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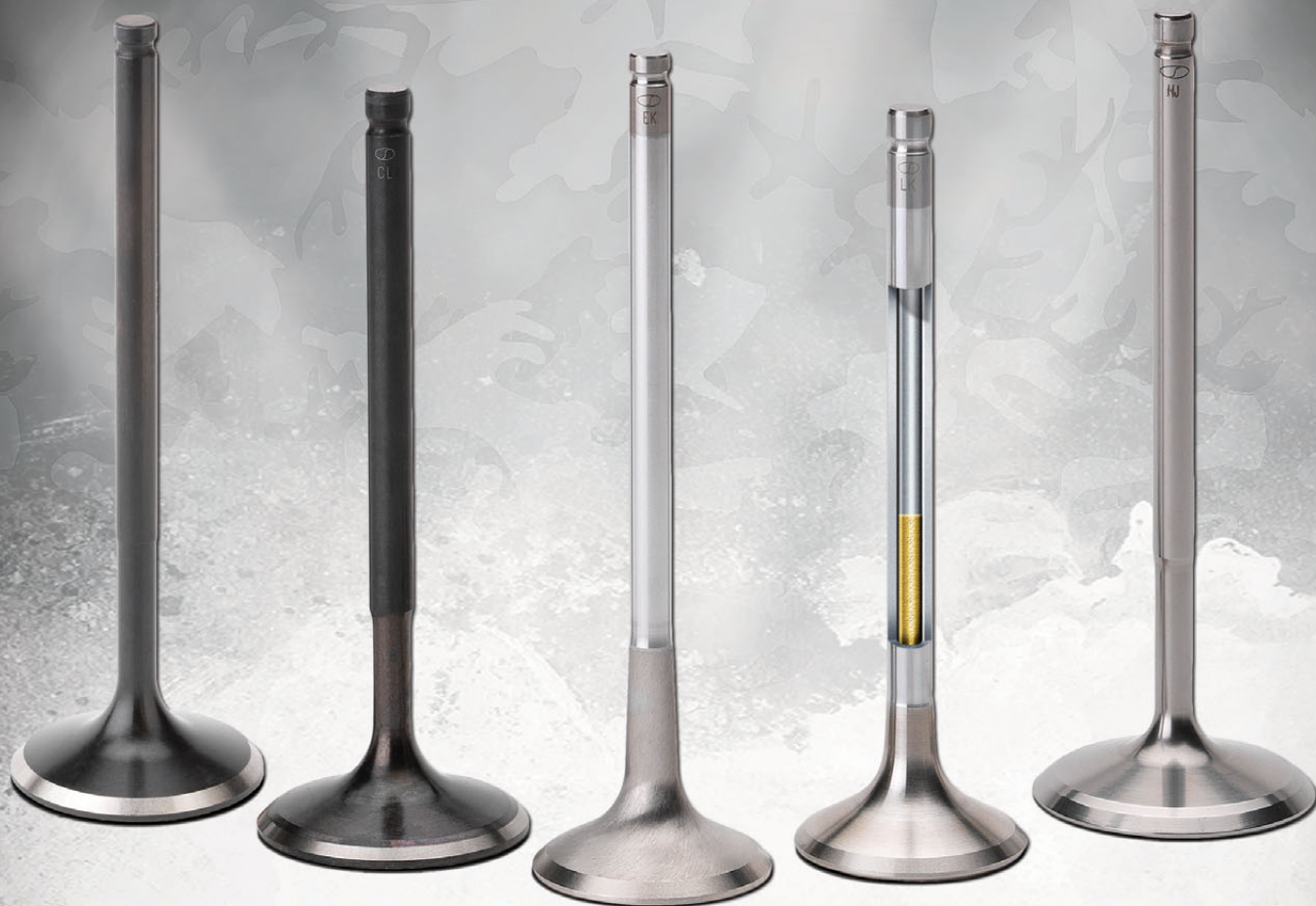
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We ask what impact new handicap system will have



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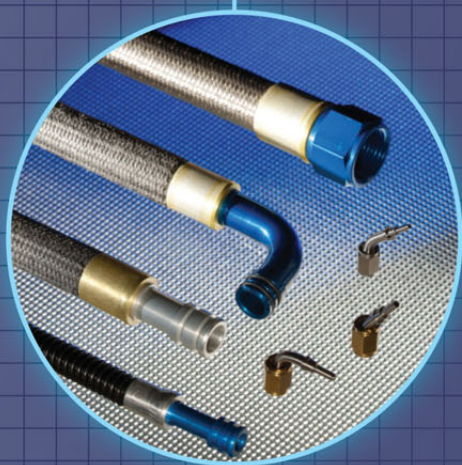
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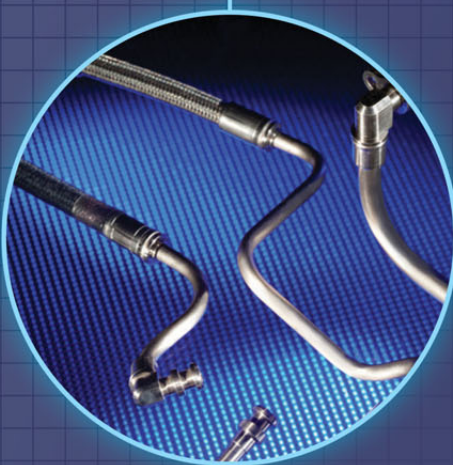
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THE CASE FOR CUSTOMER CARS IN F1

LOOKING back half a century to the start of the 1970 F1 season in South Africa, there were 23 cars on the grid, but only eight constructors, which meant that there were a number of customer cars competing.

For example, there were five March 701s: two works cars painted in red for Chris Amon and Jo Siffert, two for Tyrrell painted blue for Jackie Stewart and Johnny Servoz-Gavin, and a singleton entry for Mario Andretti painted red and known as the STP Oil Treatment Special. This was a time when you did not have to spend megabucks to field a team and a squad's head count was in double or sometimes triple figures, but never by the thousands.

As an enthusiast, was I bothered that the grid comprised a mixture of works and private cars? Not in the least. I also accepted the fact that, except in exceptional circumstances, a works car would always beat a private one.

Things changed massively in 1981 when the FIA required Formula 1 entrants to own the intellectual rights to the chassis that they entered.

By then, the teams had become more professional, increasing in size in terms of personnel and facilities, thereby requiring more revenue and increased sponsorship.

Formula 1 is now facing a financial crisis in the midst of the COVID-19 pandemic. It needs to act quickly, and customer cars are an easy answer – a point raised by Red Bull Racing team principal Christian Horner in our feature on F1's return to racing.

Why not recognise the Racing Point RP20, which is known as the "Pink Mercedes", as a Mercedes customer car? Had that been the case, would Racing Point, which will be known as Aston Martin next year, really need to purchase 27 acres of farmland with a view to expanding its Silverstone base and facilities? If the 1981 regulation was rescinded, just think of the huge amount of

money that would be saved.

Ditto Haas F1 and possibly Alfa Romeo (Sauber) and Ferrari, and also Alpha Tauri and Red Bull Racing. Meanwhile, while Renault remains committed to F1, it was reported in May that the parent company is in dire straits, so its future in the sport is not guaranteed whatever we are told.

That leaves just McLaren and Williams, both of which are feeling the financial strain. The former claims that it is on the brink of insolvency and the latter was put up for sale after losing £13m last year.

Something radical needs to be done. The very sport itself is threatened, partly due to lack of cash but also the greater danger that it is seen as pointless given the increasing move to the electric-only vehicle. The British government has already indicated that it could ban the sale of new petrol and diesel cars in 2032, just 12 short years away. How long before we see the Blockbuster phenomenon – whereby the high street giant became redundant through the screening platforms like Netflix – hit the car industry? Will the brand names we all know be replaced by the likes of Apple, Amazon, Uber, Tesla and Google, which see no need to go racing, at least not with cars powered by the internal combustion engine? There is also the concern for the car manufacturers that we will fall into the habit of renting cars by the hour and the need to actually own one will disappear over time.

These are revolutionary times and F1 and motorsport altogether needs to think out of the box as never before. **TK**

William Kimberley
EDITOR



Kingdom of Bahrain reveals new Prodrive Dakar team



Prodrive may have six World Rally Championship titles, five Le Mans class wins and four BTCC successes to its name, but now it is gearing up for a very different challenge

THE Kingdom of Bahrain has revealed its new Prodrive-developed car, and the team set to run it when it debuts in next year's Dakar Rally.

The team, called Bahrain Raid Xtreme (BRX) is the Kingdom's latest venture into global motorsport, after the country's sovereign wealth fund established Prodrive International, a joint venture with the British motorsport business, Prodrive.

The new team is set to compete in next year's Dakar Rally using the newly-developed Dakar Rally T1, a car which builds on Prodrive's extensive motorsport experience. After considering the likely terrain and the conditions for the 2021

event, the outfit decided to use a 3.5-litre turbocharged petrol V6 outputting 400 bhp and 700 nm of torque to power their four-wheel drive runner. Development of the car has been underway at Prodrive since mid-2019, with the first car currently being assembled at Prodrive's Banbury base.

As well as offering formidable performance, the BRX T1 has also been designed to be visually distinctive, with its styling evolved by Callum, the eponymous design firm of renowned British designer Ian Callum, whose work includes the Aston Martin DB7 and the Jaguar XK.

The project is being led by Prodrive chairman and founder David Richards CBE,

who has taken on the role of BRX Team Director. "The Dakar Rally is one of the great challenges within motorsport, and one that Prodrive has been wanting to undertake for a long time, waiting for the right opportunity" he commented.

"Our design team has been working on the car for over nine months. We have already been evaluating the engine on our transient dyno in Banbury and the first chassis is now being assembled in our workshop.

"The formation of a new team is incredibly exciting for everyone involved, and we truly believe that we have created a car that is perfect to take on the Dakar Rally."



LEFT The Prodrive-developed car will compete for the newly-revealed Bahrain Raid Xtreme team in next year's Dakar Rally



LEFT & RIGHT

The striking new car has been designed with the help of Ian Callum's eponymous firm



BELOW The BRX T1 has been built with the very different terrains of the Dakar Rally in mind

Designing the BRX T1 has, however, required a different approach than that taken with cars destined for other, less punishing series.

"Dakar is to motorsport what Mount Everest is to mountaineers. It is one of the great challenges in motorsport and one that Prodrive has yet to take on, but now the time is right," Richards continued. "The team are going to face hostile environments and challenging terrain that requires near-superhuman endurance to conquer. It is not uncommon for drivers to be racing for over eight hours.

"You have to approach the Dakar Rally in a very different way: the car has to be not only durable, but serviceable. Things will go wrong and you have to plan for that. If something breaks it needs to be fixable."

These differences in the way the team must approach the infamous Rally Raid were expounded upon by Prodrive's R&D director, David Lapworth. He explained to *Race Tech* that "the first challenge is balance of performance".

"I don't mean in the GTE sense, but in the

sense that the terrain at Dakar is so varied: how do you do strike the right balance between prioritising the dunes over the rocky sections, over the rally-type tracks?

"Before we got down to the real nitty gritty, we started to judge the balance of performance between two-wheel drive and four-wheel drive. Where do they gain?



Where do they lose? All those judgements about how you prioritise what I would call the normal performance factors for any race car or rally car, things like centre of gravity, weight distribution, ride height, cooling vs performance, all those things."

Lapworth also revealed how constrained the design was by the class's ruleset, with restrictions on wheelbase, roof height, minimum weight and fuel capacity all shaping the final design.

"Once you apply the constraints of what is involved, you start to realise it's actually pretty tough. Decision by decision, it turned out to be more about a hundred details, than coming up with radical ideas... It is about trying to make sure we choose the right engine, the right transmission, getting the suspension geometry right, with the right targets for all the suspension and so on, rather than any quick win."

The new BRX Team will make its competitive debut on January 3 2021, when the Dakar Rally departs Jeddah in Saudi Arabia on the start of the two-week competition. **IT**

Mercedes F1 engine head announces departure

THE Mercedes-AMG F1 team is set to lose one of the pillars of its unprecedented dominance over the sport with the managing director of its High Performance Powertrains division announcing his departure from the team.

Andy Cowell has presided over the department for seven years, at a time when the engine has been the key differentiator among teams. During his tenure his engines have helped secure six consecutive World Drivers' and Constructors' Championship doubles.

Cowell has worked with Mercedes Team Principal Toto Wolff and Daimler Member of the Board of Management's Markus Schafer to define a new management structure. This will see Cowell's responsibilities split amongst the senior leadership team, with Mercedes hoping that internal appointments and Cowell's support during the transition will ensure the change occurs smoothly.

"Andy's leadership of the team at HPP has been a key factor in our championship


success in recent seasons," commented Wolff. "He has made outstanding contribution to our motorsport legacy and I have valued and enjoyed our working relationship since 2013; I am sure he will enjoy great success in the next challenge he decides to take on.

