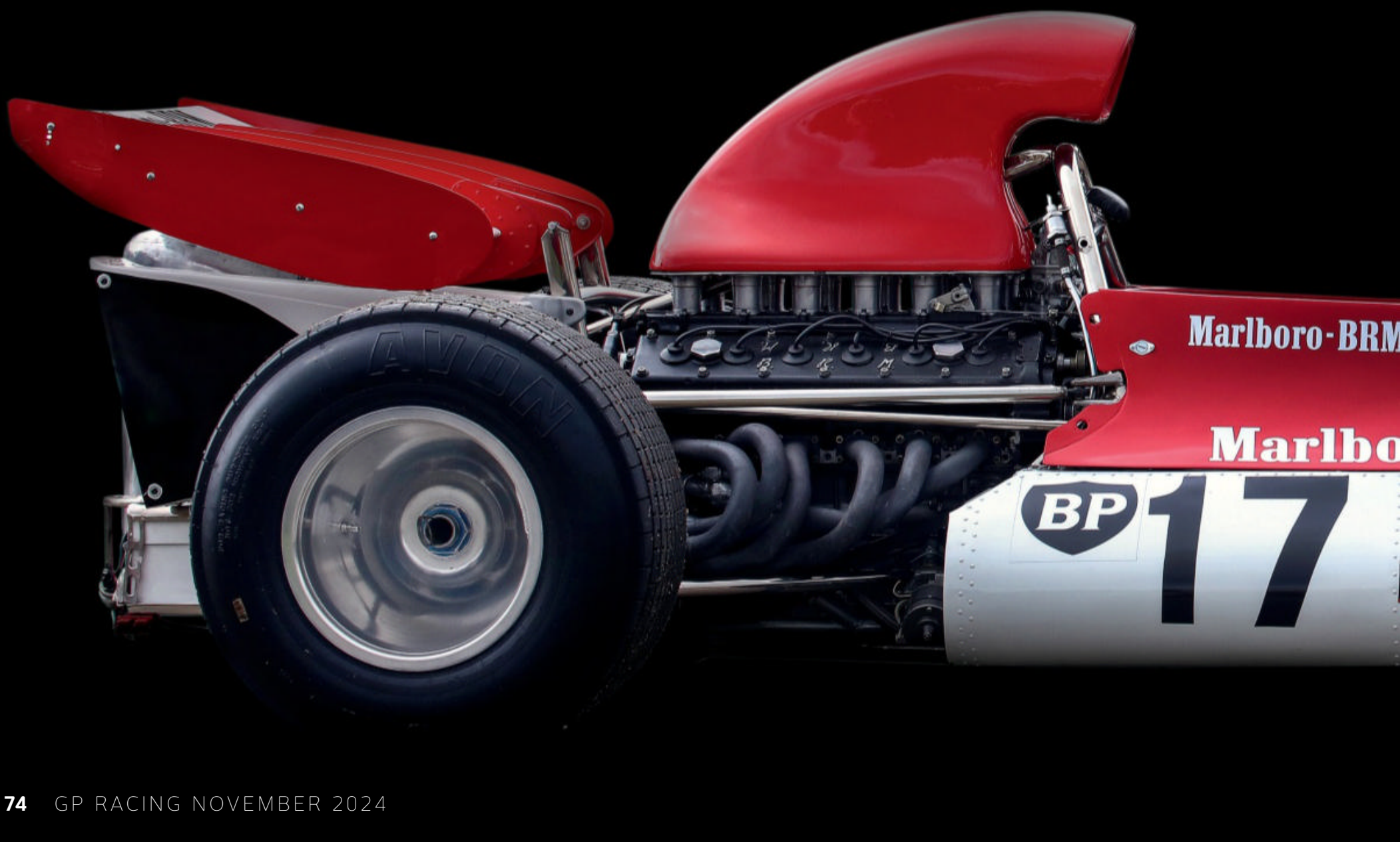
NOW THAT WAS A CAR No132

Pedro Rodríguez, Jo Siffert, Vic Elford, Peter Gethin, Howden Ganley, George Eaton and Helmut Marko. Jean-Pierre Beltoise, Alex Soler-Roig, Reine Wisell and Jackie Oliver. Niki Lauda, Clay Regazzoni, Henri Pescarolo and François Migault. All of them – the great, the good and the footnotes – share the BRM P160 in common, because they make up the dizzying roster of drivers who campaigned the British powerhouse's last Formula 1 car of genuine significance from 1971 to '74.

Inevitably, the returns diminished over that timespan. But initially, specifically across its first two seasons, P160 was a serious player, notching up three world championship victories and a pair of non-points wins in 1971. This was the car that claimed F1's closest finish, and until 2003 its fastest grand prix. It was also the last to finish first in a world championship GP for BRM – the patriotically titled British Racing Motors – on the slowest and most famous circuit of them all.

In an era of the Lotus 72, Tyrrell 003/006, Ferrari 312 and McLaren M23, BRM P160 resides in the shade of history, despite those landmarks. Yet it sure added to the colour and aural vibrancy of early 1970s grand prix racing, especially when in 1972 it became the first to adopt Marlboro's red and white chevron, the most potent brand of F1's dirty tobacco habit that it struggled to shake off over the next three decades.

Graham Hill's first world crown and concurrent constructors' title of 1962 had become a far-distant memory in a decade that stopped swinging for BRM long before 1969. The 'return to power' 3-litre H16 was a complex, heavy and unreliable miss in



1966, and the V12-propelled P126/133 failed to rediscover the glory days of the 1.5-litre era. By the final year of the decade, Britain's own Ferrari – although it was Lotus that built its own road cars while prioritising its first love on the race tracks – needed a serious reboot. Tony Rudd, the beating heart of BRM for 17 years, headed for Hethel, headstrong John Surtees departed for what turned out to be inglorious eponymy, and in came talented, ambitious Tony Southgate. An acolyte of Lola founder Eric Broadley, Southgate had lived the high life with Eagle in IndyCar, tasting success at the Indianapolis 500 with Bobby Unser in 1968. But wife Sue missed home, so he traded California for Bourne in Lincolnshire and began to pull BRM together for the start of a gauche new decade.

BRM's muddy take on British Racing Green was gone in 1970 as the team followed Lotus's lead by embracing the commercial age. Its title sponsor, Yardley cosmetics, offered a contrasting throat-catching bouquet to Gold Leaf tobacco. The deal, said to be worth £25,000, was attributed to Louis Stanley – 'Lord Stanley' to unknowing Americans – who was married to Jean, the sister of industrialist team patron Sir Alfred Owen. As Sir Alfred's health deteriorated, Big Lou's influence on BRM and its fortunes only grew. The high-handed pomposity, the ivory tower suite in London's Dorchester Hotel, charged at Rubery Owen's expense… Stanley puffed himself up as a *Commendatore*-style figurehead. Although perhaps he deserves some credit, beyond the comedic parody. He did introduce the Grand Prix Medical Unit as a meaningful effort to improve Formula 1 driver safety, and also sensibly signed the mercurial Pedro Rodríguez to replace Surtees.

BRM was grounded by team manager Tim Parnell, son of the late 1950s grand prix driver Reg. In the wake of a moderate racing career, Parnell had run F1 cars under his own name for the likes of Mike Hailwood, Chris Amon, Bob Bondurant and Richard Attwood, then was invited by Sir Alfred to join BRM. He was a figure of continuity when Rudd left for Lotus, and would prove a lynchpin in the team's early 1970s revival.

Southgate's first BRM, the clean-sheet P153, immediately set the team on a fresh (and upward) trajectory. Built around a simple and light monocoque weighing in bare at 26kg, the model featured a broad flat nose and bulbous flanks outside the straight-sided 'bathtub' chassis to house twin bag tanks in an attempt to lower the centre of gravity and minimise weight shift with fuel usage. Southgate would also admit an aesthetic inspiration behind those curves.

The four-cam, 48-valve V12 developed by Aubrey Woods was good for upwards of 440bhp, on a par with Cosworth's DFV V8. But it revved higher, at 11,500rpm, which meant it used more fuel, its narrow bearings also creating a penchant for pushing rods through blocks, leading to patched-up crankcases… To overcome the problem the answer was to pump large quantities of oil around the engine, which required a hefty oil tank. Southgate's solutions would be tidier for his P160 evolution.

The V12 was not designed to be a stressed member, so the P153 used a triangular tubular frame to take some of the suspension loads off the engine block. The rear suspension hung off the transmission, featuring a single top arm and a reversed lower wishbone, plus radius arms forward to the monocoque. The front suspension was made up by a conventional double-wishbone layout, with super-light titanium machined for the steering rack and some of the componentry. Driver-friendly on handling with V12 punch on tap, P153 and the improved P160 didn't break the mould or challenge convention. But they were precisely what down-at-heel BRM needed, offering Stanley's rolling cast of drivers

P153 AND THE IMPROVED P160 DIDN'T BREAK THE MOULD OR CHALLENGE CONVENTION, BUT THEY WERE EXACTLY WHAT DOWN-AT-HEEL BRM NEEDED

a potent weapon, especially for qualifying at fast circuits. But perhaps surprisingly, these cars proved effective at more 'technical' tracks too.

P153's greatest day came at Spa in June 1970 – the last F1 GP run on the fearsome old eight-mile circuit. Rodríguez charged past Jochen Rindt, Jackie Stewart and finally Chris Amon's March to take the lead, but the Kiwi kept the pressure on all the way in a classic contest. The V12's power allowed the Mexican to remain just out of reach as Rodríguez logged BRM's first GP victory since 1966, at an average speed of 149.94mph and by just 1.1s. Scurrilous rumours of a 3.3-litre V12, put about mostly it seems by those associated with March, have always been denied by all at BRM. Southgate in particular expressed his anguish at the accusation.

A lack of reliability limited BRM's return to form across the 1970 season, as P153 regularly broke its engine, gearbox and axle. But Southgate's improved oil system for P160 led to a better 1971 – if you discount the tragedies that befell its drivers.