"Our philosophy has always been that a winning team is a dynamic organisation, and that change is a natural part of every company's development. I am particularly pleased that we have been able to work

together to create a new leadership structure, by building on the strength in depth of the team in Brixworth."

Cowell's departure will raise questions about the F1 team's ability to continue to deliver trophies, although the outfit has a record of performing despite major changes in leadership. After all, in 2016 the team lost its then technical director, Paddy Lowe, who left the squad after three consecutive constructors' and drivers' championships. Lowe was replaced by former Ferrari technical director James Allison, who immediately picked up where Lowe had left off and helped the team to another three championship doubles.

Schafer is confident that a similar transition will occur this time, noting that the "new senior leadership team at HPP knows the business inside out – and I am confident they will drive the company forward with energy and innovation over the coming years."

He also revealed that Cowell will not leave the Mercedes fold, but would in fact be supporting a "major future project of Mercedes-Benz AG". 




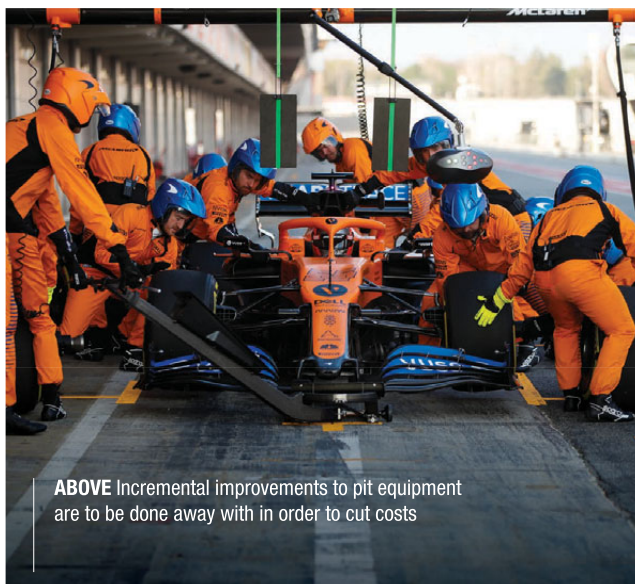
LEFT Andy Cowell, who was instrumental in Mercedes F1's winning streak, has announced he is leaving the team

Development of F1 pit equipment to be frozen

A NEW technical directive issued by the FIA will put an end to teams' development of pit equipment at the end of September.

As part of a new drive to cut the costs of competing in the premier motor racing category, teams will have to provide a comprehensive description of the pit stop equipment they rely on to the FIA by July 22. Each team is then allowed to modify the submitted description until the September 30 deadline. After that deadline, development will be essentially frozen, with only very minor changes, such as modifications to jacks to cope with different ride heights, allowed, and even then they have to be approved by the FIA.

The move also could represent the first step towards standardising further parts as the FIA continues to assess the affordability of the series. 



ABOVE Incremental improvements to pit equipment are to be done away with in order to cut costs



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Motorsport UK to provide PPE to officials during racing's restart

MOTORSPORT UK, the governing body for four-wheeled motorsport in the UK, has announced that it will support its officials with £50,000 worth of complimentary personal protective equipment (PPE) to support events through the initial phase of motorsport's restart from July 4.

The equipment will be distributed to all Motorsport UK-licensed Rescue and Recovery units, and all registered clubs with an event permit issued during July and August.

The supply of PPE will ensure that clubs and Rescue and Recovery operators will be able to facilitate motorsport's return safely, despite difficulties sourcing equipment due to increased demand. In addition to the supply of PPE, Motorsport UK will also provide individual pocket hand sanitiser to all officials working at its events.

The move comes after extensive consultation between the body and healthcare professionals from its Medical Committee, as well as careful consideration of the guidance between Public Health bodies, the NHS and other agencies.

Beyond the initial free of charge supply, Motorsport UK will also be supporting Clubs and Officials by establishing a central procurement contract for further supplies that may be required. The move follows a £1m funding package that Motorsport UK announced in April to help its clubs address the financial consequences of the COVID-19 pandemic.



"We have taken a responsible approach to the resumption of motorsport and that includes ensuring the health and safety of our officials remains the number one priority," commented Motorsport UK CEO Hugh Chambers. "Our community looks to us to provide leadership and to that end we have spent a good deal of time considering the guidance of the health professionals from our own Medical Committee and also that of public health bodies across the UK prior to implementing the appropriate resources. By making this investment and setting out these guidelines, Motorsport UK is reinforcing its commitment to the safe resumption of events in July, while endeavouring to limit the burden of additional costs on our community." **RT**

LEFT Motorsport UK is helping to ensure its officials will be safe when motorsport resumes in the UK

COVID-19 Officer roles introduced

MOTORSPORT UK has announced the creation of two new roles, COVID-19 Officer and COVID-19 Medical Officer, as part of its systematic preparation for the resumption of motorsport from July 4.

The new roles are central to all aspects of medical and public health planning in relation to COVID-19 for all events being held under the authority of a Motorsport UK Organising Permit. COVID-19 Officers will be appointed by the clubs to ensure that Motorsport UK guidelines are implemented and will liaise with various stakeholders, including club members and officials, and monitor the local COVID-19 situation.

In addition, Motorsport UK has appointed Dr Paul Trafford, the chairman of its medical committee, as its COVID-19 Medical Officer. At events where a Chief Medical Officer is required, this official will act as a local COVID-19 Medical

Officer. They will be responsible for documenting and feeding information back to the Motorsport UK's COVID-19 Medical Officer, and for ensuring that Motorsport UK's COVID-19 Medical Policy is followed. Dr Trafford will also be available to clubs who have any medical questions or concerns.

Motorsport UK CEO Hugh Chambers

called the creation of the roles an "important milestone".

"Our primary consideration remains the health and safety of everyone involved in the sport. This measure underlines that we continue to study all available medical guidance and are implementing appropriate resources in response to it," he added. **RT**



LEFT Two new roles have been created to facilitate motorsport's safe return

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Mercedes F1 tech to transition from the track to the street

MOTORSPORT is often spoken about as the automotive world's research and development centre. That trend continues as the MGU-H becomes the latest Formula 1 innovation to leave the confines of the track and hit the streets.

Despite the Motor Generator Unit-Heat being one of the sport's most complex technologies, Mercedes is set to adapt the technology for use in an upcoming Mercedes-AMG production model. The device increases the efficiency of an engine by recovering energy from the turbo by using the gases that spin its turbine to create electricity.

The technology was first developed for the current generation of 1.6-litre V6 power units, brought into F1 in 2014. It will now be used in a road development, dubbed the "electric exhaust gas turbocharger", which has been made in conjunction with turbo manufacturer Garrett Motion.

The electric exhaust gas turbocharger uses a small electric motor between the exhaust-side turbine wheel, and the compressor wheel on the fresh air side of the turbo. Before exhaust gas enters the turbo, the electric motor drives the compressor, eliminating drag and giving immediate power from the turbo, as well as increasing torque at low engine speed.

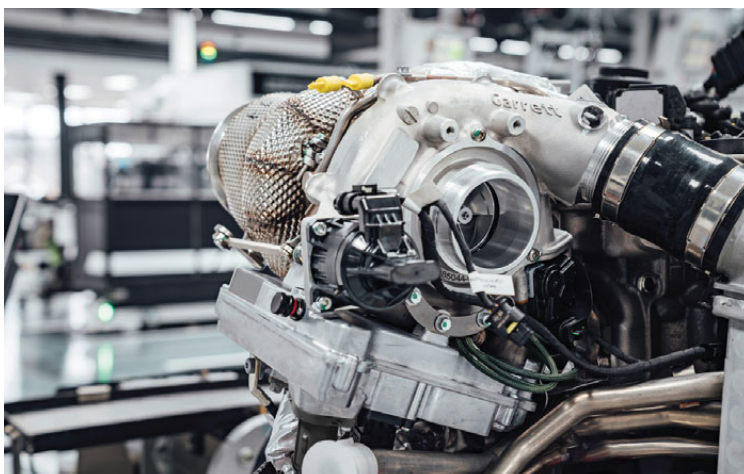
"We have clearly defined our goals for an electrified future. In order to reach them we are relying on discrete and highly innovative components, as well as assemblies," explained Mercedes-AMG CEO Tobias Moers.

"With this move we are strategically supplementing our modular technology and tailoring it to our performance requirements.

"In a first step this includes the electrified turbocharger – an example of the transfer of Formula 1 technology to the road, something with which we will take turbocharged combustion engines to a previously unattainable level of agility."

The new turbocharger operates at speeds of up to 170,000 rpm, which enables a very high rate of airflow. It can be operated via a 48-volt on-board electrical system and is integrated into the combustion engine's cooling circuit, enabling the turbocharger to operate at its optimum temperature at all times. **RT**

BELOW F1's MGU-H has inspired the new "electric exhaust gas turbocharger"

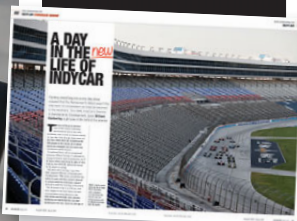


IndyCar Aeroscreen makes racing debut



LEFT IndyCar's cockpit protection device was finally used in competition for the first time

IndyCar's racing return
Find out how the Aeroscreen's debut went - **PAGE 60**



THE Aeroscreen made its racing debut at the 2020 IndyCar season-opener at Texas Motor Speedway on June 6.

IndyCar's new cockpit protection system, the Aeroscreen, was a joint development by Red Bull Advanced Technologies (RBAT), Dallara and IndyCar. The system is a mandatory component of the 2020 IndyCar Series and is present on all 24 cars.

The purpose of the Aeroscreen is to protect the head and upper torso of drivers competing in open-cockpit series. Tuned to the specific requirements of IndyCar, it has been developed to function effectively on both oval speedways and road courses.

The Aeroscreen has been developed at a high tempo, going from initial discussions between IndyCar and Milton Keynes-based RBAT in January 2019, to a proof of concept displayed at the Indy 500 during the Spring, to track testing at IMS with Scott Dixon and Will Power at the wheel in the autumn. Full field testing took place earlier this year at the IndyCar shakedown held at the Circuit of the Americas. **RT**

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Renault F1 team instrumental in developing COVID-19 equipment

RENAULT'S F1 engineers have played a major part in developing a new aerosol shield called the Oxford Box, which will keep frontline medical staff safe when they are treating patients with COVID -19.

Aerosol shields are a barrier between a patient undergoing treatment and the staff helping them. They allow access to the patient, while at the same time keep staff safe from the infection.

The new box represents a significant improvement, explained Oxford University Hospital consultant anaesthetist Bianca Tingle.

"It is unique because it is completely collapsible and easy to stow away – space is a precious commodity in hospitals – and it is much easier to clean than other similar devices being developed, which helps enormously with infection control. These were the key features we were looking for.

"It adds a vital layer of protection for clinical staff. Removal of PPE is the riskiest moment for us, but keeping aerosols inside the Oxford Box greatly reduces contamination of us and the surrounding area."


The new device was developed jointly

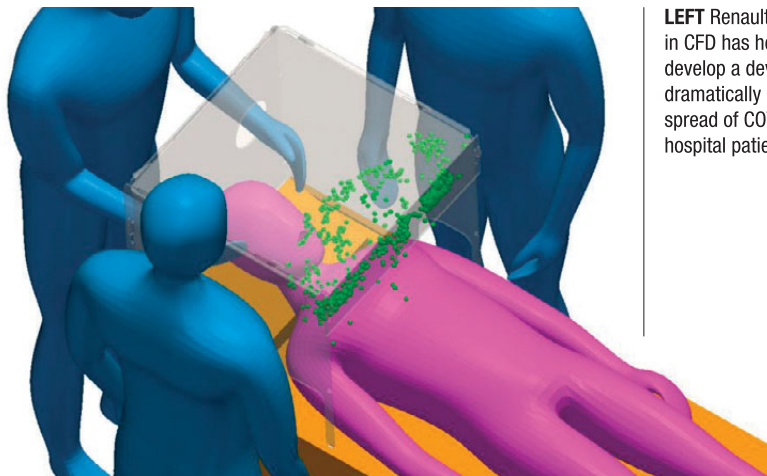
between the University of Oxford's Simulation, Teaching and Research unit and Renault F1, as well as other businesses in the Silverstone Technology Cluster network in order to get the device working and past extensive trials as quickly as possible.

"We modelled the speed, direction and air flow as we would in F1 and were thus able to advise the best placement, size and shape of the box to take its protection level to near 100 per cent for the treating medic," said Renault's Head

of CFD, Paul Cusdin.

"The models were complex to establish, but by applying the principles we would do in developing a car, we were able to improve its protection and condense development from months to weeks.

"F1 is once again proving its capacity to apply its thinking, technology and processes in speeding up the help we can give to those in genuine need. I hope this will be yet another tool in the ongoing fight against COVID-19." 



LEFT Renault's expertise in CFD has helped develop a device that dramatically reduces the spread of COVID-19 from hospital patients


Interest grows in Ferrari's ventilator

THE FI5 pulmonary ventilator developed by Scuderia Ferrari and the Italian Institute of Technology in response to the COVID-19 pandemic has attracted interest from across the world.