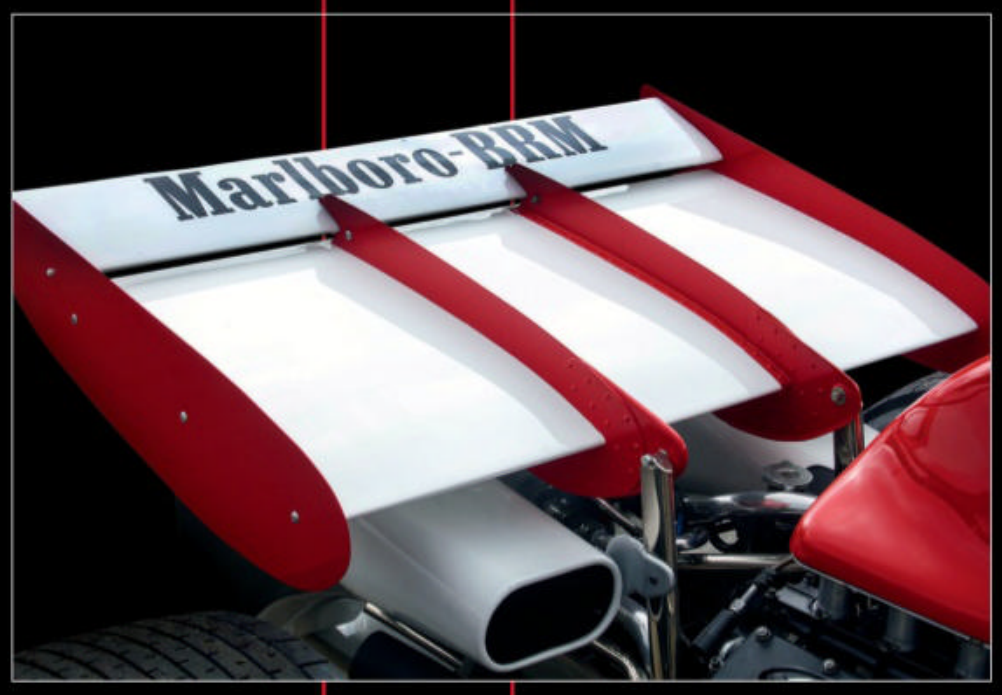
Rodríguez was joined by his Gulf Porsche 917 team-mate/nemesis Jo Siffert – among F1's most potent brews. Siffert signed for BRM after a year of frustration at March and embarked on an astonishing season of multi-dimensional motor racing. Along with F1, the debonaire Swiss remained a focal point for John Wyer's Gulf Porsche team in sports cars, bought a Chevron for Formula 2 and a 917 for Can-Am. At BRM, there was little between the two bulls – although when push came to shove, most on the inside tipped Rodríguez as the slightly better grand prix driver.

Rodríguez was encouraged by the evolution P160 when he scored the model's first win, leading all 40 laps of the non-championship Rothmans International Trophy in April 1971 at Oulton Park, the Yardley BRM heading Peter Gethin's McLaren and Jackie Stewart's Tyrrell. Then in June he and Ferrari's Jacky Ickx put on a wet-weather masterclass on their Firestone tyres at the Dutch GP, in a fantastic duel that took them clear of the field. Ickx got the nod, but Rodríguez had led for large chunks at Zandvoort. BRMs were now reliable and competitive.

But then the following month Rodríguez was gone, killed in a relatively minor sports car race at the Norisring guesting in Herbie Müller's Ferrari 512M. Siffert now stepped up to lead the BRM charge, qualifying in the top three at five of the last six grands prix of the year and scoring a commanding win from pole position at the Österreichring that sent a 130,000-strong crowd into rapture.

Then at Monza in September came the closest-ever GP. Peter Gethin had fallen out with McLaren chief Teddy Mayer and found himself drafted in as Rodriguez's replacement. The Monza slipstreamer proved his F1 day of days. Five cars crossed the finish line in a pack, Gethin's P160 streaking across by a nose – the gap to Ronnie Peterson's March measured at 0.01s. François Cevert's Tyrrell was third, 0.09s away from the win, Mike Hailwood next for Surtees and Howden Ganley fifth in his BRM. The quintet were separated by just 0.61s – a finish and result never likely to be repeated. The race was also the fastest GP, at an average speed of 150.755mph – a mark only beaten early this century. Monza 2003 now holds that record, Michael Schumacher's Ferrari winning at a speed of 153.8mph.

Gethin won again at the end-of-season non-championship



ICKX GOT THE NOD, BUT RODRÍGUEZ HAD LED FOR LARGE CHUNKS AT ZANDVOORT. BRMS WERE NOW RELIABLE AND COMPETITIVE

BRM P160

Victory Race at Brands Hatch, a Rothmans-backed extra earner run in October supposedly to honour Jackie Stewart's second world title. But nobody cared about the result as a pall of black smoke rose from the trees out at Hawthorn bend. It was Siffert. Three months after Rodríguez, his old rival had now perished. The P160 had veered off into the bank in the dip before Hawthorn, overturned and caught fire. Parnell would report a bracket locating a top radius arm had broken. When he identified Siffert's body, he said there had not been a mark on him, that the only injury was a broken ankle. The winner of the 1968 British GP had been lost at the same circuit and died not because of burns, but from suffocation. 'Seppi' had become the only driver to lose his life in a BRM F1 car.

It's hard for us today to understand how brutal F1 was back then, how the death toll ticked over with such inevitable regularity – how accepted it was that racing drivers died doing what they loved. They always had, always would – wouldn't they? Only those directly involved know how it was to deal with the grief, perhaps guilt whether merited or otherwise, yet somehow they always found a way of carrying on. BRM rolled into 1972 shaken by the loss of its two star drivers, yet also encouraged by finishing (a distant) runner-up to Tyrrell in the constructors' championship, ahead of Ferrari. Southgate continued to evolve the P160 while developing

a more ambitious and experimental P180, as Stanley again changed the team's colours.

At Paul Ricard, a stunt was arranged for a P160 to burst out of a giant cigarette packet to mark BRM's switch from Yardley to Marlboro – the brand that was to become the world's most popular. Why? Apparently, its free-spirited 'Marlboro Man' who featured on billboards and magazine adverts – and the company's association with the jet-set glamour of F1. The danger and tragedy? That was all part of the allure, surely something any smoker could naturally relate to.

Stanley's ambition now soared, choosing to run a fleet of BRMs at every race. He wanted six cars per grand prix, but settled on occasion for five. In all, 10 drivers appeared in grands prix for the team that year, in iterations of P160, P153 and what turned out to be the dud P180. Southgate, in an effort to overcome a V12 now falling behind the DFV hordes, Matra's V12 and Ferrari's flat-12, sought extra grip through an extreme 30:70 weight bias, relocating the radiators beside the gearbox under the rear aerofoil. The drivers hated the handling and, since it was slower than its predecessor in a straight line, the wide-track P180 quickly fell out of favour – although Jean-Pierre Beltoise claimed another Victory Race non-championship win at the end of the season in one, what turned out to be the last for any BRM in a contemporary motor race.

But the Frenchman is remembered first for a far more illustrious victory, and the last for a BRM in a world championship-counting round: his wet-weather masterclass (and only GP victory) at a drenched Monaco in a P160B.

Beltoise had joined BRM in the wake of a dark 1971. He'd built a fine reputation despite limited mobility in his left arm from injuries sustained in the Reims 12 Hours sports car race back in 1964. A winner around Monaco in Formula 3 in 1966, Beltoise became a Matra stalwart in single-seaters and sports cars. But in early 1971 at the Buenos Aires 1000Kms he'd got out to push his Matra back to the pits, only for Ignazio Giunti's Ferrari to collide with it at speed. Blame for Giunti's horrible death had fallen on Beltoise, whose racing license was

THAT DAY, BELTOISE GOT THE BETTER OF F1'S RECOGNISED RAINMASTER ICKX TO BEAT THE FERRARI BY 38S AND LAPPED THIRD-PLACE FITTIPALDI

suspended. Now as Chris Amon became Matra's focal point, Beltoise was grateful to Stanley for finding refuge at BRM. It was time to repay that faith.

He'd finished a close second to Emerson Fittipaldi at Silverstone's International Trophy. Now Beltoise lined up a promising fourth on the grid at Monaco behind only Fittipaldi's Lotus and the Ferraris of Ickx and Clay Regazzoni. Before the start he asked for his anti-roll bar to be disconnected, while mechanic Alan Challis adjusted the fuel timing to make his and Gethin's BRM more driveable – all of which contributed to a remarkable performance. That day, Beltoise got the better of F1's recognised rainmaster Ickx to beat the Ferrari by 38s and lapped third-place Fittipaldi, with Jackie Stewart fourth two laps down, to become the first French winner in Monaco since Maurice Trintignant in 1958. The streaming conditions meant his average speed was slower than the Cooper driver's.

But that was by far as good as it got for BRM in 1972. The fleet only scored points on three other occasions over the rest of the season, Ganley managing a fourth place at the Nürburgring. Meanwhile at the French GP at Clermont-Ferrand, a stone flicked up by another car shattered the helmet visor of Helmut Marko, blinding him in his left eye and ending his F1 driving career. Big Lou's team was starting to unravel and Southgate's patience was stretched. He accepted an offer to join Shadow as the American-owned team expanded from Can-Am into F1.

Now under the technical guidance of Mike Pilbeam, later to make his name with his own string of pace-setting hillclimb cars, the fleet size was reined in for 1973. BRM persevered with P160s for Beltoise, Clay Regazzoni – who took pole position and led on his debut in Argentina in a P160D – and Niki Lauda. Labelled a pay driver, accurately so, the Austrian accepted Big Lou's advances for what amounted to a pay-as-you-go deal after a demoralising experience at March in 1972. But Lauda soon proved his worth. He scored his first world championship points with fifth at Zolder, then put himself on the radar by running in the front bunch at Monaco… later admitting to Big Lou he didn't have the funds to keep paying to race. Stanley took the initiative and signed Lauda to a three-year deal. But down-at-heel Ferrari had been impressed by the Monaco performance and came a-courting as it sought revival. To Big Lou's credit, he ceded and, after a string of retirements, Lauda made the defining move of his racing life for 1974. Regazzoni also moved on to rejoin Ferrari beside him.

The empire was crumbling. Marlboro too was out of patience and focused its primary support on McLaren, beginning one of the great F1 team sponsor associations. Pilbeam's angular P201 showed promise in Beltoise's hands but, with the anchor of that hefty V12 still weighing it down, BRM drifted into the realm of the backmarker. When Sir Alfred died Rubery Owen's support was withdrawn, leaving the team to rebrand as Stanley-BRM – also without Parnell as a voice of reason. The team laboured on, fuelled by egotism until 1977, when British Racing Motors dribbled to a halt. Formed on a patriotic wave of postwar optimism and belief in the might of homegrown engineering, Britain's Ferrari had fallen badly out of step. BRM P160 represented a final flurry from a company weighed down and rooted forever in the old world.

RACE RECORD	
Starts	120
Wins	3
Pole positions	1
Fastest laps	0
Podiums	2
Championship points	72

SPECIFICATION	
Chassis	Aluminium semi-monocoque with rear tubular subframe
Suspension	Double wishbone, coil springs over dampers, anti-roll bar
Engine	BRM P142 V12
Engine capacity	2,998cc
Power	440bhp @ 11,500rpm
Gearbox	BRM P161 5-speed manual
Brakes	Steel discs
Tyres	Firestone
Weight	550-573kg
Notable drivers	Pedro Rodríguez, Jo Siffert, Peter Gethin, Jean-Pierre Beltoise, Clay Regazzoni, Niki Lauda

MAURICE HAMILTON'S ALTERNATIVE VIEW

Chafing about team orders at McLaren? Consider the example of Peter Collins at Ferrari, sacrificing his title bid for team-mate Juan Manuel Fangio. But consider also that the maths of that claim don't stack up...

PICTURES motorsport IMAGES

Collins came from humble roots and never forgot them, but was determined to enjoy life as a racing driver. He'd joined Ferrari for the 1956 season and started 20 GPs for the Scuderia

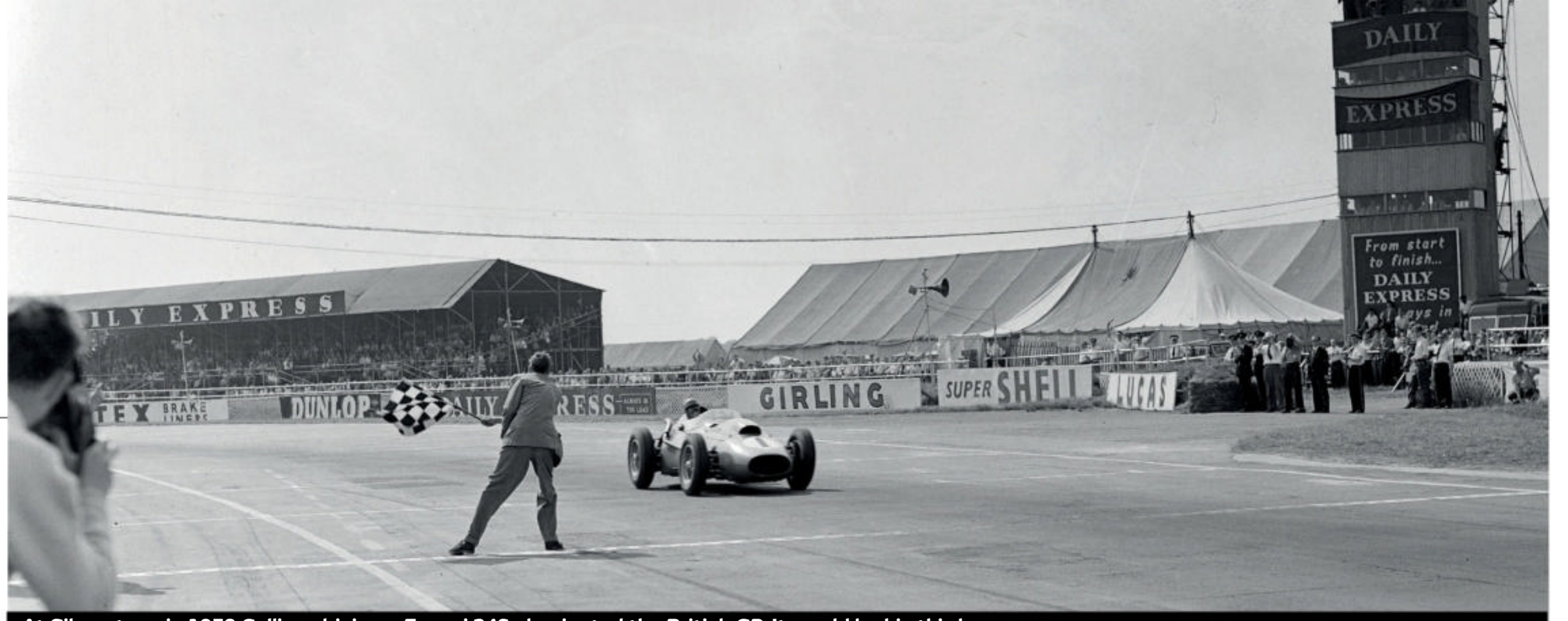
MANY YEARS AGO, there was a Swedish motor sport journalist whose specialist subject was 'The Graves of Dead Racing Drivers'. Rather than being a reverential journey of respect, this was a mission, an assemblage of headstones from far and wide. He would show cemetery photos with a sense of enthusiasm not dampened in the least by the apathy of his rather bewildered audience.

I therefore hesitate – but not for long – before revealing that I recently sought out the resting place of Peter Collins, one of Britain's finest young drivers and the winner of his home grand prix in 1958 at the wheel of a Ferrari Dino 246 F1. It seemed appropriate because I happened to be in Worcestershire and Collins's name had come up in the debate about which McLaren driver – if any – deserved to be given title precedence in 2024.

It was fitting that the subject should arise at Monza because this was the scene, 68 years before, of a selfless act that would be scorned in today's aggressive and micro-managed racing world. The 1956 Italian Grand Prix was the eighth and final race of the season. Collins had an outside chance of winning the championship, the favourite being his Ferrari team-mate, Juan Manuel Fangio, who was eight points ahead (points were awarded 8, 6, 4, 3, 2 to the first five finishers, with a single point for fastest lap).

The race was run at a furious pace, the combination of banked track and fast straights playing havoc with tyres and machinery. Fangio, who had been running in the top three (with Collins not far behind) was forced to retire after 19 laps with a broken steering arm. Drivers were

Collins (above) was running fourth at Monza in 1956 before he handed his Ferrari D50 over to Fangio (right) at a pitstop. Fangio went on to finish second and win the title



At Silverstone in 1958 Collins, driving a Ferrari 246, dominated the British GP. It would be his third and final world championship victory before he was tragically killed two weeks later, aged only 26

permitted to share their cars, any points accrued to be split evenly among the drivers.

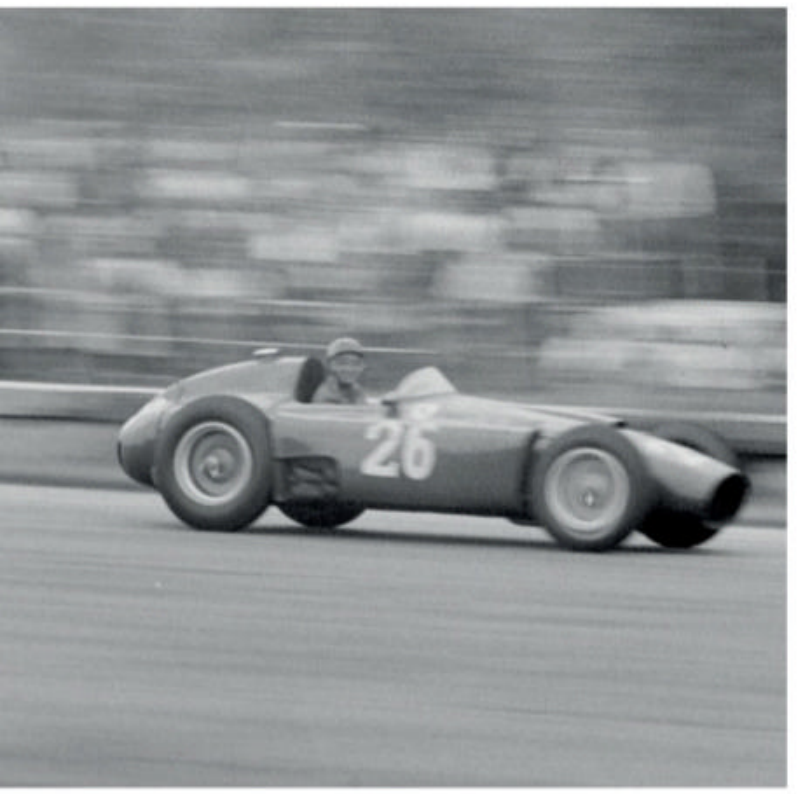
At the end of the 35th lap, Collins pulled into the pits to have his left-front tyre changed. Seeing Fangio was out of the race, Collins had no hesitation in leaping from the cockpit and signalling the Argentine driver to take over. An eternally grateful Fangio rejoined and finished second. Not only did this seal his fourth world title, but it also triggered a story of sportsmanship on the part of Collins that has been embellished with the passage of rose-tinted time.

Although in contention for the championship, the assumption that Collins heroically gave up his title for Fangio does not stack up when the mathematics are analysed. Had Collins stayed in his car and finished second, Fangio would still have become world champion thanks to being two points ahead. If Collins had won the race (highly unlikely, under the circumstances), it would have been a different story. But, either way, Collins gave up what amounted to no more than a slim *chance* of winning the title – which, truth be told, actually suited the laid-back Englishman. The last thing he wanted was the attendant pressures of being reigning world champion.

Collins's view of life as a racing driver was coloured principally by two things. Just seven days after meeting Louise King, Collins had married the American actress who had played the part of Marilyn Monroe in the Broadway production of *The Seven Year Itch*. They made a glamorous couple, life on a boat in Monte Carlo adding to Collins's determination to enjoy the moment during a period when racing drivers were killed with shocking regularity.

Peter's roots as the son of a garage owner and haulier from Worcestershire ruled out him being seduced by the fame that attached itself to a talented young racer. A story told by Denis Jenkinson ('Jenks'), the doyen of F1 reporters at the time, sums up Collins's attitude to life.

THE LAST THING HE WANTED WAS THE ATTENDANT PRESSURE OF BEING THE REIGNING WORLD CHAMPION



While motoring to the 1957 British GP at Aintree, Jenks came up behind an articulated lorry being driven at a brisk pace north of Kidderminster. When eventually waved through, Jenks was initially shocked to have the driver give him a V sign – only to look up and see the grinning face of Collins. They pulled over for a chat (as F1 drivers do). Collins explained that his father had wanted this new truck delivered to Liverpool and it was agreed, since Peter was going to Aintree, he would take it to the new owner after the first day's practice (as F1 drivers do).

Jenks went on to say that he next saw Collins at the Aintree main gate, trying to convince an official that he was an F1 driver and should be allowed in, complete with his lorry, to park in the special enclosure on the manicured lawn.

With a few nods to his fame, Collins's grave sits in a quiet churchyard in Worcestershire

(Of course, he would have no such problem today as more than 350 articulated team trucks are welcomed inside the Silverstone Wealth Fund – aka the British GP – at the expense of humble paying customers with cars.)