The project is open source, with an open patent allowing anyone to produce the ventilator without red tape delays. Currently there is particular interest from the Americas, which is currently the worst affected part of the world.

Interest comes after Mexico took on the FI5 on the day it was presented in May, when several companies downloaded the freely-available information about the

RIGHT Ferrari's FI5 ventilator is starting to be adopted by countries across the world

device. Three FI5 prototypes have already been produced in the country, and are now being assessed for certification by the Ministry of Health. After this certification is granted, mass production can begin to supply hospital emergency departments. 



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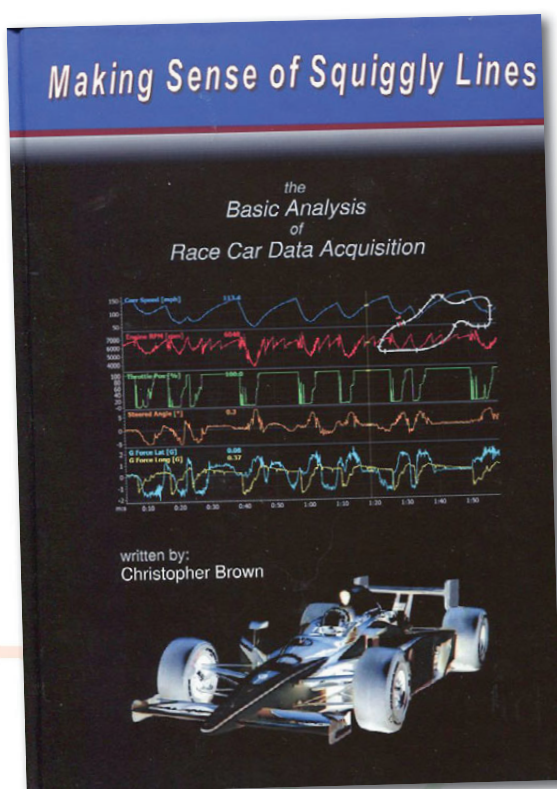


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World Rally Championship team to supply BTCC engine from 2022



ABOVE From 2022 the TOCA engine used in the BTCC will be made by M-Sport

M-SPORT, a team which is best known for taking Fords to World Rally Championship title glory, has been awarded the next five-year contract to supply the TOCA engine to the BTCC, taking the place of Swindon Powertrain, whose deal expires at the end of 2021.

The move to M-Sport engines will mark the first time the BTCC has switched to another provider, with Swindon having held the supply deal since the introduction of TOCA engines in 2012.

Although Swindon's TOCA engine has never usurped a bespoke engine to win the championship outright, it has powered numerous race wins, with 55 per cent of the BTCC field relying on the engine in 2020, including the official Toyota and Vauxhall teams.

With the BTCC heading into the hybrid age, M-Sport is set to work closely with Cosworth, which is developing the new hybrid system to be used in the series from 2022 onwards.

"I'm delighted to welcome M-Sport into the BTCC family and congratulate them on their successful tender," commented BTCC chief Alan Gow.

"The opportunity to supply the TOCA engine from 2022 understandably attracted great interest from an extremely high calibre of bidders, so it is testament to M-Sport's professionalism and expertise that they were able to come out on top of such a competitive and comprehensive process.

"I would also like to express my sincere thanks and appreciation to Swindon Powertrain, who have been such an integral part of the success of the BTCC engine regulations, and we look forward to working closely with them for the remaining two seasons of their contract."

M-Sport managing director Malcom Wilson said he was "delighted" with the decision.

"The BTCC has long been a popular and prestigious part of the British motorsport scene, and we're all looking forward to working with TOCA and the relevant teams on this new and exciting project.

"I firmly believe that M-Sport has some of the best engineering expertise in the country, and with the development of our on-site Evaluation Centre this capability is only going to increase." **RT**

Le Mans winner Turner to become BTCC hybrid development driver

BTCC race winner and Le Mans 24 Hours class winner Darren Turner will conduct the majority of the on-track testing of the BTCC's new hybrid car, after confirming an agreement to be the official Hybrid Development Driver for both TOCA and Cosworth.

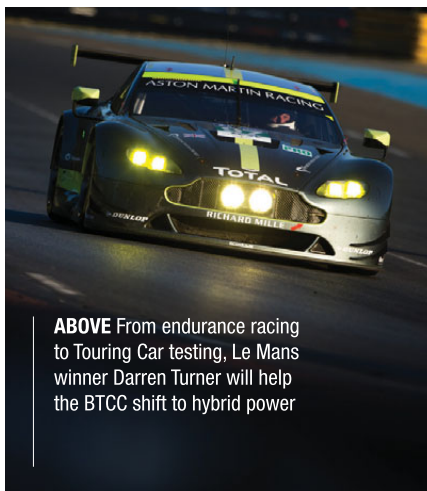
Turner, who has a wealth of experience having competed in the BTCC between 2006 and 2008, and taken three class victories in the 24 Hours of Le Mans, will get his first opportunity to drive the new hybrid Speedworks Motorsport-built Toyota Corolla at Goodyear's two-day test at Snetterton in early July.

"It's a really interesting project. I hugely enjoyed the British Touring Car Championship

when I raced in it and this is a brilliant opportunity to get back in a touring car and do something a little bit different," said Turner.

"I want to come at this fresh – I will meet the team and the guys doing the development and we will work out clearly what the objective is, because it isn't just about the ultimate performance of the cars. It's about making sure that it enhances what the racing currently is like and it adds to what the British Touring Car Championship is all about. And of course another important aspect is durability testing – we'll be putting the equipment through some punishing test cycles.

"As the hybrid deployment will be for both attacking and defending, we will need to work on how it is best configured so that it's easy to understand and easy to use. It's also important that the fans can see it and understand what's going on." **RT**



ABOVE From endurance racing to Touring Car testing, Le Mans winner Darren Turner will help the BTCC shift to hybrid power

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Multimatic launches Special Vehicle Operations group



LEFT Motorsports projects like the Mazda DPi racers will be handled by the new Special Vehicle Operations Group

MULTIMATIC has announced the creation of a Special Vehicle Operations Group in response to the firm's growth and diversification throughout the global automotive industry.

The new unit, which will be led by Larry Holt, comes after the company's engineering organisation has grown over more than 30 years to encompass a diverse range of operations around the world. In a bid to maintain agility, technical focus and the ability to offer customers dedicated and committed support it was determined that a division of the original organisation into specific areas of expertise was required.

MSVO will be responsible for all vehicle engineering developments as was

undertaken for the Ford GT, motorsports engineering projects like the Mazda DPi, and all race team operations, continuing the use of the Multimatic Motorsports identity. Additionally, low volume vehicle body/chassis manufacture, carbon fibre part production and low volume component supply will also be incorporated within the new MSVO. Multimatic Motorsports will continue to operate on both sides of the Atlantic, from dedicated facilities, in a bid to provide a unique proposition in the global GT and prototype competition space.

The Multimatic Engineering group will now be headed by Jim Holland, and will focus on providing Multimatic's industrial

manufacturing groups with continued product and technology development, while maintaining a close relationship with Holt and MSVO to assure a two-way flow of expertise.

Commenting on the restructuring, Multimatic president and chief operating officer Raj Nair said: "Multimatic continues to grow, in both size and technical diversity and this restructuring means we can remain true to our decentralised, agile and innovative operating philosophy. Multimatic is capable of engineering and manufacturing at extremely low and extremely high levels of volume; as well as engineering and manufacturing at the individual component level all the way to a full vehicle level; not to mention our capabilities and accomplishments at the highest levels of global motorsports, this now demands a higher level of specialisation and that is what the split will facilitate.

"This new structure will allow Larry to focus on vehicle engineering and motorsports, while Jim manages the Engineering Group. Jim brings more than 35 years of experience in the automotive industry at Ford Motor Company and Jaguar Land Rover, where he served in progressive engineering leadership roles. Refocusing our engineering leadership team provides a clear structure that will allow us to continue to deliver on our commitment to Strength Through Technology." **RT**

Virtual 24 Hours of Le Mans enjoyed by record audience



ABOVE With more than 63 million viewers, the Virtual Le Mans 24 was a record breaker

DESPITE the 24 Hours of Le Mans being held virtually for the first time ever, more than 63 million people tuned in online and on television, breaking previous records for a stand-alone motor racing esports event.

The virtual race brought together 200 drivers from 37 different countries, racing on 170 simulators worldwide in 50 entries, on the iconic Circuit de 24 Heures in France. The real-life motor race was forced to be postponed until September due to the global COVID-19 pandemic, so a virtual version was created to occupy the endurance classic's mid-June spot.

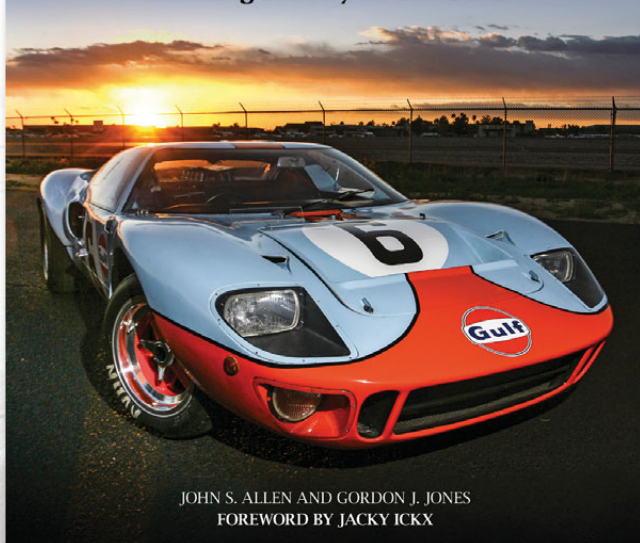
"This first edition of the 24 Hours of Le Mans Virtual was indeed worthy of the Le Mans name, and it perfectly captured all the excitement, tension and magic that is seen in real life at the Circuit de la Sarthe every June," said Automobile Club de l'Ouest president Pierre Fillon. "Our congratulations to all the competitors and all the teams who made this incredible event possible." **RT**

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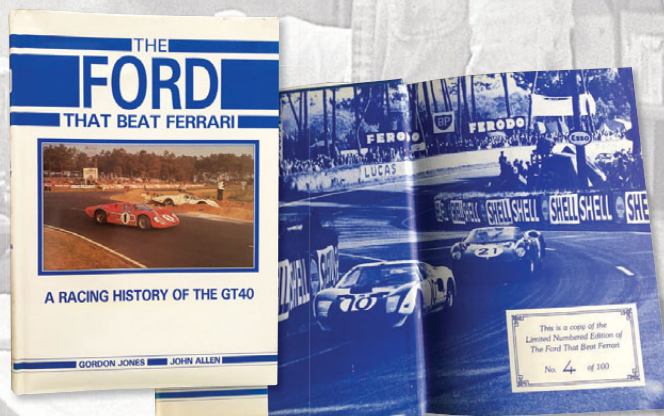
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Porsche pulls out of IMSA SportsCar Championship

PORSCHE has revealed that it will cease its factory involvement with the 911 RSR in the GTLM class of the IMSA WeatherTech SportsCar Championship at the end of 2020. Porsche said that the move would help the renowned automaker overcome the economic effects brought about by the COVID-19 pandemic. However, the withdrawal could also offer it the chance to prepare an entry into the upcoming LMDh class which will sit atop the championship from 2022. Porsche has not yet confirmed any intention to run in the hybrid prototype class, although it has attended a number of IMSA manufacturing meetings, and head of factory motorsport Pascal Zurlinden has stated several times that it is "evaluating" entering the nascent category, and the team is "still working on the concept of LMDh".

Porsche are the reigning champions in the GTLM manufacturers' championship, and rank second in the 2020 season after the 24 Hours of Daytona, the only race that has taken place this season due to the pandemic. The IMSA championship plans to resume its racing activities on the first weekend in July, with the return also taking place at Daytona.

Although Porsche will be leaving the series as a works entry, the motorsport marque has insisted that its support of customer teams in the GTD class of the IWSC, as well as the Michelin Pilot Challenge and the GT3 Cup Challenge USA will continued unchanged in

cooperation with Porsche Motorsport North America and Porsche Cars North America.

"The decision to halt our factory involvement in the IMSA series was not an easy one for us," emphasises Fritz Enzinger, vice president Porsche Motorsport. "With a view to the current corporate situation in connection with the Coronavirus pandemic, it is only logical for Porsche Motorsport to make a contribution to coping with the economic fallout. We've openly discussed our exit with all involved. At this point, we'd like to convey our sincere thanks to Jim France and the colleagues at IMSA for their understanding. Porsche belongs in endurance racing. We will work hard to ensure that this is only a temporary Auf Wiedersehen." **RT**

BELOW Reigning IMSA GTLM champions, Porsche Motorsport, set to say auf wiedersehen at the end of 2020



Glickenhaus prepares for Le Mans

WHEN the ACO and the FIA published regulations to establish a new top class of endurance racing, Scuderia Cameron Glickenhaus (SCG) saw an opportunity to build a beautiful sportscar to race in the top class of the WEC and at Le Mans. Starting with a blank sheet of paper and a design team led by Michael Young and Jim Glickenhaus, Italian engineering company Podium Advanced Technologies, the technical driving force behind the Glickenhaus SCG003C project, has been entrusted with the task of building the new car.

The car's development is well underway, with preliminary wind tunnel analysis complete and an extensive wind tunnel testing campaign starting this month. The plan is to complete the engineering by early

July, assemble the subsystems in July, build the car in August and by this September the Glickenhaus 007 will hit the track for its first shakedown. If all goes to plan, the new racer will then make its competitive debut in the Sebring 1000 Miles in mid-March 2021.

"We have completed our first set of physical wind tunnel testing, in one of the

world's top wind tunnels. We have already met several of our engineering targets, and are applying the lessons learned to move us towards additional targets," said Glickenhaus founder, Jim Glickenhaus. "We will start dyno testing our Pipo engine next month, and we will be testing our 007s before the end of this year." **RT**

RIGHT Renders of the hypercar that Glickenhaus hopes will bring glory at Le Mans



Rallying returns after COVID lockdown

THE first top-class rally since the COVID-19 lockdown has successfully taken place, with victory going to Oliver Solberg and his co-driver and mother Pernilla who piloted a Volkswagen Polo GTi through the stages of the Rally Sweden Lockdown.


The made-for-tv special was screened by Swedish broadcaster SVT, and was run without fans under strict health restrictions. Rally Lockdown was an invite-only event and used an exciting knockout format to whittle down some of the biggest names in rallying.

"It was great fun. The road was pretty rough in the end and that was tricky because we were having to push hard to stay ahead of Pontus [Tidemand, who placed second]," admitted Solberg.

"It was a really tight fight at the end but to win is something special for me and my mum. It's been a long time out of the car and I want to say a very big thanks to everybody who made this happen. They have done an amazing job."

Rally Sweden Lockdown director Glenn Olsson added that the event provided excitement and close competition for fans watching on television.

"Like all other sport across the world, rallying has been forced to stop since March because of the Coronavirus. Today we fired up the engines again and were treated to thrilling action in conditions that became increasingly tricky as the roads became wet and muddy."

"Congratulations to Oliver and Pernilla. Pontus made them work really hard for their success with the outcome going right down to the very final run of the day." 



LEFT Oliver Solberg snatched victory in the invite-only Rally Lockdown, beating second place by just 1.1 seconds

Toyota scraps plans for GR Yaris




BELOW Instead of being retired at the end of the season, Toyota's current WRC Yaris will be used until 2022

TOYOTA has said that it will no longer be introducing its Gazoo Racing WRC car in 2021, and will instead continue to use its current model.

The Japanese marque had initially planned to retire the current car at the end of this season, and replace it with a new contender based on the GR Yaris road car, which was unveiled in February.

Toyota didn't reveal the reason for the change in plans, although it is likely down to the financial impact of the COVID-19 pandemic on the automotive industry. With car sales affected globally, it is understood that it would have proved too expensive for Toyota to simultaneously build the GR Yaris, while working on a hybrid entrant for the 2022 season, as well as the present model.

Toyota, who began testing with its current model again in June, now plans to stop testing with the new GR Yaris completely, although it has said the data already collected will now be used to develop its 2022 car. The current Yaris will now continue to be used and refined until November 2021, when it will be replaced by Toyota's Rally1-based car for the 2022 season. 

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F1'S AERO REVOLUTION

A radical sliding scale for aerodynamic testing is coming to Formula 1 in 2021, but is it a gimmick or a game-changer?

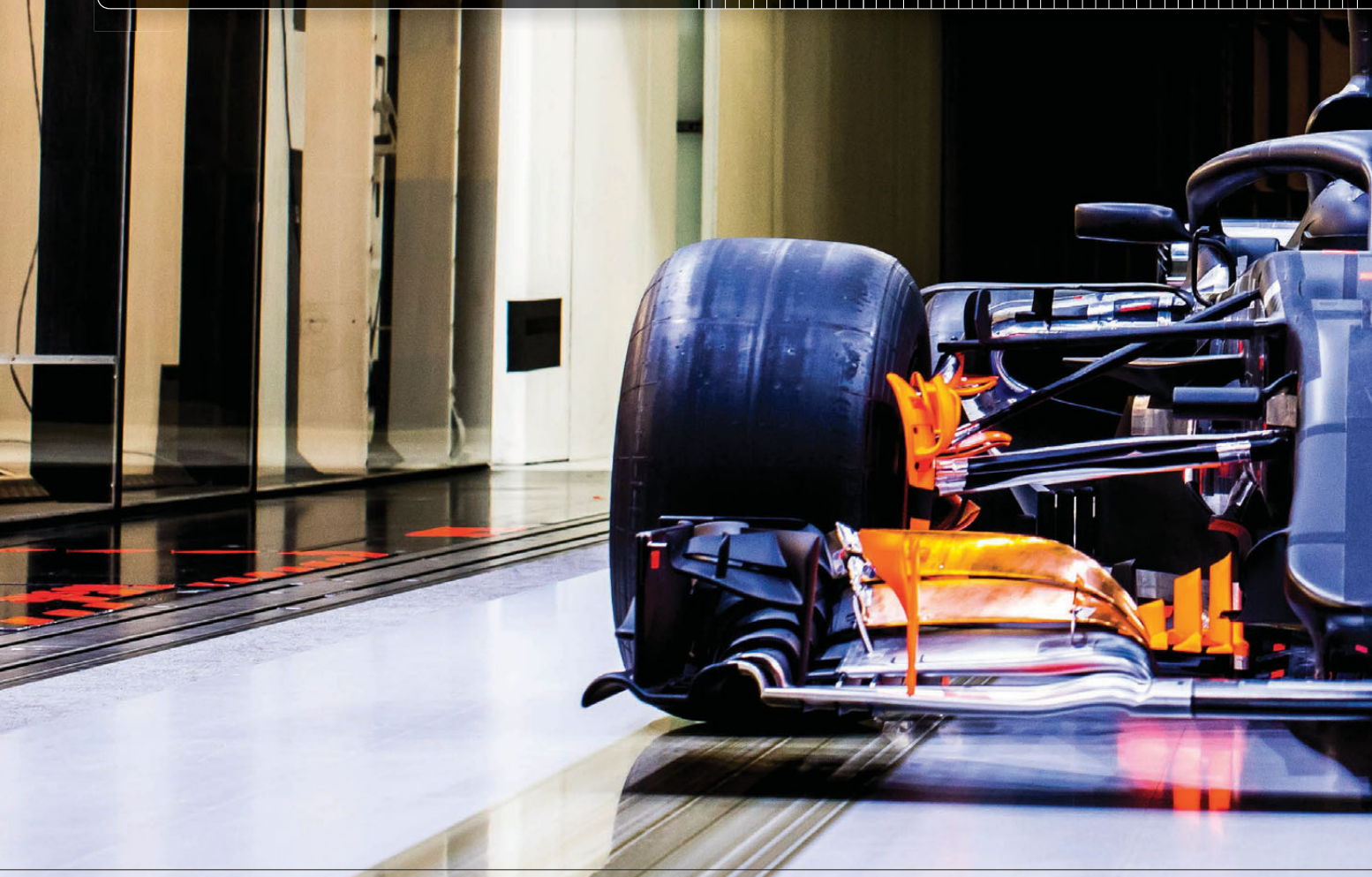
William Kimberley quizzes F1 Head of Aerodynamics Jason Somerville and **Mark Skewis** gauges paddock reaction

AERODYNAMIC development in Formula 1 has traditionally been unrestricted. In the past some teams ran their wind tunnels 24 hours a day, seven days a week. Such was the focus on aero development that some even operated more than one wind tunnel.

Those hedonistic times came to an end a decade ago when the governing body tried to control rocketing costs. It reined in the arms race with the imposition of limits on the use of both wind tunnels and compute-time for Computational Fluid Dynamics (CFD). Teams are currently limited to 65 runs in the wind tunnel per week, with that figure dropping by more than 30% to just 40 runs per week for 2021.

New sliding scale on aerodynamic testing in F1

Teams' previous season's championship position	①	②	③	④
Percentage of current aero testing allowed for 2021	90%	92.5%	95%	97.5%
Percentage of current aero testing allowed for 2022-25	70%	75%	80%	85%



Furthermore, for the very first time, each team's allowance of wind tunnel and CFD testing time will now be defined by on-track performance. For 2021, the team that won the 2020 World Championship will receive 90% of the testing allocation, or 36 runs per week. Second place will be allotted 92.5%, third place 95%, increasing in 2.5% increments down to ninth place 110% and 112.5% for the 10th place team.

From 2022-25, the restrictions will bite harder: the allowed aero testing will be reduced to 70% for the 2021 champions, increasing in 5% steps to 115% for the tenth-placed team. The aim is, in conjunction with the introduction of the budget cap, to cut costs for teams hit hard by the Coronavirus crisis. The ambition is also to create a more level playing field.

The big question is: what sort of impact will the new rules have?

"It will not work overnight," cautions F1 Head of Aerodynamics Jason Somerville, who has been part of the team shaping the new Technical Regulations. "A wind tunnel run isn't the same for all teams. Inevitably, the small team's processes are less efficient, so effectively one wind tunnel or CFD run isn't worth as much in terms of knowledge gained as, say, a Mercedes wind tunnel or CFD run, who have built powerful capabilities over time.

"But over the course of a few seasons, it's very unlikely you will not see a closing of the grid."

In fact, he argues, the initial gentle glidepath of the sliding scale is preferable to an overnight sensation: "We don't want to change the grid ►

BELOW For the first time in history, each team's allowance of wind tunnel and CFD testing time will be defined by on-track performance. The most successful, like Mercedes (testing here), will receive the smallest allocation





Mercedes-AMG F1

artificially. It's about trying to find a balance between adjusting the aerodynamic allocations on a weekly basis, which is obviously far too frequent, and having an ingrained development advantage hardwired in for a year, which seems too long – we therefore settled on a mid-season review.

"It won't make an immediate impact but, because so much of the performance comes from aero development, it will give a leg up to the mid and lower grid teams over time, allowing them to chip away and explore more ideas."

“It will give a leg up to the mid and lower grid teams over time, allowing them to chip away and explore more ideas”

Mercedes has recorded double title wins in each of the last six seasons, leaving some frustrated that the Aerodynamic Testing Restrictions (ATR) should feature such a soft start. The reason for that gentle slope, before a more aggressive step is phased in, is that the introduction of new regulations for 2022 offers plenty of opportunities to exploit. The bigger teams were very nervous that if the initial big step was put in place, it was handing too big an advantage to the mid-grid and smaller teams.

"It's very likely there will be some loopholes in any



Pirelli

new regulations and if you have 20% to 30% more wind tunnel testing or CFD time, there's a better chance they will be found," says Somerville. "Therefore, for the transition year, the gradient is shallower."

The sliding scale – some remain wary of using the term 'handicap' – represents a huge departure for Formula 1. The sport's heavy-hitters are legendary for their ability to protect their vested interests. Three decades have now elapsed since Ron Dennis famously welcomed Eddie Jordan to "The Piranha Club", but that sentiment still holds true. "The working groups are like a snake pit of deception and deceit," revealed one technical insider to Race Tech. "Everyone knows that every team is battling for their own team only and trying their best to screw everyone else!"

"The proposed regulations for varying the aero research limits team by team are, in general, hated by the big teams. But now the FIA and FOM have more people in the meetings between them than the teams do, so the balance of power looks to be changing."

Somerville admits it was "quite surprising" to get such a landmark agreement between the teams. Especially given that the meetings can, he

LEFT Big teams like Mercedes will inevitably do more analysis before putting parts in the wind tunnel and CFD

BELOW RIGHT Jason Somerville, F1 Head of Aerodynamics, won RACE TECH's 2019 Dino Toso Racecar Aerodynamicist of the Year award. The honour was conferred for his work, in conjunction with the Formula 1 and FIA technical departments, in establishing an exciting new set of regulations

BELOW Depending on where teams are in the competitive order, it could be a difficult call on when they give up on the current car to devote resources to the '22 car

concedes wryly, "become very animated very quickly".

However, the financial impact of COVID-19 has acted rather like a battering ram when it came to breaking down the notorious vested interests of the top teams. With jittery Zoom board rooms needing little excuse to review F1-size budgets, it was perhaps inevitable that the budget cap should eventually be reduced, from \$175m per year to \$145m, with further reductions in the following campaigns. Nevertheless, the headline aero changes still came as a surprise to many.

WILL IT MAKE A DIFFERENCE?

Well aware of the fact that such upheaval is about as popular with the big teams as finding the proverbial in your sandwich box, F1 Managing Director Ross Brawn chooses his language carefully. "The important thing about it is it still is a



strong meritocracy," he insists. "If you do a bad job, even if you've got more aerodynamic capacity, you're going to be at the back of the grid. And if you do a great job with less aerodynamic capacity, you're going to be at the front of the grid."