Twelve months on, Collins would have no difficulty gaining admission to Silverstone, where he would totally dominate and score his third GP victory. It would also be his last. At the Nürburgring Nordschleife two weeks later, while chasing the leading Vanwall of Tony Brooks, Collins made a slight misjudgement at the entrance to Pflanzgarten, a fast right-hander with a tricky approach. The combination of a ditch and a grass bank flicked the Ferrari upside-down. Collins died of head injuries later that night.

His loss was keenly felt, the leading lights of motorsport making their way to a small church in the hamlet of Stone, a short distance from the family garage at Mustow Green. The headstone on the modest grave says: "With a cheerful smile and a wave of the hand, he journeyed into the unknown land." Such an inscription was typical of a carefree time. And a more hazardous one when you are reminded that Peter John Collins was only 26. Debating who should or should not win a race would have been at the bottom of his agenda.

motorsport IMAGES

SHOWCASE

DANIEL RICCIARDO

After 257 GP starts and eight wins it seems that the Honey Badger is finally exiting Formula 1 for good

Where else to start but with the 'Shoey'? When Danny Ric finished third at the 2016 German GP he drank the champagne from one of his racing boots. Lewis Hamilton and Max Verstappen couldn't believe what was happening but it quickly became a tradition for Dan – and sometimes the rest of the podium – whenever he got the chance

After a tension-filled 2018 season when Max Verstappen beat him comfortably in the drivers' championship, Ricciardo fatefully left Red Bull and moved to Renault, a team that seemed to be on an upward trajectory. 2019 was a disaster, but he managed two thirds in 2020, at the Eifel and Emilia Romagna GPs, before his switch to McLaren for 2021

Promoted to the Red Bull senior squad from Toro Rosso for 2014, Ricciardo qualified sixth for the Canadian GP. He leapt up to third during the pitstops, before overtaking Sergio Pérez and Nico Rosberg in the last four laps for his first F1 win, becoming the fourth Australian to achieve the feat

When Ricciardo made a pitstop on lap 32 of the 2016 Monaco GP, he looked certain to hold a lead he had just regained from Lewis Hamilton. Only Red Bull didn't have the tyres ready for him and a 14s stop saw him rejoin alongide Hamilton, who won the drag up the hill and with it the race

2016 was Danny Ric's first season with Max Verstappen as his Red Bull team-mate. In Malaysia the pair had an almighty scrap for second on lap 39, through a number of corners, with Ricciardo just holding sway. When Lewis Hamilton retired with 15 laps the win was Dan's

His lifeline back into a race seat in 2023 didn't go well but there were some highpoints for Ricciardo. One of these was at the Mexico City GP. Dan qualified his AlphaTauri fourth, the team's highest starting position of the season, and brought the car home in a creditable fifth

Ricciardo had a reputation as a superb late braker and one of the best examples of this was after a restart of the 2017 Aberbaijan GP. Into Turn 1 he dived inside two (or three, depending on your point of view) other cars to climb to third. That would eventually become first...

One of Ricciardo's admirers in his breakthrough season of 2014 was none other than Fernando Alonso. After this battle at the German GP, Alonso said, "He's driving fantastically and was always taking the slipstream of me after I pass him and braking very late. It was a great fight."

Three GPs into his return to F1 in 2023, after replacing Nyck de Vries at AlphaTauri, Dan crashed in FP2 for the Dutch GP, breaking the metacarpal in his left hand. Liam Lawson stepped in to replace him at Zandvoort and the next four races, and is now taking his place at RB

Hot on the heels of his second win, at the 2014 Hungarian GP, Ricciardo claimed victory number three in the next race in Belgium. This solidified his third position in the championship, a slot he would hold until the end of the season

Ricciardo shared the role of reserve/test driver for Red Bull and Toro Rosso in 2010. Fellow Aussie Mark Webber was one of Red Bull's drivers at the time and four years later it would be Webber who he would replace at the team

If Ricciardo's last race in F1 does turn out to be the 2024 Singapore GP it may – depending on the winner of the world title – be remembered but for the wrong reasons. Running last he pitted for soft tyres and set the fastest lap, thus depriving Lando Norris of the crucial point

In the 2018 Azerbaijan GP Ricciardo – a race winner already that season – and team-mate Max Verstappen had already clashed heatedly a number of times when they started lap 40, with Max fourth and Dan fifth. Into the first corner the inevitable happened as the pair came together

With an view to promoting him to a race seat at Toro Rosso for 2012, Red Bull placed Ricciardo with the financially struggling Hispania Racing midway through 2011. Dan made his F1 debut at the British GP, qualifying 24th and last, before finishing 19th, also last, three laps down

McLaren announced in August 2022 that Ricciardo's 2023 contract had been terminated by both parties. Dan's F1 career seemed at an end until he was given a reserve role for 2023 by Red Bull, but McLaren still decided to give him a send-off at the season-ending Abu Dhabi GP

Ricciardo's first Australian GP was in 2012, when he also drove for Toro Rosso for the first time. He hadn't raced on home soil since the 2005 Western Australia Formula Ford Championship but endeared himself to the Aussie fans by finishing ninth for his first two world championship points

The Aussie's first F1 podium should have been at the 2014 Australia GP and he did get to stand on the second step and celebrate with that trademark smile. Unfortunately, Ricciardo's Red Bull was subsequently disqualified for exceeding the permitted fuel flow so the trophy went back

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FINISHING STRAIGHT

RACE DEBRIEF

F1 WORLD CHAMPIONSHIP ROUND 17

THE AZERBAIJAN GP IN 5 KEY MOMENTS

REPORT BY JAMES ROBERTS

1 No need for tricky McLaren team call as Piastri triumphs

In the fortnight after Monza, there was much chatter about McLaren's so-called 'papaya rules' – the guidelines for Lando Norris and Oscar Piastri. In essence, they're the same rules that govern motor racing. Appendix L of the International Sporting Code, Chapter IV, explains what is and isn't allowed with regards to driving conduct – essentially taking each other out is forbidden.

What was more pertinent was whether Norris was going to receive favourable treatment from Piastri to aid his quest for the drivers' championship. "Yes" seemed to be the new diktat, but not if it meant giving up a win. Ah. Yes-but-no, then. Events transpired to kick this particular can down the road since it was Norris who found himself in a position to give Piastri a bit of help towards his Azerbaijan Grand Prix victory.

Lando had started 15th after failing to advance from Q1. Esteban Ocon had hit the wall in qualifying and was driving his hobbled Alpine slowly back to the pits. Normally a white flag would suffice to alert drivers of a dilatory car but, in the blind-apex, high-speed esses at the end of the Baku lap, Race Control felt a yellow flag was more appropriate. It was that yellow which caught out the McLaren man on his second run...

Meanwhile Piastri qualified on the front row alongside polesitter Charles Leclerc. Charles is something of a Baku specialist – this was his fourth consecutive pole position here – but lack of race pace and the power of DRS here had prevented him from converting his three previous poles into victories. So it was no surprise to see him gallop into an early lead in a bid to end this unfortunate statistic. Oscar had pushed hard to keep up – too hard as it turned out, since he was nearly six seconds behind when it was time to switch from the medium-compound Pirellis to the hards.

"I tried at the start to get in front but, once I dropped out of DRS, I just didn't have the pace," explained Piastri. "After the stop, I saw we were pretty close again. I had to go for it because I knew if I didn't get past, I was never going to get past. So I went for a pretty big lunge, but managed to pull it off and hung on for dear life for the next 35 laps."

Piastri had been warned by his engineer Tom Stallard not to damage his tyres at the start of his second stint by attacking Leclerc, as he had in the first. "Let's be smart here." But Oscar, as he would later admit, ignored that advice to charge past the Ferrari at the beginning of lap 20. It was a decisive move, which Piastri judged to perfection. Leclerc wasn't overly concerned at this stage, thinking he'd have ample time to re-pass the McLaren.

But since the Ferrari was set up with more downforce, it was quicker in the twisty, castle section of the Baku lap but didn't have the top speed for the straights. Equally, the McLaren's rear wing became a focus of intrigue as footage from the rear-facing high-definition camera on Piastri's

Piastri claimed his second win of the season after a stunning move on Leclerc and this time there was no furore over the 'papaya rules'

PICTURES: DOM ROMNEY; ZAK MAUGER; SAM BLOXHAM

MCL38 appeared to show the outer leading edge flexing at speed outside the DRS zones. For lap after lap, Leclerc wasn't quite close enough to wrestle the lead back from the McLaren. Equally, Piastri withstood immense pressure as the Ferrari sat on his tail for the remainder of the race.

Behind Leclerc, the embattled Sergio Pérez was also in close contention in his Red Bull. Crucially, Checo's charge was stymied just after he'd made his pitstop. Norris (who had started on the hards) was running long and just managed to delay Pérez enough to give Piastri a necessary gap. During this critical phase of the race, Leclerc also suffered in trying to get heat into his tyres and lost his six-second advantage.

Finally, the Ferrari man's bid to win in Baku ended three laps from the flag when he lost all rear grip and fell into the clutches of Pérez...

2 Red Bull's street fighter loses the finishing move

Before last season, Baku enjoyed a reputation as one of the most unpredictable races on the calendar. In the first six grands prix it held, Azerbaijan's capital had produced six different winners. That was until last year when Sergio Pérez became the first two-time victor – three times if you wish to venture into the world of statistical anomalies and include the 2023 sprint race.

Four of Pérez's six Formula 1 career wins have come on street tracks (five if you include Jeddah, though that circuit's asphalt isn't open to the public). So when Red Bull decided against dropping the embattled Mexican mid-season, knowledge that he should be strong in this Baku-Singapore double-header will have fed into the decision.

And so it came to pass. The Red Bull featured a new floor, but Max Verstappen was struggling with setup changes that caused his RB20 to bounce wildly. It meant that for the first time this year Pérez outqualified his team-mate. Checo also made a strong start, overtaking Carlos Sainz for third at Turn 2 on the opening lap.

The scrap for third between Sainz and Pérez (above) ended in tears. It was a result that Pérez (below) could have done with...

Pérez was the first of the top three to pit (on lap 14) and the power of the undercut meant Piastri was in danger of losing second place – until Norris played his hand to keep the Red Bull behind him.

Thereafter, once the pitstop cycle had played out, Pérez kept the leaders in his sights. Tyre management and the effects of DRS meant that, like an accordion, the gap between the top three opened and closed throughout the rest of the race.

When Leclerc's rears had finally cried enough, Pérez attempted a pass at Turn 1 on the penultimate lap. Leclerc defended the inside and kept his second place. Meanwhile fourth-place Sainz had closed in on the leading trio and opportunistically overtook Pérez coming out of the same corner.