"I like to think of it a bit like the NFL draft pick where you get to pick the best players initially, but you still have to coach them properly. You still have to have the right tactics and you still have to be fit and you have to do all those other things that makes it a meritocracy. So this is just a general levelling of the playing field."

Former Jordan tech director Gary Anderson, now a pundit, suggests that the new aero rules are a great idea but still don't go far enough. ►



Photos courtesy of F1

One tech chief we spoke to agrees with his old foe. "Will it make a difference? Probably, but it won't push the small teams to the front," he stresses.

In spite of the ever-tightening aero testing restrictions over the past decade, the big teams still have 200 people in their aero groups. That tells you all you need to know about the continuing importance of aerodynamics as a performance differentiator.

At present, the big teams gather prodigious amounts of data – considerably more than their smaller rivals. They spend a lot of man-hours

mining that information.

"The return for that effort is small and if you are budget/person time-limited, like the small teams, you can't do that," explains one source. "So you go for 80% of the potential gain from 20% of the effort because it is better to do more runs. The big teams scour the data for the last bits of detail that may or may not be useful – and sometimes they find something. Of course nobody leaves any performance unused knowingly but there just isn't time to go through every last detail in the hope that in one case in 100 you find a little nugget of useful information.

"Now with a budget cap coming in, and assuming that it is effective in reality, the big teams will also have to revert to focusing on finding the big learning steps first and leave the unlikely areas alone or on the back-burner. The big teams will almost certainly have to cut people due to the budget cap, *but* they will know very well how to mine the mega data they get anyway very well. The small teams don't have as many tools set up to do that and won't need to create them. It isn't a lack of real understanding, it is being practical about the probability of learning something." ►

ABOVE & RIGHT The development of the 2022 cars was one of the factors dictating a gentle glide path into the new aero regulations



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POLICING THE RULES

Getting agreement on the new aero rules was one thing, policing them is quite another.

On a superficial level, it is clearly much easier for a large team to copy a small team's innovation than it is the other way around. But beyond that, in the murky world of shades of grey, the established outfits are better equipped to find and exploit any legality loopholes.

Teams are already wary of the business model that enabled Haas to make such an immediate impact after entering the sport with a technical tie up with Ferrari. Now, with the 'buddying up' of small teams with bigger partners an established part of the game – and Racing Point's 'Pink Mercedes' about to be unleashed in Austria this month – many will be viewing the changing aero landscape with suspicion.

"There is an honesty element," concedes Somerville of the restrictions. "The power of CFD means that you could submit and run CFD jobs on hardware at home. There is a bit of artistic licence on that because the models that are being used now are massive, so you

“The degree of odium in getting caught is just not worth it”



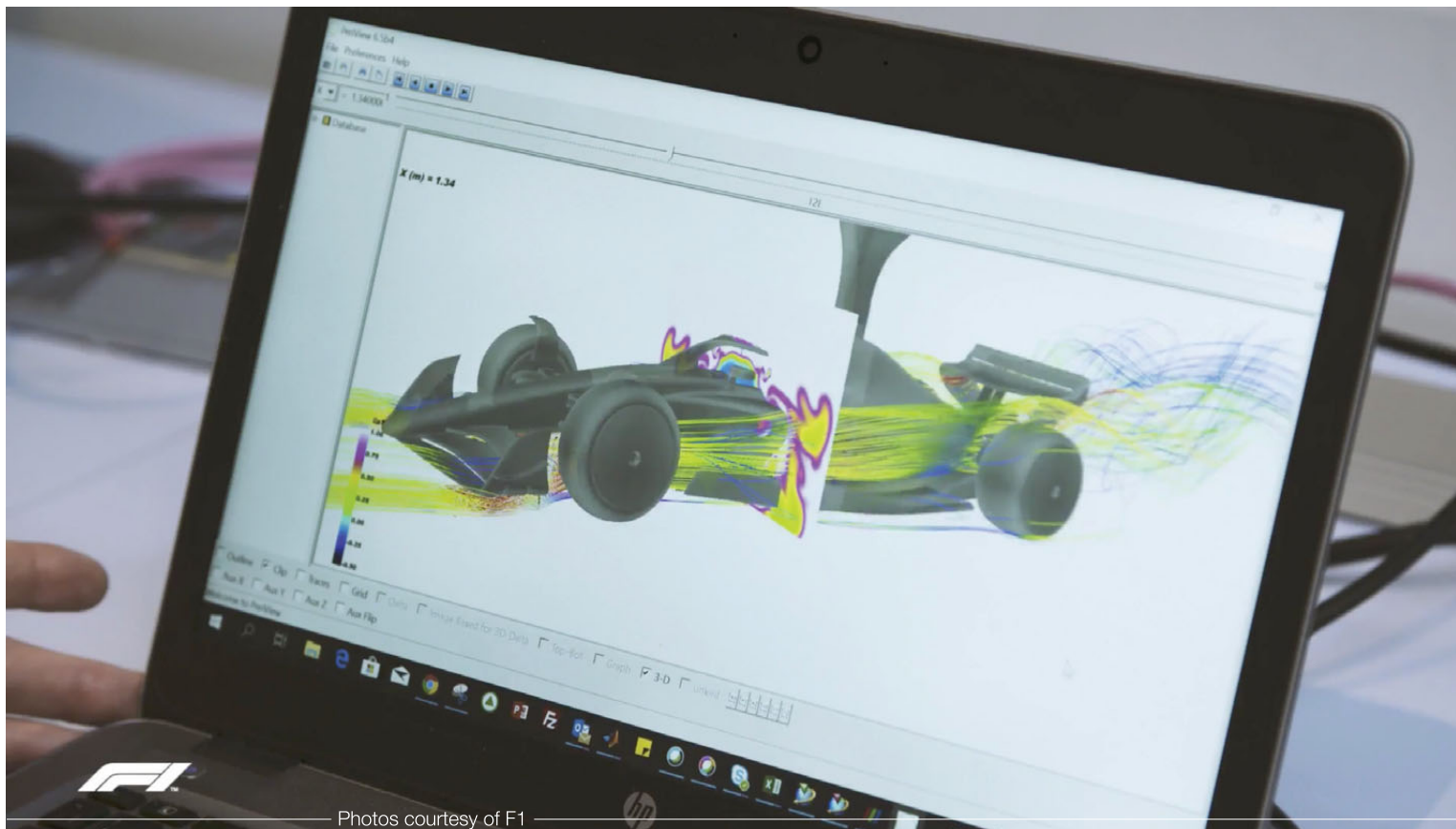
ABOVE The 2022 F1 model being prepped for another wind tunnel test. For the teams, each run will now count like never before

BELOW The 2022 car undergoing analysis in CFD. Could a spec CFD package one day be introduced?

would need a decent size cluster at your disposal or it would take weeks to come up with a solution!

"However, I think you rely on the fact that if you really wanted to do that sort of thing, you would need to keep it very quiet, because the degree of odium in getting caught is just not worth it.

"A lot of policing goes into it with the FIA doing spot checks, a bit like a taxman turning up at your door with almost no notice, asking for your log of runs and requesting specific post-processing which will be looked at and compared with what was in the team's official ATR submission. ►



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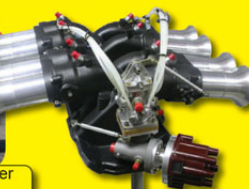
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"It's the grey zones that the FIA and ourselves are trying to nip because they're the areas where teams will try to find legitimate advantages. And it's the better-funded teams that have the resources who are typically most likely to find them. This initiative is all about trying to level the playing field slightly."

One fear raised is that the high stakes could tempt teams to 'sandbag' towards the end of a season. Would it *really* be worth sacrificing a championship position in order to earn a better aero allowance for the following campaign?

"In theory, teams could try and buck the system by deliberately holding back on track to gain a few more CFD and wind tunnel runs," admits Somerville. "However, because there's the Constructors' Championship prize fund involved, we reckon that teams are very unlikely to want to sacrifice real financial bonus for the potential future gains from more CFD and wind tunnel time. It's therefore self-policing to some degree."

SPECTRE OF SPEC CFD

Even before the COVID-19 pandemic sent financial shockwaves around the world, F1 was rushing headlong down the route of mandating spec components. In the 'new normal' that is now emerging, there is even more pressure to cut costs. Only last month, for instance, it was revealed that development of pit equipment is to be frozen. So could

Somerville ever envisage some form of spec CFD?

"All ideas are on the table, including cloud computing," he suggests. "We are coming up to the point where we are putting ideas together for review internally and with the FIA and then eventually discussing them with all the teams."

"If you were coming up with Formula 1 today, you would probably have a spec cluster that's divided equally, so 10 per cent for each of the teams, and relax some of the complex rules governing CFD usage. At the moment, though, because of the way that CFD has evolved organically, each team has gone its own route and has different CFD hardware and software combinations."

"When you get to the discussion of a spec cluster, there are often gripes from the teams that it doesn't suit their current software or it negates their new hardware. You can help get around that problem by setting clear time frames, far enough ahead, so teams can plan their major investments around it. The efficiency of CFD is year-on-year getting better, whereas the cost of wind tunnel testing isn't getting cheaper."

"At my latter days at Williams we were recruiting young graduates who would invariably come in with some post-processing from a generic F1 car, rather than saying they had done Formula Student or weekend Formula 3 work. They had drawn the F1 car in CAD and analysed it on their own cluster and come with recommendations. There's no doubt that the next generation of engineers and aerodynamicists are ►

BELOW Runs might be limited, but the bigger aero departments will still be able to mine the data more successfully



Photo courtesy of F1

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The lesser of two evils?

Did the threat of success ballast help pave the way for new aero agreement?

IT'S not what the sliding scale does, so much as what it doesn't do, that is important.

"The new aero rules are about adding opportunity, rather than adding weight to the car – and that's crucial," suggests Race Tech's Expert Witness, an F1 insider who must retain anonymity. "So while this won't turn the grid upside down, the big teams will eventually feel the pain from the ATR – but it won't be as bad as being forced to accept success ballast."

The ATR offers a gentle approach, possibly helping overcome resentment of the 'Balance of Performance' systems that are so detested by engineers.

For at least a decade the dreaded success ballast – a feature of touring car and GT categories – has periodically surfaced in F1 strategy meetings as a method of levelling the field.

It is a blunt instrument, though, akin to the "baseball bat" approach that Mercedes-AMG F1 team principal Toto Wolff referred to recently. He said the champions accepted ATR because it was designed to help close the field up over the long-term, rather than to specifically handicap the winning team.

"I am a fan of the meritocracy of F1, the best man and best machine wins," he said. "I hate any kind of balance of performance. It becomes a political game and a political world championship, and has no place in F1."

He told *Autosport* that the ATR "was done as a fine adjustment, not with a baseball bat," adding: "The reverse grids would have been a baseball bat."

F1 MD Ross Brawn reassured fans that the intention is to void such heavy-handed forms of performance-balancing. "We don't like them," he said of such measures, "and what's come across in many of the discussions we have with the fans is they don't like it either. If you win a race and then you have to carry 10 kilos extra at the next race, that's not

what Formula 1's is about."

He points out that there is a clear distinction between such techniques and the new aero sliding scale: "What we're basically saying to the teams that aren't doing so well is 'here's a great opportunity for you – if you don't take it, that's your problem'. But we're not going to penalise the top teams by taking away power or adding weight. That will never happen."

Although predictably welcomed by the likes of Racing Point, McLaren and Williams, the introduction of the ATR was greeted in distinctly lukewarm fashion by the top teams. Indeed, discussions are believed to have taken place about all three using the same aero allowance, in order that their rivals

don't get an edge.

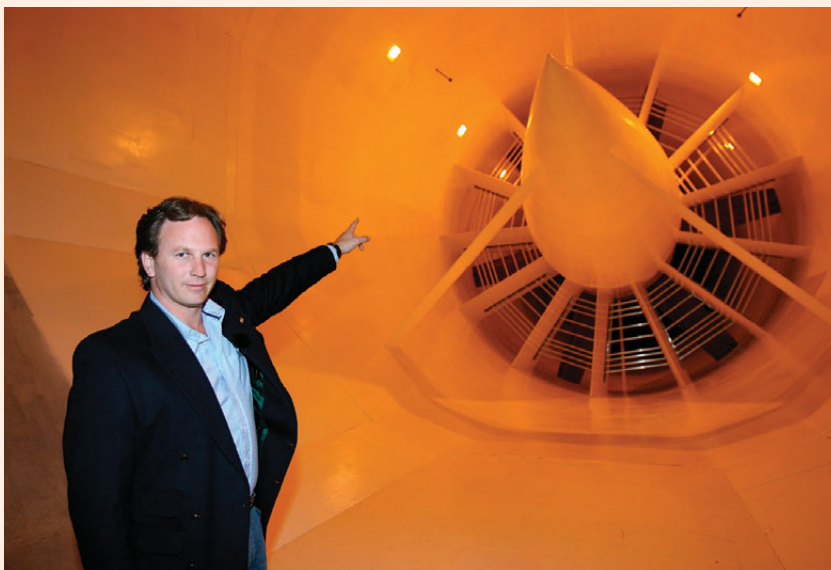
Christian Horner, Red Bull's team principal, confessed he wasn't a fan of the sliding scale.