Heading into Turn 2, Sainz drove deep into the left-hander. That allowed Pérez to look for a gap on the inside. Then as the pair accelerated along the straight – both wanting to pick up the tow from Leclerc ahead – they collided and speared off together into the retaining wall. The race finished under a Virtual Safety Car and, while the stewards decided "neither driver was predominantly at fault", that view wasn't shared by the protagonists.

"As we exited Turn 2, I did my normal racing line. I didn't do any strange manoeuvre or anything and for some reason that I still don't understand, we collided," said Sainz. "I think he had plenty of space to the left and I didn't do any strange movement."

In a challenging season, team boss Christian Horner rued the loss of a potential podium for Pérez: "I was just looking at the replay and you can see Carlos start to drift across the circuit," said Horner. "It has destroyed the race for Checo today. It cost us a lot of damage and obviously vital points in the constructors' championship."

After an excellent recovery drive, Norris was elevated to fourth, one place ahead of Verstappen. McLaren went to Azerbaijan eight points behind Red Bull, but left Baku 20 points ahead. It's the first time McLaren has led that points table since the first round of 2014.

Former F2 rivals Colapinto (above) and Bearman (below) both scored valuable points for their respective teams in Azerbaijan

PICTURES: SAM BLOXHAM; ZAK MAUGER; DOM ROMNEY; ANDREW FERRARI; SIMON GALLOWAY

3 Rookies recover after early offs

Williams mechanics dropped their heads in FP1 when they looked at their garage screens and saw one of their cars in the wall. It was hoped a mid-season driver change would eliminate unnecessary practice accidents. But by the end of the Baku weekend the team was wildly celebrating, having accrued ten points with both cars in the top 10.

Credit must go to Franco Colapinto, who shrugged off his innocuous shunt to get his Williams into Q3 – showing great tenacity and resilience along the way. Although both cars benefitted from the penultimate-lap contact between Sergio Pérez and Carlos Sainz, it was still an impressive performance. Alex Albon ran long on the hard tyre at the start and, after briefly running in P3, finished in seventh, just one place ahead of Colapinto.

As the first Argentine driver to score an F1 point since Carlos Reutemann in 1982, the 21-year old described his result as a "dream come true", adding, "we've already climbed one position in the constructors' championship and it's only our second race together."

As Kevin Magnussen was serving his one-race ban in Baku (for reaching 12 licence points in a 12-month period), Haas gave Chelmsford's Oliver Bearman a chance to race ahead of his full-time seat at the team next year.

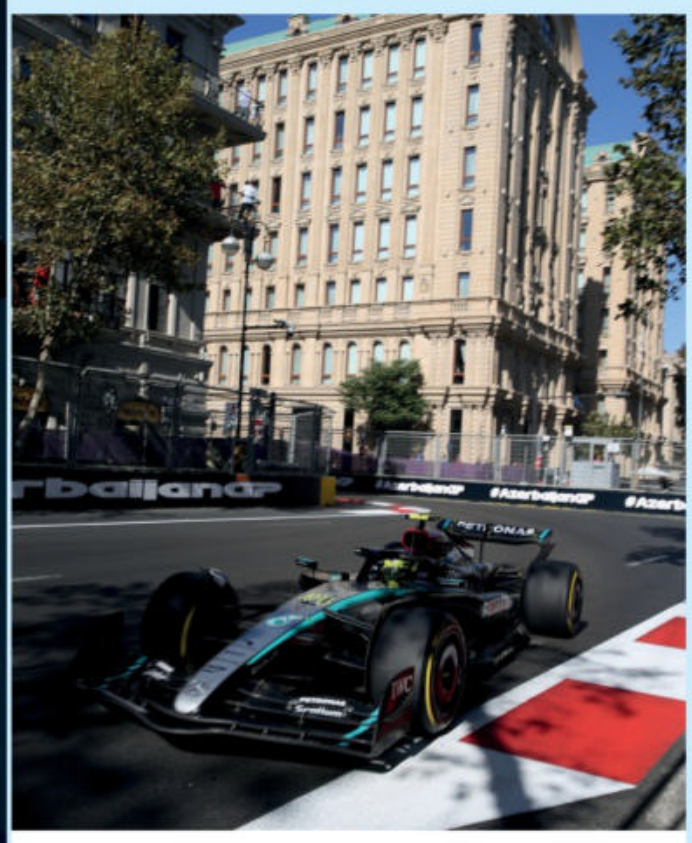
He too crashed in practice, this time in FP3 when he was too fast entering Turn 1 and failed to bail out in time, damaging the front-left of his car and spoiling his chance to practice some qualifying runs.

After starting tenth, he admitted he was too cautious in the opening stint and was frustrated he was losing time as his Pirellis were overheating. In the final reckoning he finished tenth, to achieve a little piece of F1 history. After his seventh place in Jeddah for Ferrari, Bearman becomes the first driver to score points in his first two races for two different constructors.

4 Split fortunes as Mercedes struggles

When George Russell crossed the line third to record his 14th F1 podium he had been, in the closing stages, one of the fastest cars in the race. That contrasted sharply with an opening stint when he struggled on the mediums and lost a place to Max Verstappen on lap one, having started fifth.

Baku highlighted how sensitive the W15 can be in terms of optimising tyre performance. Lewis Hamilton had a troubled qualifying, owing to a component being "not correctly built" according to Mercedes. Although this issue sent him down the wrong path on setup he set a time good enough for seventh. That prompted the team to change engines and add a new one to the pool – which, along with setup changes, meant a pitlane start. It was tough but the team felt this was the race to take what would be an inevitable penalty



It was a mixed bag for Merc in Baku. Third for Russell (left) was a bonus but Hamilton could only finish ninth after an engine change

after Hamilton lost an engine in Australia. Lewis recovered to ninth but said he had to "yank" the wheel in corners to overcome balance issues.

"There was so much hard work for everybody," said Russell. "There were engine changes on my side, and for Lewis, everybody was working so hard – so it was a bonus to stand on the podium."

5 Alonso shows his genius (again)

It was almost as if Fernando Alonso was driving to impress someone in Baku. In a car that wasn't as fast as the Williams, he drove a superb race to finish ahead of both of them in sixth. Just a few days earlier he had been all smiles as he appeared at the announcement of Adrian Newey as Aston Martin's new managing technical partner.

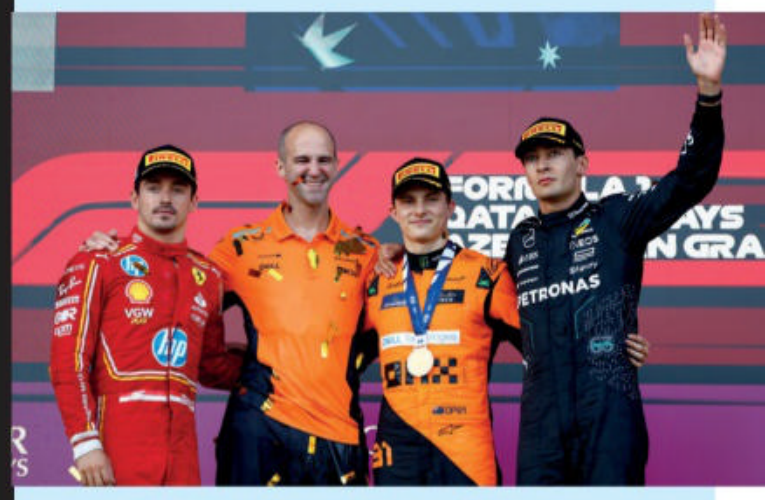
On Friday, Red Bull boss Christian Horner was asked how it was possible for Newey to appear at the Aston Martin factory when he was still under contract at Red Bull. "Adrian has always tended to do his own thing..." was Horner's wry response.

Newey wasn't in Azerbaijan but he would have been impressed with Alonso's performance, collecting eight points for the team. In contrast, Lance Stroll had a race to forget. On the opening lap he dived down the inside of RB's Yuki Tsunoda and found a space that was rapidly closing. Stroll picked up a puncture, then later retired with a brake issue, while Tsunoda continued for a while with a hole in his sidepod before calling it a day.

Alonso continued the good news for Aston Martin when he came home sixth, just days after Newey's appearance at the factory

RESULTS ROUND 17

BAKU CITY CIRCUIT / 15.09.24 / 51 LAPS



1st	**Oscar Piastri** McLaren	1h33m58.007s
2nd	**Charles Leclerc** Ferrari	+10.910s
3rd	**George Russell** Mercedes	+31.328s
4th	**Lando Norris** McLaren	+36.143s
5th	**Max Verstappen** Red Bull	+77.098s
6th	**Fernando Alonso** Aston Martin	+85.468s
7th	**Alex Albon** Williams	+87.396s
8th	**Franco Colapinto** Williams	+89.541s
9th	**Lewis Hamilton** Mercedes	+92.401s
10th	**Oliver Bearman** Haas	+93.127s
11th	**Nico Hülkenberg** Haas	+93.465s
12th	**Pierre Gasly** Alpine	+117.189s
13th	**Daniel Ricciardo** RB	+146.907s
14th	**Zhou Guanyu** Stake	+148.841s
15th	**Esteban Ocon** Alpine	+1 lap
16th	**Valtteri Bottas** Stake	+1 lap
17th	**Sergio Pérez** Red Bull	+2 laps/accident
18th	**Carlos Sainz** Ferrari	+2 laps/accident
19th	**Lance Stroll** Aston Martin	+6 laps/brakes

Retirements

Yuki Tsunoda RB	14 laps/damage

Fastest lap

Lando Norris 1m45.255s on lap 42

TYRE COMPOUNDS USED

Hard (C3) **Medium** (C4) **Soft** (C5) **Inter** **Wet**

CLIMATE	AIR TEMP	TRACK TEMP
Sunny	28°C	45°C

DRIVERS' STANDINGS

1 Verstappen	313pts	11 Hülkenberg	22pts
2 Norris	254pts	12 Tsunoda	22pts
3 Leclerc	235pts	13 Albon	12pts
4 Piastri	222pts	14 Ricciardo	12pts
5 Sainz	184pts	15 Gasly	8pts
6 Hamilton	166pts	16 Bearman	7pts
7 Russell	143pts	17 Magnussen	6pts
8 Pérez	143pts	18 Ocon	5pts
9 Alonso	58pts	19 Colapinto	4pts
10 Stroll	24pts	20 Guanyu	0pts
		21 Sargeant	0pts
		22 Bottas	0pts

motorsport STATS

FINISHING STRAIGHT

RACE DEBRIEF

F1 WORLD CHAMPIONSHIP ROUND 18

THE SINGAPORE GP IN 5 KEY MOMENTS

REPORT BY JAMES ROBERTS

Norris was number one in Singapore, but the McLaren driver will need a lot more of those if he is to be number one at the end of the season

1 Norris in a class of his own despite wall strike

Lando Norris's third Formula 1 victory was his most dominant yet – if perhaps not his easiest. Twice he came close to disaster, just managing to avoid race-ending contact with Singapore's unyielding barriers. Such was the dominance of his McLaren, he nearly had a full pitstop advantage over title rival Max Verstappen, but he came oh-so-close to throwing it away.