"Thankfully, while we weren't able to get rid of it in its entirety, it has been adjusted so that it's a linear line between first and 10th, rather than isolating the first three, and more time being available from fourth onwards," he commented.

"It could be quite significant in a year of new regulations that are totally removed from what we currently have."

He noted that there was a slightly perverse element to the rules, suggesting it is "somewhat ironic you are basically encouraging little teams to spend more money by having more testing available to them". **ti**

“It could be quite significant in a year of new regulations that are totally removed from what we currently have”



ABOVE Red Bull's team principal is not a fan of the aero restrictions, but believes "the cream will always rise to the top"

**ABOVE & BELOW**

If the FIA had each team's data, it would make it easier to eliminate the harmful wake that makes following cars in close proximity so difficult

at another level of CFD competence.

"You get so much more understanding with CFD. However, the wind tunnel still has its place. We are now looking to map some of our 2022 concepts and it's not the best use of CFD with lots of discrete steps of ride height or steer, which is where a wind tunnel traditionally comes into its own. However, building and running a 60% scale F1 model has very significant infrastructure costs."

The concept of spec CFD is fascinating, but controversial. One aero expert we talked to pointed out that teams' attempts to circumnavigate the limits on compute-power had led them to investigate

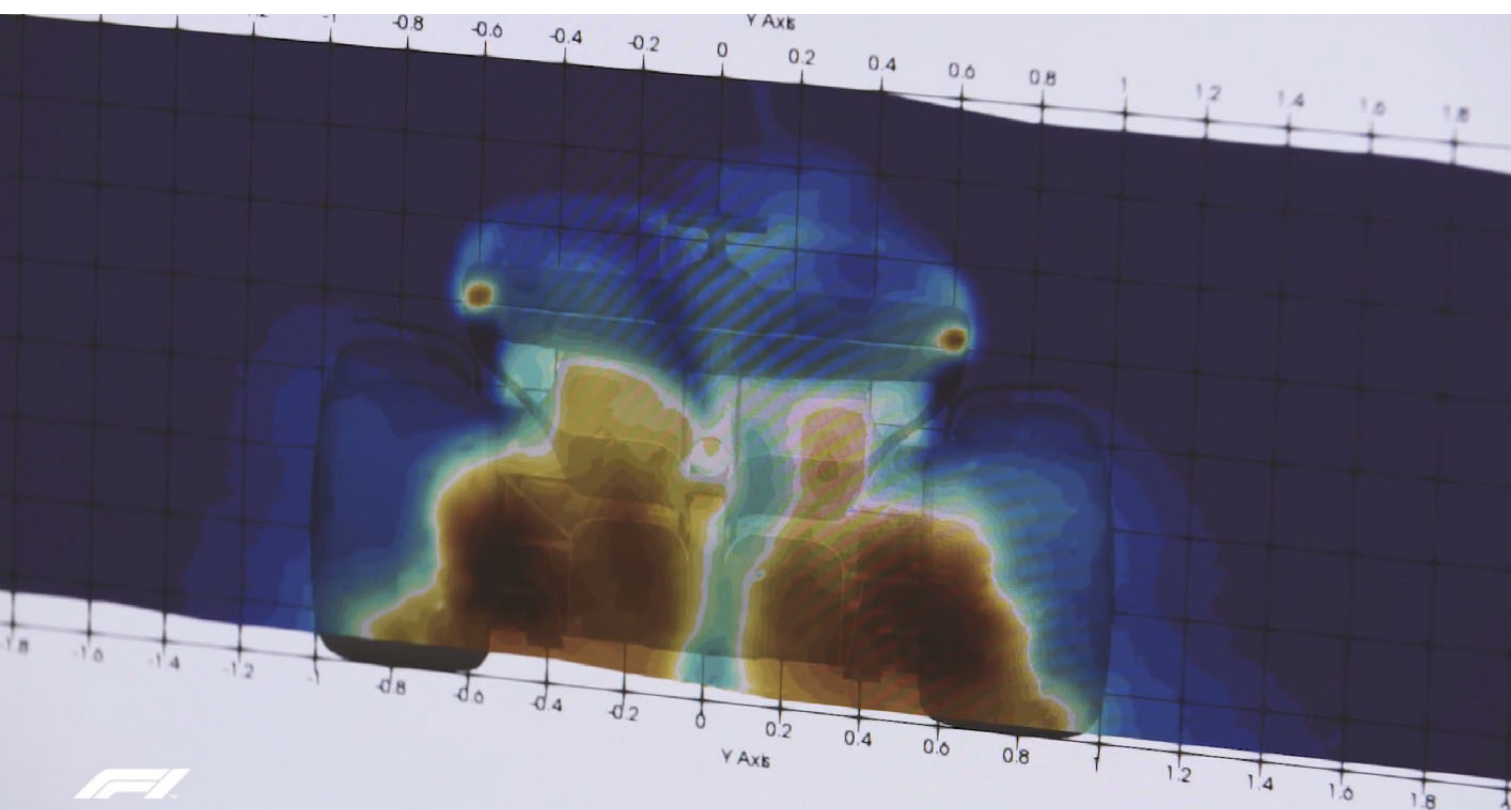
many different routes. Some, such as creating special computer chips optimised for 'teraflops' – when that was the measure used for policing – were ridiculous. Now, the measure used relates to the consumption of energy, which aligns more with real industry choices for computer chips. Other innovations, though, helped drive the development of game-changing solutions applicable to wider industry.

"Some teams invested in software that gave them accurate results for staggeringly little compute-power," says our source. "That's great for the future of all industries using CFD because it improves the code, which helps progress the science in the commercial world. Sure, those successes are in the minority and teams vote to help themselves not Formula 1, and certainly not the world of real work. But the direction of the current rules makes it less likely that teams will invest in improvements like CFD code."

"Besides, why are there limits on CFD computers but no limits on Driver-in-the-Loop simulators?"

Looking into the future, there are suggestions that the FIA could capture teams' data. That would not only enable more efficient policing of the regulations, but make it far easier to counter the disruptive wakes of the cars in order to frame regulations that allowed better racing.

"For me, the solution is on the way, slowly," concludes our source. "The FIA getting CAD of the cars will, in the long-term, allow them to assess the research done by FOM and assess the interference on the following car from each design. It will take another 10 years of pain, but will be possible." **RT**



EVERY SMALL ADVANTAGE COUNTS. AND THIS MIGHT JUST TURN OUT TO BE A BIG ADVANTAGE!

Could this collar, developed by Italian physicians, transform safety/driver performance in endurance events like Le Mans and the Dakar Rally? **Anthony Peacock** tries the prototype of the Neuron Guard

THE history of motorsport is littered with clashes between drivers, both on and off-track, which have formed part of its epic moments.

Nelson Piquet's pass on Eliseo Salazar at the 1982 German Grand Prix will always be remembered for the trackside fisticuffs between the pair after Salazar inexplicably blocked him at the Hockenheim chicane while being lapped and both went off.

Spa-Francorchamps, 1998: Michael Schumacher piled into the back of David Coulthard in the rain, leaving three wheels on his wagon and throwing a near-certain race victory into the bin. Despite the fact that this was mostly Schumacher's fault, he furiously hunted down Coulthard in the pit lane, determined to do some damage.

“A big synergy between what we saw in hospitals, and the scenario in races and rallies”

The late Colin McRae never forgot his British Touring Car Championship debut at Knockhill in 1992. It resulted in an on-track altercation that meant he had to hide in the Prodrive motorhome afterwards, to evade a pursuer who wanted to – quoting more or less directly – ‘rip off his head and do you-know-what down his neck’.

All of these incidents could be accurately described as “hot-headed”: the sort of thing that happens when your blood boils in the heat of competition. But behind these popular idioms lies a medical truth. And for the first time, it's being addressed thanks to a brand-new device from

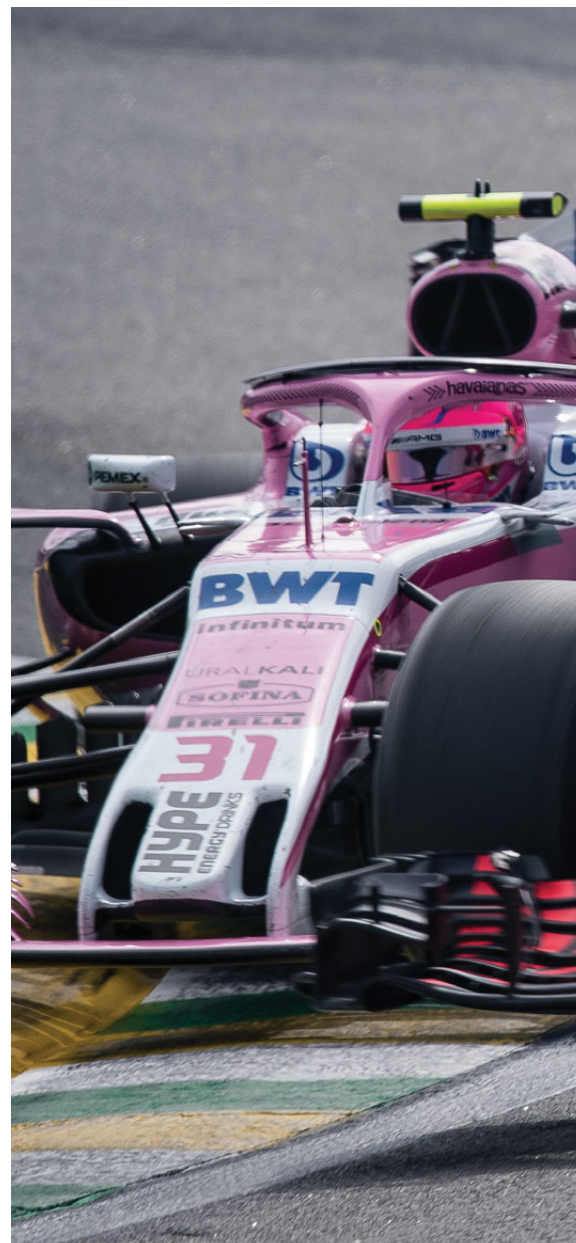
ABOVE RIGHT Mattia Vita, a 23-year-old former member of the Ferrari Driver Academy, has been testing the device in the simulator with promising results

Italy that's designed to improve both performance and safety.

Neuron Guard was born using some of the technology seen in intensive care units all over the world, when it was noted that cooling the blood flow to the brain resulted in patients recovering from brain injuries faster than usual.

This led its creators to note the link between a cooler blood flow to the brain and its effect on cognitive performance. In particular, how that performance tailed off when temperatures were above 24 degrees Centigrade.

The ramifications of that go far beyond motorsport. A comprehensive medical research programme has been carried out over the last 12 months at Cambridge



RIGHT On-track altercations that resulted in off-track scuffles, such as that between Max Verstappen and Esteban Ocon in Brazil, are part of racing's DNA



University Hospital in the United Kingdom. Its aim was to see to what extent the temperature of the human brain can be selectively adjusted, in order to help it work better.

It's well-known that the human body underperforms when it gets too hot, but with the brain being the part of the body that takes the most blood – around 15% to 20%, despite comprising only 2% of the average human body weight – the research proved that people did in fact perform more accurately, with sharper responses, when the blood to their brain was cooled. That cognitive performance improvement amounted to as much as 20%.

The people behind Neuron Guard are ►





Doctor Enrico Giuliani and Mary Franzese: two Italians who have known each other for seven years after meeting at the SeedLab accelerator programme in Milan – designed to grow start-up businesses – where Neuron Guard was founded.

With both sharing an interest in sports and entrepreneurship, they started talking about the potential for Neuron Guard as a result of studying the effect of heat stress on human performances in competitive sport: a shared interest. In the second half of 2019, they then agreed to work together to build a ground-breaking motorsport collar designed to keep drivers cool, stop them crashing, and make better decisions which should ultimately lead to them using their fists a bit less as well.

OVERWHELMED BY HEAT

“We realised at an early point that there was a big synergy between what we saw in hospitals, with brain-injured patients benefitting from cooler blood to get better more quickly, and the scenario that we saw in races and rallies,” says Giuliani. “In the case of rallying, drivers and co-drivers are regularly subjected to in-cockpit temperatures in excess of

70 degrees Centigrade, while wearing a balaclava, helmet and overalls. At those temperatures it can be really hard to make rational decisions and avoid becoming overwhelmed by heat, so we realised that – if our data proved our hypothesis – there was a big chance to improve both safety and performance by regulating the temperature of blood to the brain.”

The research, carried out both in Italy and England in the second half of 2019, underlined the benefits of the idea, but it was another thing entirely to turn it from a proven theory to a practical machine.



The evolutions are still ongoing right now, but the basic concept has already been defined.