In the latter stages of the race he was pushing, perhaps too hard, to try and build a cushion if circumstances dictated another stop for soft tyres and a final push for the fastest-lap point. A couple of times, his engineer Will Joseph tried to calm his charge. "Full concentration now. Take a drink," followed by, "just chill out and bring this car home."

Early on Norris had been lapping in the 1m37s, while the rest of the field circulated in the 1m38s – or slower. He'd been requested to build a five-second gap. But such was the pace at which Lando pulled away from second-placed Verstappen between lap eight and Max's stop on lap 29 that the gap nearly reached 25s.

"That was taking the piss," harrumphed Red Bull team principal Christian Horner later.

But on lap 30, Norris suddenly sunk into the 1m41s. Radio traffic suggested the possibility of front-wing damage. He'd locked his front-right, run deep into Turn 14, and *just* managed to steer away from the tyre barrier before there was contact. Then on lap 45, he tapped his right-rear on the wall approaching Turn 10 – exactly where George Russell came to grief last year. And there was one more scare when he was lapping the Williams of Franco Colapinto in the final stages and ran wide, across the dust, on the penultimate corner of the lap. But despite the near misses he crossed the line in P1, nearly 21 seconds ahead of Verstappen.

It was another demonstration of McLaren's superiority over its rivals at maximum-downforce circuits. At other venues the distinction is less clear-cut. Perhaps the most surprising element of the weekend was Red Bull's transformation from Friday to Sunday. Neither Verstappen nor Sergio Pérez could 'switch on' the tyres in practice, and the team concluded it had "overcompensated", in the words of Horner, in terms of focusing on suspension compliance to dial out the ride issues experienced last year. Following a busy Friday evening in the Milton Keynes simulator for Sebastien Buemi, solutions were found – just not

PICTURES: STEVEN TEE, ANDY HONE, MARK SUTTON

enough performance to challenge McLaren.

"I was flat out and I was probably pushing a bit too hard," said an exhausted but relieved Norris after the race. "It was definitely not like I was cruising. I was pushing to open up a gap, and at one point I wanted to try and open up a pit window to give myself an opportunity to maybe box at the end of the race for the quickest lap if I needed to try and achieve that. I didn't want to have a one-second lead. I wanted to have the biggest lead possible."

Prior to Singapore, Lando hadn't led the first lap after each of the four pole positions he'd achieved so far this year. With Verstappen lined up alongside him on the front row, the question before the start was whether Max might take advantage of Lando's struggles to launch off the line. In the event, Norris made a clean getaway while Verstappen slotted into second.

After pulling out an early advantage, the McLaren man stopped a lap after his slight brush with the barriers (on lap 31) and switched from the mediums to the hards. In the absence of serious damage McLaren made a slight wing adjustment but didn't deem a new one was required.

"The team said that there was something with the front wing, maybe being a little bit off," Norris added. "I hit the front wing against the barrier, so it might have tweaked it a touch, but I don't think enough to change it, but hard to know."

Having escaped his brushes with the wall, Norris finished ahead of his championship rival to cut another seven points from Verstappen's overall lead. Lando had been hoping for eight, but the fastest lap point was snatched from him by an unlikely interloper...

Ricciardo (below) was put out of his misery by RB after Singapore but his fastest lap (above) didn't go down too well at McLaren

2 Questions hover around Ricciardo – and his fastest lap

Speculation over Daniel Ricciardo's future had been mounting ahead of Formula 1's annual visit to Marina Bay, triggered by word that a release clause in test driver Liam Lawson's contract could be triggered if the young Kiwi wasn't given a race drive by the end of September. Ricciardo, an eight-time GP winner, had been putting on a brave face when fielding the inevitable barrage of questions. But there was a telling moment when he took a while to extract himself from the RB cockpit after he parked up at the finish. While Singapore presents an immense physical toll, the body language was suggestive of someone who knew this might be the last time he exited an F1 car.

A few guests formed a guard of honour as Ricciardo trudged back to the RB hospitality unit. Did they know too? Even Laurent Mekies' post-race quote in the team's press release was oddly non-committal, saying: "Given this may have been Daniel's last race, we wanted to give him the chance to savour it and go out with the fastest lap."

Ah, yes. The fastest lap. Worthless to anyone outside the top ten, priceless in a world championship battle that isn't going your organisation's way. For a while now McLaren Racing CEO Zak Brown has condemned the single ownership of two F1 teams. An uneven playing field both on and off the track, he argues.

Ricciardo dived into the pits for soft tyres at the end of the race and set the fastest lap, even though he was running outside the top 10 so it wouldn't earn him a point. Perhaps crucially, though, it meant Norris *didn't* score the point, thus hindering his quest to close the championship gap. Ricciardo joked that he might be deserving of a generous Christmas present if Max wins the title by a solitary point in Abu Dhabi.

McLaren team principal Andrea Stella wasn't smiling, though. "At no point I have evidence to say RB went for the fastest lap to support Red Bull. I just find it a little... how to say... peculiar," he said with asperity. "I was a little surprised that the highest priority of RB racing in Singapore was to go and score the fastest lap of the race."

Ricciardo's famous smile also evaporated when he was asked about his tardy exit from his cockpit.

RACE DEBRIEF

F1 WORLD CHAMPIONSHIP ROUND 18

PICTURES: MARK SUTTON; SIMON GALLOWAY; LIONEL NG

"Yeah, a lot of emotions because.... Look, I'm aware this could be it... Yeah. Also it's exhausting after the race so, a flood of many emotions and feelings. Exhaustion. The cockpit is something that..." Looking down to the ground he added, with tears in his eyes, "I got used to it for many years... and... I just wanted to savour the moment."

3 Censors working overtime for Verstappen

One of the consequences of F1's foray into the fly-on-the-wall documentary arena is the tendency for microphones to appear when you least expect them. A hoped for off-the-record briefing with a team boss is often curtailed when they inform you they're "mic'd up".

In contrast, race broadcasts are garlanded by a stream-of-consciousness thanks to F1's determination to boost 'the show' with emotional outbursts. But, it seems, the profanities – although bleeped out – are too much for the sensitivities of Mohammed Ben Sulayem. In an interview with our sister website *Motorsport.com*, the FIA president openly lamented the decline in public discourse.

Although Ben Sulayem didn't say he would punish drivers for the open use of expletives, Max Verstappen's description of his car as "fucked" in Singapore's Thursday press conference earned a rebuke from the stewards – and a community service order. This despite Max's explanation that his choice of words was "ordinary in speech as he learned it", adding English wasn't his first language.

Perhaps the Netflix producers don't read the FIA's stewards' bulletins – because they failed to record the extraordinary moment Max gave curtailed answers in the post-qualifying FIA presser, then invited journalists to ask their questions in an impromptu huddle in the paddock where he would respond in full. At the time of writing it was unclear how the situation would develop, though Verstappen intimated post-race that he could quit F1 if such measures continued to be handed down.

"If you can't really be yourself, then it's better not to speak," said Max. "But that's what no one wants, because then you become a robot, and that's not how you should be going about it. I'm at a stage that I don't want to be dealing with these kinds of silly things all the time. It's really tiring."

Perhaps, like 1990s rapper Mark Morrison, he could pay a lookalike to do his community service for him? Netflix would love that.

GPDA chairman Alex Wurz summed up the contradiction in the sport's desires. "How many lifetime community services would Guenther Steiner have to serve?" said Wurz. "He was glorified for using the F-word. Netflix broadcast this worldwide, no problem. But then to suddenly change?"

4 Mercedes drivers suffer in the heat

Among the less controversial items of team radio during the Singapore GP was a curious exchange between George Russell and his engineer Marcus Dudley, during which George requested a bit of "encouragement". Russell was fifth at the time, sandwiched between Charles Leclerc (who was running a long first stint) and his team-mate Lewis Hamilton, who was competing in his 350th race.

Hamilton had qualified third and was the only driver in the field, apart from Daniel Ricciardo, to start on the soft-compound tyres. Team boss Toto Wolff later conceded that this had been a mistake. The intention was to get a better launch than Verstappen off the grid but, when this didn't happen, Hamilton's race quickly unravelled. His long 45-lap stint on the hard tyre dropped him to sixth at the flag.

Despite being in the middle of a title scrap, it was Verstappen's performance in a press conference that drew most attention

"We took a decision based on historic Singapore races where it is basically a procession, Monaco-like, and that the soft tyre would give him an opportunity at the start," said Wolff. "That was pretty much the only overtaking opportunity. That was the wrong decision that we all took together jointly."

Mercedes' W15 is at its least competitive in hot conditions and at stop-start tracks which put a premium on traction. Russell, who described his cockpit as a "sauna", fended off Leclerc for fourth

The heat of Singapore didn't suit the Mercedes drivers and Hamilton (left) and Russell (above) struggled on race day

but finished a minute down on the winner.

When he stepped out of his Mercedes, Russell lurched forward with his hands on the wheels of the car parked in front of him, clearly drained by the experience. The team withdrew both drivers from post-race media commitments and placed them in the obligatory ice baths instead.

5 Happy days for the bean-counters

In this budget cap era of F1, the accountants up and down the grid will have been mightily relieved it was a trouble-free weekend. Indeed, this was the first Singapore GP to pass without a Safety Car deployment. The only costly incident was Carlos Sainz's prang into the barriers during qualifying. Just about to start his first Q3 run, Sainz accelerated around the final corner on the lap, lost control of his Ferrari and spun backwards, hard into the wall.

The moment put paid to any hopes he had of repeating his victory from 12 months ago and, to compound matters, he was then fined €25,000 for crossing the track. The fine was halved on the condition of no further transgressions this season.

The first corner is usually a hotspot for car damage but even this was relatively civilised, with just a handful of drivers feeling the need to run wide rather than get caught up in a tangle as the field funnelled in. Among them was Sainz, who lost two places from 10th on the grid. Alex Albon also went wide in his Williams and initially blamed his rookie team-mate Franco Colapinto for a "dive bomb" into Turn 1 (during which Colapinto made up three places). Sainz was also critical of the move while Albon, perhaps after being put into a gentle headlock by his team's PR, rowed back on his complaint and concluded that no damage had been done.