Neuron Guard works thanks to a collar that wraps completely around the neck and contains several small active elements that pass a cooling effect into the body via the skin: a bit like wearing a neck scarf made of ice, but with no water or hydraulics involved. Instead, it works by using a thermoelectric effect to precisely regulate heat extraction.

The effect is to cool the blood flowing up through the carotid artery from the neck to the brain and ultimately the brain itself, with the aim of keeping it at a temperature where cognitive processes are less affected by heat stress.

The electrodes are powered by a control unit, currently the size of a first-generation mobile phone. But in the same way that mobile phones have slimmed down, by the time Neuron Guard gets to market – which should be in time for the 2021 season – the unit will be a lot smaller and lighter, around the size of a walkie talkie radio.

To use, the collar is simply plugged into the control unit via wires, and the effect is felt straight away. In a car, it's entirely



unobtrusive: taking up less space and weight than a full drinks bag, for example.

In closed cockpit cars, particularly during endurance events such as Le Mans and Dakar, it could make a real difference. The rule-makers in both disciplines have recognised the danger of heat build-up in the

cockpit to recreate the same level of heat likely to be encountered at a hot race in the European summer. The driver demonstrated a marked improvement on overall performance when using the device, reducing lap times by three-tenths of a second (3.3%) when Neuron Guard was used.

“It works by using a thermoelectric effect to precisely regulate heat extraction”

cockpit, leading them to mandate air conditioning. In the case of the Dakar Rally organisers, they were prompted to act by stories of drivers reaching the end of marathon stages whilst being unable to recollect the last few kilometres of the test.

Neuron Guard has conducted a preliminary indoor test with a race car simulator, where the driver was actively heated by a forced hot air flow into the

The patented system has already undergone a number of tests both on simulators and in real life, with promising feedback in real-world conditions.

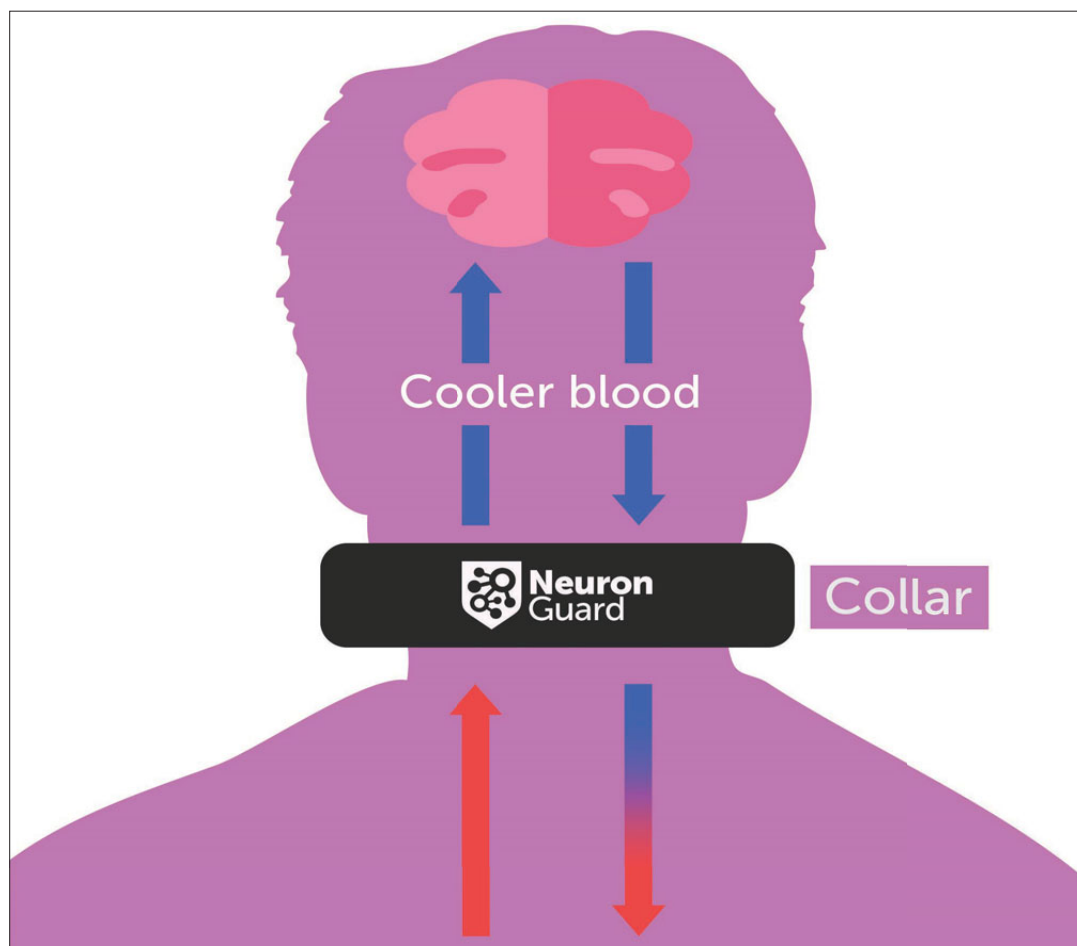
One driver in the unique situation of having tried both is Italy's Mattia Vita: a 23-year-old former member of the Ferrari Driver Academy who has now switched codes and is competing on the European Rally Championship. ►

ABOVE Vita's switch of codes from single-seaters to rallying has offered another dimension to the test programme

RIGHT Studies have shown a cooler blood flow to the brain has a positive effect on cognitive performance

ABOVE LEFT The problem of heat build-up in endurance events, such as sportscar racing, is an issue that has been on the rule-makers' radar for some time

LEFT Nelson Piquet's altercation with Eliseo Salazar at the 1982 German Grand Prix is the stuff of legend



Who are its creators?

A glimpse of the people behind the Neuron Guard

ENRICO GIULIANI (CEO) is a 38-year-old physician specialising in anaesthesiology and intensive care and is responsible for the development of the Neuron Guard device.

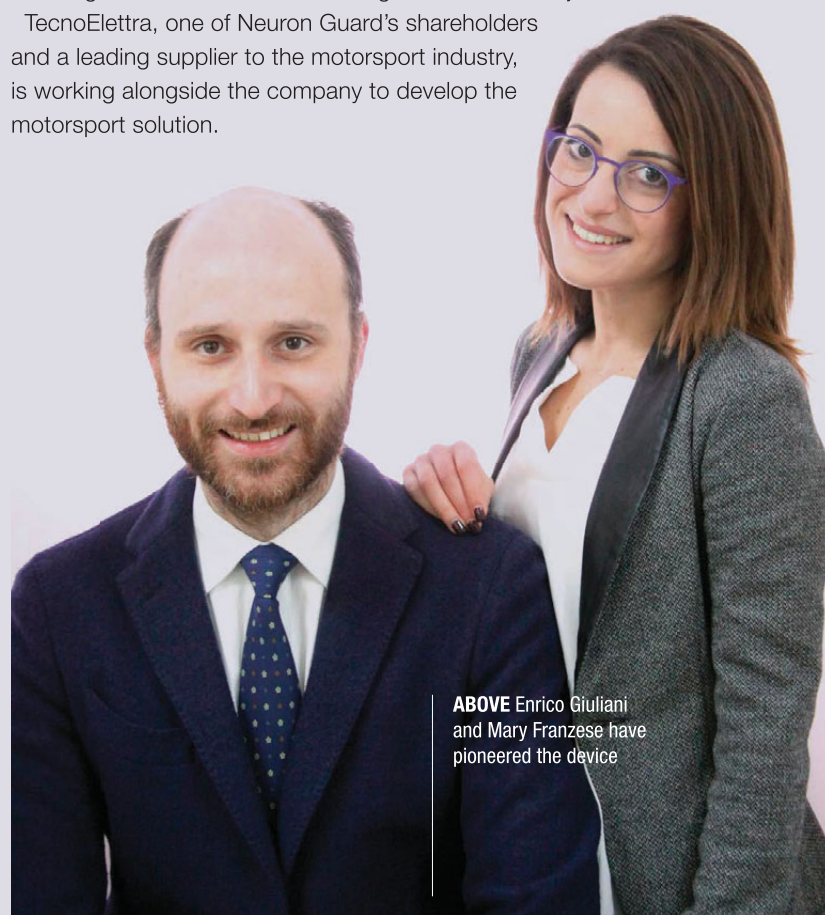
He was born in Mantua, studied in Modena and worked in hospitals in Italy and the USA. He got the idea for the device by observing current medical practices, having been interested in anaesthesiology and intensive care with a very technical interest for the inner workings of medical devices.

MARY FRANZESE (CMO), from Naples, has a master degree in entrepreneurship from the Bocconi Business School in Milan and is responsible for marketing and communication.

Her career began in 2011 as CEO of a company active in the healthcare field, supplying a wide range of services to rehabilitation centres in Naples, until meeting Giuliani in Milan in 2013, where they discovered their shared interest in developing an easy-to-use medical device to treat neurological emergencies. Together, they founded Neuron Guard back in 2013, with human trials commencing at Cambridge University Hospital shortly afterwards.

Their vision for Neuron Guard goes far beyond sport though. The company aims to place a Neuron Guard kit over a wide variety of public places, just like Automatic External Defibrillator (AED) machines are regularly deployed, to help bystanders immediately react in an emergency. Except this time, we're talking about neurological rather than cardiac emergencies: which are just as common.

TecnoElettra, one of Neuron Guard's shareholders and a leading supplier to the motorsport industry, is working alongside the company to develop the motorsport solution.



ABOVE Enrico Giuliani and Mary Franzese have pioneered the device



ABOVE Rally Raid events such as Dakar are acknowledged to be among the last true endurance tests left in motorsport. Could the Neuron Guard make a real difference in these situations?

He tried out Neuron Guard while using the TecnoElettra Formula 2 simulator in Italy to pound round about 100 laps of Monza. He's also tested it in his rally car, with a more comprehensive programme planned that was temporarily halted because of the COVID-19 pandemic.

"GENUINELY AMAZED"

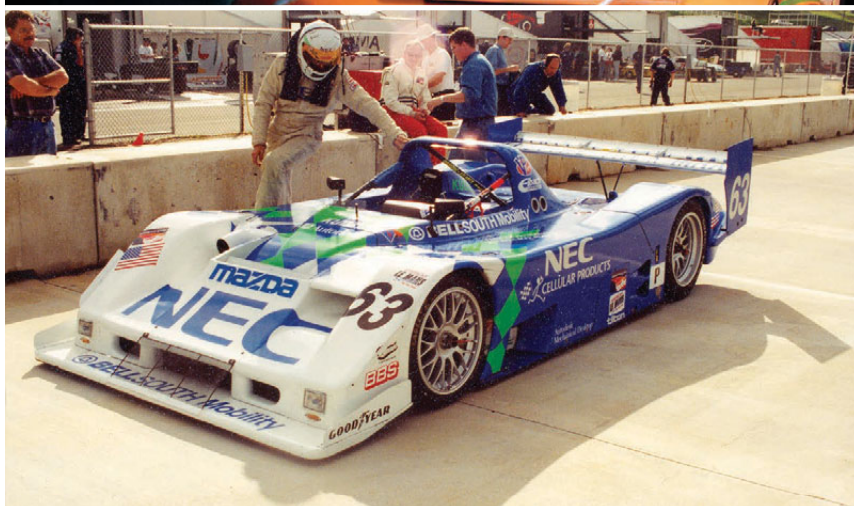
"It was really impressive, both in the simulator and in real life," concludes Vita. "I've never suffered too much with the heat – you never go that far in rallying if you do! – but I was genuinely amazed by how much I noticed not feeling hot, if you see what I mean: it was something that I had just taken for granted up until now. It's still obviously early days, but we did some back to back tests and the performance was definitely improved using the collar."

His optimism is shared by Franzese, who outlined a lot of the testing that had been done so far. "We've started to carry out both laboratory and physical testing, but unfortunately, COVID has



got in the way of both programmes slightly. Nonetheless, we're hoping to resume soon and we're still on track to launch the product to everyone by the end of the year. The next step in our testing programme is conducting a more extensive research on the cognitive effects of brain temperature management, and what we've seen so far makes us believe we can offer drivers a personal temperature management system, that can be easily used in a racecar."

Unusually for someone writing about new developments in motorsport, I actually had the chance to try out the prototype for myself: something that doesn't happen every day in the secretive world of motorsport start-ups. The effect is astonishing, if somewhat surprising. It feels like wearing a very chilly scarf, but you soon get used to that. As for how much it



improves performance, it's hard to tell for somebody who's definitely not an athlete just sitting down in a room, without exerting themselves. However, there is this feeling of greater lucidity, and being more aware of your surroundings. A sense of coolness and sharpness, a bit like breathing in oxygen.