This Q3 off by Carlos Sainz resulted in a red flag but for the first time in its history the Singapore GP didn't need a Safety Car

RESULTS ROUND 18

MARINA BAY CIRCUIT / 22.09.24 / 62 LAPS

1st	**Lando Norris** McLaren	1h40m52.571s
2nd	**Max Verstappen** Red Bull	+20.945s
3rd	**Oscar Piastri** McLaren	+41.823s
4th	**George Russell** Mercedes	+61.040s
5th	**Charles Leclerc** Ferrari	+62.430s
6th	**Lewis Hamilton** Mercedes	+85.248s
7th	**Carlos Sainz** Ferrari	+96.039s
8th	**Fernando Alonso** Aston Martin	+1 lap
9th	**Nico Hülkenberg** Haas	+1 lap
10th	**Sergio Pérez** Red Bull	+1 lap
11th	**Franco Colapinto** Williams	+1 lap
12th	**Yuki Tsunoda** RB	+1 lap
13th	**Esteban Ocon** Alpine	+1 lap
14th	**Lance Stroll** Aston Martin	+1 lap
15th	**Zhou Guanyu** Stake	+1 lap
16th	**Valtteri Bottas** Stake	+1 lap
17th	**Pierre Gasly** Alpine	+1 lap
18th	**Daniel Ricciardo** RB	+1 lap
19th	**Kevin Magnussen** Haas	+5 laps/puncture

Retirements

	Alex Albon Williams	15 laps/power unit cooling

Fastest lap

Daniel Ricciardo 1m34.486s on lap 60

TYRE COMPOUNDS USED

Hard (C3) **Medium** (C4) **Soft** (C5) **Inter** **Wet**

CLIMATE	AIR TEMP	TRACK TEMP
Dry/ night	30°C	36°C

DRIVERS' STANDINGS

1	Verstappen	331pts	11	Stroll	24pts
2	Norris	279pts	12	Tsunoda	22pts
3	Leclerc	245pts	13	Albon	12pts
4	Piastri	237pts	14	Ricciardo	12pts
5	Sainz	190pts	15	Gasly	8pts
6	Hamilton	174pts	16	Bearman	7pts
7	Russell	155pts	17	Magnussen	6pts
8	Pérez	144pts	18	Ocon	5pts
9	Alonso	62pts	19	Colapinto	4pts
10	Hülkenberg	24pts	20	Guanyu	0pts
			21	Sargeant	0pts
			22	Bottas	0pts

motorsport STATS

FINISHING STRAIGHT

RACE PREVIEW

F1 WORLD CHAMPIONSHIP ROUND 19

UNITED STATES GP

18-20 October 2024
Circuit of The Americas

PICTURE: ANDY HONE. ILLUSTRATION: ALAN ELDRIDGE

THE MAIN EVENT

For a while the Circuit of The Americas was considered something of a white elephant – not quite along the lines of the facilities which hosted the here today, gone tomorrow Korean and Indian GPs but it still struggled to turn a profit on the US GP owing to F1's sanctioning fees. On top of a few changes of leadership during the construction of the circuit, it relied on government grants to remain financially viable. Help arrived in the form of the explosion of interest in F1 Stateside in the wake of Netflix's *Drive to Survive* docu-series.

Drivers love this track's distinctive, imaginative and challenging layout but in recent years its bumpiness has become an issue. The clay soil in this area of Texas expands and contracts by a substantial amount between the wet and dry seasons. Major resurfacing works have been performed ahead of this year's race.

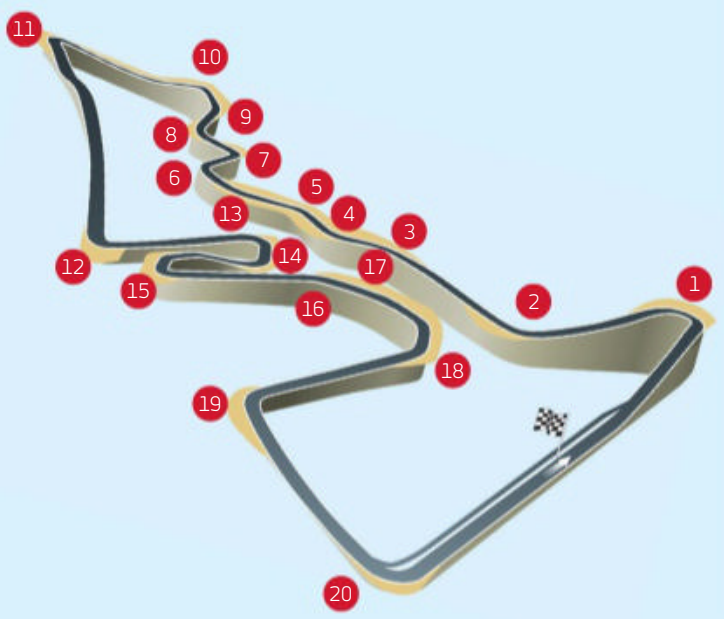
2023 RACE RECAP

Max Verstappen arrived with an unassailable lead in the drivers' championship and confidently won both the sprint event and the grand prix despite Charles Leclerc starting the Sunday race on pole. Leclerc later suffered the indignity of being disqualified after finishing sixth, along with Lewis Hamilton, who finished second on the road and briefly led. Excessive skid plank wear was the cause, a consequence of low car ride height and COTA's notorious bumps.

Max complained of brake issues during Sunday's race but was able to fend off both Hamilton and Lando Norris in his final stint.

KEY CORNER: TURN 11

This tricky hairpin is the gateway to the back straight so it's tempting to carry too much speed into it, thus compromising the exit.



RACE DATA

Venue Circuit of The Americas
First GP 2012
Number of laps 56
Circuit length 3.425 miles
Race distance 191.633 miles
Lap record 1m36.169s
Charles Leclerc (2019)
F1 races held 11
Winners from pole 5
Pirelli compounds C2, C3, C4

CAR PERFORMANCE

Downforce level Medium
Cooling requirement Medium
Full throttle 63%
Top speed 205mph
Average speed 121mph

TIMETABLE (UK TIME)

Friday 18 October
Practice 1 18:30-19:30
Sprint qualifying 22:30-23:14
Saturday 19 October
Sprint 19:00-20:00
Qualifying 23:00-00:00
Sunday 20 October
Race 20:00
Live coverage Sky Sports F1
Highlights Channel 4

THE PAST FIVE WINNERS HERE

2023	2022	2021	2019	2018
Max Verstappen Red Bull	Max Verstappen Red Bull	Max Verstappen Red Bull	Valtteri Bottas Mercedes	Kimi Räikkönen Ferrari

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FINISHING STRAIGHT

RACE PREVIEW

F1 WORLD CHAMPIONSHIP ROUND 20

MEXICO CITY GP

25-27 October 2024
Autódromo Hermanos Rodríguez

PICTURE: ANDY HONE.. ILLUSTRATION: ALAN ELDRIDGE

THE MAIN EVENT

Originally opened as the Magdalena Mixhuca circuit, this track's initial foray into F1 – a non-championship race held in 1962 ahead of Mexico's inclusion in the main calendar from '63 onwards – was marred by the death of local hero Ricardo Rodríguez when the rear suspension on his Lotus failed in the soon-to-become-notorious Peraltada turn. After his brother Pedro, a grand prix winner by then, died nine years later the track was named after them.

Little changed in terms of layout during the circuit's first two stints on the F1 calendar, ending in 1992, but it was given a thorough revamp ahead of its return in 2015. Space was limited by the track's urban park location but the key change was the bisection of the Peraltada: the cars now turn right and go through the Foro Sol baseball stadium before emerging via a slow right-hander.

2023 RACE RECAP

Charles Leclerc and Carlos Sainz occupied the front row for Ferrari but the thin air of Mexico City enabled the Red Bull-Honda package to prevail in race conditions. From third on the grid, Max Verstappen launched quicker and had already sped between the two Ferraris when team-mate Sergio Pérez, also quick off the mark, made his own bid for the lead at Turn 1 and clipped Leclerc's front wing. The collision took Pérez out of the race and initiated a fist fight in the grandstands.

After a mid-race red flag to cover barrier repairs, Verstappen showed the field a clean pair of heels again, finishing 13.8s ahead of Lewis Hamilton.

KEY CORNER: TURN 1

Mexico City's altitude furnishes a boost to top speeds and this corner, at the end of the main straight, is where full send often turns into full bend as drivers collide...

RACE DATA

Venue Autódromo Hermanos Rodríguez
First GP 1963
Number of laps 71
Circuit length 2.674 miles
Race distance 189.738 miles
Lap record 1m17.774s Valtteri Bottas (2021)
F1 races held 23
Winners from pole 10
Pirelli compounds C3, C4, C5

CAR PERFORMANCE

Downforce level High
Cooling requirement High
Full throttle 47%
Top speed 227mph
Average speed 115mph

TIMETABLE (UK TIME)

Friday 25 October
Practice 1 19:30-20:30
Practice 2 23:00-00:00
Saturday 26 October
Practice 3 18:30-19:30
Qualifying 22:00-23:00
Sunday 27 October
Race 20:00
Live coverage Sky Sports F1
Highlights Channel 4

THE PAST FIVE WINNERS HERE

2023	2022	2021	2019	2018
Max Verstappen Red Bull	Max Verstappen Red Bull	Max Verstappen Red Bull	Lewis Hamilton Mercedes	Max Verstappen Red Bull

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FINISHING STRAIGHT

RACE PREVIEW

F1 WORLD CHAMPIONSHIP ROUND 21

SÃO PAULO GP

1-3 November 2024
Autódromo José Carlos Pace

PICTURE: SIMON GALLOWAY. ILLUSTRATION: ALAN ELDRIDGE

THE MAIN EVENT

For several years Interlagos was an outlier on the F1 calendar as the only circuit flowing anticlockwise, putting a greater strain than normal on drivers' necks. Now it's part of a small but select club which also features Imola and Jeddah. In its first few years of existence the track was virtually double the current length but safety requirements dictated a rerouting of the circuit. Some sections now run in the opposite direction to the original layout.

Although Brazil is still on the lookout for a new racing hero – Pietro Fittipaldi's two races for Haas as a stand-in for Romain Grosjean in 2020 aside, there hasn't been a regular Brazilian F1 driver since Felipe Massa finally hung up his helmet in 2017 – the crowds remain passionately invested in the spectacle here.

2023 RACE RECAP

The drama began on Saturday when a violent storm ripped through the circuit, causing a grandstand to partially collapse, and Q3 to be red-flagged with only four minutes remaining. A slightly disordered grid ensued behind the regular front row of Max Verstappen and Charles Leclerc; Lance Stroll must have been bordering on vertigo as he contemplated his starting position of third.

Max won the sprint race ahead of polesitter Lando Norris after taking the lead at the first corner. This order was repeated in the grand prix after a hydraulic failure caused Leclerc to crash on the formation lap. The victory enabled Verstappen to exceed Alberto Ascari's record percentage of wins per season, set in 1952.

KEY CORNER: TURN 12

Junção – *not* to be pronounced 'young cow' – is the critical final corner before the main not-quite-straight, and it's where Lewis Hamilton effectively won the 2008 world championship on the last lap of the race.

RACE DATA

Venue Autódromo José Carlos Pace
First GP 1973
Laps 71
Circuit length 2.677 miles
Race distance 190.064 miles
Lap record 1m10.540s Valtteri Bottas (2018)
F1 races held 40
Winners from pole 17
Pirelli compounds C3, C4, C5

CAR PERFORMANCE

Downforce level Medium
Cooling requirement Medium
Full throttle 60%
Top speed 202mph
Average speed 131mph

TIMETABLE (UK TIME)

Friday 1 November
Practice 1 14:30-15:30
Sprint qualifying 18:30-19:14
Saturday 2 November
Sprint 14:00-1500
Qualifying 18:00-19:00
Sunday 3 November
Race 17:00
Live coverage Sky Sports F1
Highlights Channel 4

THE PAST FIVE WINNERS HERE

2023	2022	2021	2019	2018
Max Verstappen Red Bull	George Russell Mercedes	Lewis Hamilton Mercedes	Max Verstappen Red Bull	Lewis Hamilton Mercedes

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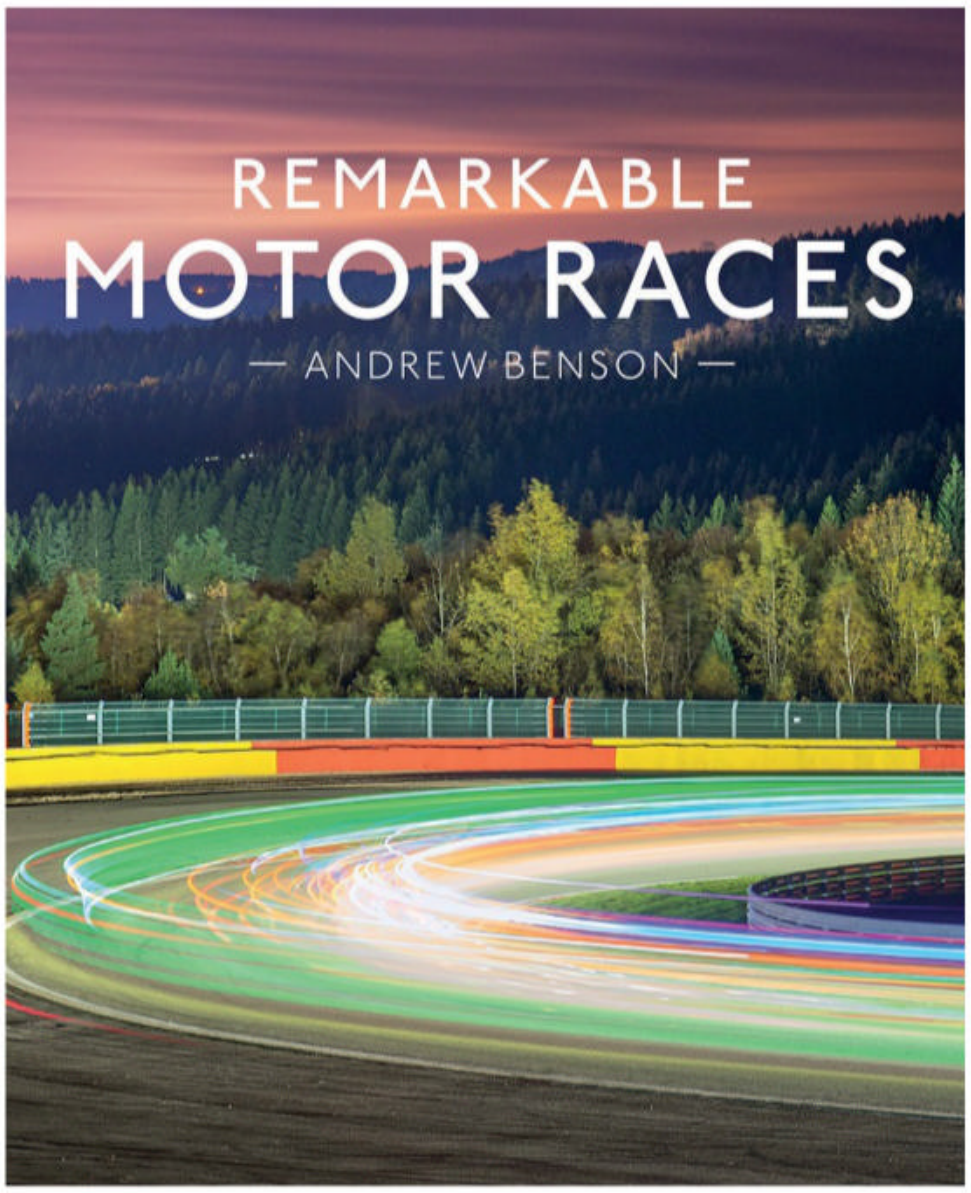
There have been plenty of books about races and race tracks. But none with the depth and scope of this one, the first book by regular *GP Racing* contributor Andrew Benson. As F1 has proved in recent years, a ribbon of asphalt is just the starting point – it's the human factor which creates the story value.

"This all points towards why a book about race tracks and venues, as this appears to be on a superficial level, is not really a book about race tracks at all," says Benson in his introduction. "It's a book about what they mean, about the events that have taken place on them."

Expect, then, not a directory of circuits but a fascinating collection of stories reaching outside the world of F1 to the wider motorsport diaspora. The in-depth research is backed up by original interviews with racing personalities past and present.



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Those in the know simply called it "The Track". There was no other motor racing venue quite like Brooklands, the world's first banked circuit purpose-built for motor racing. Now the Brooklands Watch Company is launching a limited-edition timepiece inspired by the golden age of the circuit and the land-speed-record-holding Napier Railton racing car built there in 1933, and taking its name from the Triple-Four Aero engine which powered the legendary bolide.

More fascinating still, the timepiece is the final work of the celebrated restaurateur, retailer and designer Sir Terence Conran, founder of the Habitat chain which revolutionised houseware and furniture design. Each of the 500 pieces is individually numbered and bears Sir Terence's autograph as well as his design signature.

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"Las Vegas is everything that's right with America," quipped the comedian Drew Carey. That might be the case for some, but disappointment awaits if you're hoping to catch the Lionel Ritchie or Shania Twain shows during the GP weekend – Lionel might still enjoy performing all night long, but he'll have packed away his glitterball the week before the race. Meanwhile Shania's shows appear to have sold out already. This news did not impress us a great deal.

Still, with that spare cash you can splash out on some GP merch. The new Core Collection features cap, tee shirts and hoodies and is available from the website and some LV hotels.

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tagheuer.com

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FLAT CHAT

FULL THROTTLE MUSINGS WITH ALEX KALINAUCKAS

PICTURES motorsport IMAGES

PEOPLE ARE PEOPLE: WORDS THE FIA DOESN'T WANT TO HEAR

'WTF?' Seems the appropriate response to FIA president Mohammed Ben Sulayem revealing recently that he wants Formula One Management to limit bad language in live broadcasts.

It certainly had that effect during the Singapore GP weekend – spectacularly managing to distract from the on-track action in this unexpectedly exciting 2024 F1 season. When Max Verstappen tested the waters with an F-bomb in the pre-event press conference and was slapped with a community service sanction (alone astonishing given Ferrari and Mercedes team bosses Fréd Vasseur and Toto Wolff got off with warnings for the same thing in a vitamin D-deficient Las Vegas press conference), observers duly connected the dots and decided that an example was being made.

In the Singapore post-qualifying presser Verstappen protested by keeping his answers to a minimum

There have been rumblings elsewhere. World Rally legend Sebastien Ogier had been given a huge suspended fine for comments made at the Acropolis Rally where he (albeit sans swearing) criticised stage organisers. But when Max – with unusual deftness – opted to protest against what's being seen as a clampdown on freedom of expression by holding his own press huddle in the paddock, it took the melodrama to new heights.

It says a lot that Verstappen – the driver who used appalling language after a practice shunt with Lance Stroll at the 2020 Portuguese GP, and exploded with rage in a press conference after the Silverstone clash with Lewis Hamilton in 2021 – is the voice of reason.

Just as with jewellery-gate, the intentions behind the FIA's effort have been lost amid the noise. Back in early 2022, the governing body acting proactively to avoid a driver suffering serious burns in a crash was pretty reasonable. That it was communicated clumsily was the problem. And so again here on driver language.

OBSERVERS DULY CONNECTED THE DOTS AND DECIDED THAT AN EXAMPLE WAS BEING MADE

Ben Sulayem muddied the waters by complaining about a problem F1 broadcasts already tackle by bleeping the expletives. He even said as much. With the drivers kicking off over a misunderstanding, it has been forgotten that Ogier's sanction stemmed from the FIA wanting to avoid social media abuse against officials that competitors – consciously or otherwise – can unleash with their online followings.

Better explanation of complex decisions is the answer here – not asking drivers to not react like human beings. That's whether driving in the heat of the moment or if they later disagree with a stewarding decision. Clamping down was bound to backfire given past events.

As a handy aside, remember how until Abu Dhabi 2021, and even during Covid-19 restrictions, the now castigated and cast aside F1 race director Michael Masi would hold post-race briefings to explain calls made by officials. Exactly the sort of thing that would have been critical in regaining public trust in the aftermath of the Abu Dhabi scandal. But this has disappeared.

As Ben Sulayem's puts it – that the FIA "never gets the credit" – ultimately stems from its decision-making often appearing unfathomable. In some cases it does issue an explanation eventually but is constricted by its processes and complexity. A governing body also shouldn't be crying for recognition. It's a somewhat unenviable position of not being acknowledged when things are going correctly, but that is the basis for functioning society – people, rightly, just expect things that should work, to work.

Drivers shouldn't be impeded from being people – their flaws make them interesting. It shows the scale of the problem that so many people regard what's happening now as a restriction on freedom of expression.

And the real kicker? F1 fans love the extra information – such as that Masi used to provide in those briefings. Healthy discussion, even with a few words some won't want to hear occasionally, is always better. And praise may even follow.

PICTURE: LIONEL NG. ILLUSTRATION: BENJAMIN WACHENJE

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