From there, as a mere mortal, you have to imagine what it would feel like driving a competition car on the edge. One thing is for sure though: every small advantage counts. And this might just turn out to be a big advantage. **LI**

ABOVE & TOP Enrico Giuliani displays an early prototype of the collar (top). Like the first unwieldy HANS device worn by Jim Downing (above), further iterations of the Neuron Guard will be less bulky and therefore easier to wear

BELOW Staying cool in the heat of battle can be difficult if the battlefield is a desert





F1 ADJUSTS TO LIFE IN A BUBBLE

Formula 1 has often been accused of 'living in a bubble', but now it really needs to. **William Kimberley** and **Mark Skewis** examine how it is returning to racing in the midst of the pandemic

F1 launched its #WeRaceAsOne initiative on the eve of the new season. That we race at all, given the turbulence of the past few months, is near-miraculous.

"Our first race in Austria at the start of July is a big moment for our sport after nearly four months of no racing," acknowledges Chase Carey, Chairman and CEO of Formula 1. "While it is an important moment for the Formula 1 community, it is also a time to recognise the issues that are bigger than any one sport or country.

"The #WeRaceAsOne initiative is our way of saying thank you to the bravery and unity everyone around the world has shown during this unprecedented time. It will also be a platform for Formula 1 to come together and achieve results against the most important issues facing us as a sport and the world.

"That is why at our first race in Austria Formula 1 will stand united to say loud and clear that racism must end. We will show our full support in fighting inequality throughout the weekend and accelerate

ABOVE The world has changed profoundly since the teams last gathered in Melbourne. For 2020, Mercedes will race in an all-black base livery as a public pledge to improve the team's diversity and acknowledgement of the call to end racism

ABOVE LEFT & RIGHT F1 is aiming to create its own 'bubbles' in which it can keep personnel safe as it returns to the racetrack



Photos: Mercedes-AMG F1

our own efforts to make Formula 1 more diverse and inclusive. As a global sport we must represent the diversity and social concerns of our fans, but we also need to listen more and understand what needs to be done and get on with delivering."

Beyond the mere spectacle of support, the rainbow logos displayed on the cars, there is talk of 'added purpose and determination' to tackle the major issues faced not only by the sport, but also society. Accordingly, a foundation, with initial funding of \$1m, is being created to help finance internships and apprenticeships within Formula 1 for under-represented groups.

From the absence of fans, to the presence ►



of face masks, Formula 1 will look very different as the 'new normal' emerges. But there is a different *feel* to it too: the positivity, the awareness of a wider world beyond the paddock gates, all seems a far cry from F1's abortive – and much criticised – attempt to start the year back at Melbourne in March.

PREPARING FOR THE GREEN LIGHTS

Behind the scenes, a remarkable amount of work has gone into the logistics and protocols that have made F1's return to the racetrack possible.

While there has not been any racing to date this season, Pat Symonds, F1's Chief Technical Officer, admits: "When

we first shut down and went into this sort of lockdown, I was as busy as hell! I wrote a paper for Ross [Brawn] on ways we could save some money, then it was a huge amount of work going through teams, regulations and all the unintended consequences and so we were massively busy.

"We finished that work in early June and it went through the World Motor Sport Council to sign everything off, so I have now come down to a much more normal type of working environment and getting on with our future ideas.

"All the people who have been more on the operational side of things have been ramping up since April, preparing for the racing to begin and how we maintain

social distancing and so on. They're now as busy as hell as well. I don't envy them because it's a pretty tough task getting back to racing. However, we have severely limited the number of people that teams are allowed to bring to each race and so it would be wrong for us to bring people who are not fully operational."

A raft of measures has been put in place as F1 strives to create the protective "biosphere" in which its personnel can function safely.

The first is **regular testing**. Using private testing, any personnel attending a race will be tested for COVID-19 before travelling, and each must produce a negative result before they will be allowed to go to the event.



BELOW The Formula 1 season will get underway with back-to-back races at the Red Bull Ring in Austria

BELOW RIGHT The rainbow will be in evidence in Austria as F1 uses the occasion to thank health workers from around the world



There will be regular testing, conducted by private medical teams, during events, along with extra screening – including on arrival to the circuit – and all locally-based workers will also be tested before the event.

Most notable, perhaps, these will be **closed events**. Although some of the American series are now planning for a limited number of spectators to return, the initial run of European GPs are currently not expected to be open to spectators, guests or partners.

F1 hopes fans will be able to join events as soon as it is safe to do so, but in the meantime grandstands will be empty and the paddock much quieter than usual, with **only essential personnel** allowed in the confines of the circuit – 1,200 essential personnel in total compared to a usual range of 3,000 – 5,000.

There will be a significant reduction in the personnel travelling to races from all parties, including the teams, the FIA, suppliers and F1 itself. To help achieve this, some functions of a race weekend – such as parts of the television broadcast – will be carried out remotely. Additionally, those personnel on site will be required to isolate in their respective team units and not interact with others.

Isolated travel is another key measure. All personnel attending races – who will each have a negative test certificate following a test before departure – will travel in an isolated manner, with use of charter flights as much as possible and private transfers between venues, hotels and airports to ensure all event staff travel in a restricted ‘bubble’ to prevent any wider interaction with the non-tested public.

Social distancing measures will be put in place and enforced throughout the F1 paddock and the circuit as a whole at each event. Pre- and post-race

“COVID hasn’t changed the other problems of the world, it has just added a new one”

activities such as the national anthem, parc ferme, podiums and cool down rooms will be altered to ensure safe distances can be maintained, as will media obligations and interviews.

“There are aspects of operating at a Grand Prix that really preclude social distancing,” accepts Symonds. “Our fans need to understand that everyone won’t be two metres apart: you can’t envisage a pitstop where that happens, so we have to take even more precautions.

“It’s an incredibly complex operation that’s changing day by day as regulations and our understanding changes – but we want to ensure safety above everything: that is our critical remit.

“There are bubbles within bubbles – we are trying to keep that level of isolation without the social distancing that we all know is so effective.”

COUNTING THE COST

Formula 1, like the rest of the world, is having to re-evaluate many things that it once took for granted. “The ‘New Deal’ I propose for motorsport in the context of the COVID-19 pandemic means laying the foundations for the recovery and a sustainable future for Formula 1 and other disciplines,” says Jean Todt, President of the FIA.

“It includes new rules to reduce costs as well as initiatives to increase the popularity and accessibility of motorsport. Importantly, it shall also harness the positive contribution motor



sport brings to society, covering all sectors from health, safety, economy, environment, education, inclusion and diversity.”

Even F1, usually so resistant to change, has implemented a new reduced budget cap, delayed its new regulations, frozen more development, and approved its first ever ‘handicap’ system: the sliding scale of aerodynamic restrictions.

Symonds admits that he is concerned about the financial state of some of the teams. “This is why we are doing what we have been doing as for the majority of them, business has not been sustainable,” he says. “All the things that we felt needed doing are still there on the table. The fact that the budget cap is a much better thing than was proposed at the start of the year is really good.”

Talking about the aero sliding proposal, Symonds says that not many people have picked up on it outside the teams, and if they have, he questions whether they really understand the implications of it: “For many, many years going back to the time when I was at Renault, doing a lot of stuff with FIA president Max Mosley, who was always concerned that the business wasn’t viable, I said then that the only

way everything can be encompassed is by handicapping, and even then you have to be careful as you are dealing with very clever people who will manipulate the handicap, but it’s the only way you can put a blanket over everything. While there’s an argument that it’s a step too far and not the way Formula 1 should be, I didn’t disagree with it. Balance of Performance is pretty unpopular, certainly with the racers, but it has its good points. You can’t imagine Bentley coming back to racing again without the Balance of Performance and things like that, so this is

a very lightweight step and is a long way from being a BoP.”

Turning to aerodynamic research and CFD in particular, Symonds feels that introducing spec software was probably a step too far, but that’s not necessarily the case with hardware. “I do see spec hardware providing there’s long enough notice,” he predicts. “At F1 we do all our high performance computing remotely, so effectively cloud-based, and it is very effective. I can see a time, and this is one of our long-term ambitions, that we move people away from wind tunnels. ►



ABOVE No, not a new boy band: Red Bull Racing gets ready for the new normal during a filming day at Silverstone ahead of the season-opener

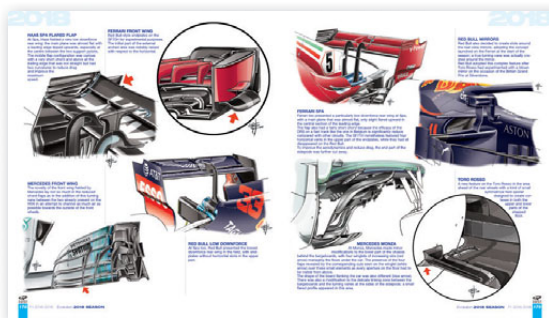
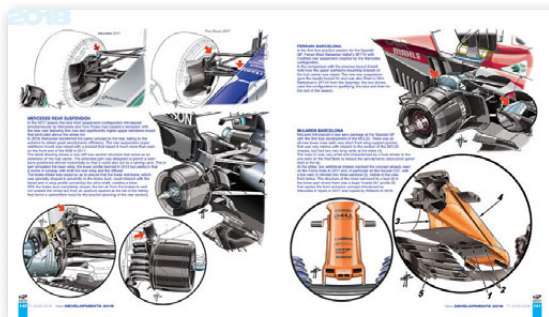
LEFT Regular testing for COVID-19 will be undertaken

Giorgio Piola

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"I think cloud computing is probably the first port of call. If you can do a deal with someone where all the Formula 1 teams are using their data centres to do the computation, it could be very cost-effective. At the moment teams are using reasonable amounts of money on running CFD facilities; they're not cheap and they consume a huge amount of electricity. While the hardware has a life of about three years and needs updating, it is less expensive than wind tunnels, which I think will disappear over time, especially as we reduce the number of runs the teams can do."

BREAKING THE REGULATIONS

Like WEC, NASCAR and IndyCar, F1's Brave New World must wait a while longer. The eagerly-awaited new car for 2021 has now become the eagerly-awaited new car for 2022.

"Delaying the introduction of the new car was one of my first recommendations to Ross [Brawn] to save some money," says Symonds. "The fundamentals of what we are doing with the 2022 car are really no different to what we were doing with the '21 car. What it has allowed us to do is to spend longer on it to make a better product."

Quite a bit of work has been spent on modelling the car, especially the wake. "At the moment we are wearing a team hat and trying to break the regulations to assess how to get maximum performance out of this car, and in doing so what it's doing to its wake," he notes. "This will not be of interest to the teams, but if we try and get maximum

ABOVE Social distancing won't be possible in all scenarios

RIGHT Red Bull's factory, like those of its rivals, had been repurposed to aid in the fight against COVID-19

performance, let's see what happens to the wake then we can decide whether there's more to be done.

"We haven't released some of the prescribed design components and just by playing with them, we have improved the car in many respects. It's not a bad thing for us in that way, but as I have said before, COVID hasn't changed the other problems of the world, it has just added a new one. All the other things, such as sustainability or the fact that we want closer racing, haven't gone away. If our ambitions were correct prior to Christmas, they still are correct now and we need to work."

REVERSE GRIDS

One of the problems that hasn't gone away is that of the teams voting for what's best for themselves, rather than what might be right for the sport.

NASCAR's return to the racetrack, like that of IndyCar, presented the chance to re-evaluate well-established formats. Both knew that the hungry eyes of sports-starved fans, frustrated by weeks of lockdown, would be upon them. Time for a fresh start?

The US stock car series skipped practice and qualifying for its first race, drawing lots for the grid.

“Our challenge has been to make sure that quarter-year of development could get off the drawing boards and onto the car”

Its single-seater counterpart, meanwhile, opted for a one-day show.

With F1 running back-to-back races at the same circuit on consecutive weekends, concerns were raised about the danger of dishing up the same spectacle – or, in the worst-case scenario, *lack of spectacle* – two weeks running. Reverse grid qualifying races were therefore proposed for the second event. Now, surely, was the ideal opportunity for F1 to experiment?

The idea was blocked by Mercedes, which suggested the measure was heavy-handed, like a “baseball bat” approach. Its veto, in the face of the other teams’ consent, probably left Ross Brawn, F1’s MD of Motorsports, wishing that he had the baseball bat to hand.

“We’re in very unusual circumstances because we have two or maybe three occasions where we’re going to have a race on consecutive weekends at the same track,” Brawn told *Racer*.

“We can’t reverse the tracks. Lots of people have asked why we can’t do that, and (it’s because of) the safety standards and the way the tracks are configured. The barriers are designed so that you

glance off them one way if you hit them; going the other way you do yourself a lot of damage. So it’s just not feasible, unfortunately, to reverse the tracks.

“We may get lucky. We may find we go to Austria and there is a chance of some different weather. It’s the first few races of the season and it could be pretty mixed up and we may be fortunate.

“Interestingly, for me, the people who’ve been the strongest in Austria the last couple of years – Red Bull – were the biggest supporters of the (reverse grid) idea. They were prepared to do it. So it’s a little frustrating, but I think that is part of the aspects of Formula 1 which in the future need to change. I think unanimous decisions by the competitors have always been difficult.”

Brawn accepts that teams need a voice, for he has spent long enough himself on that side of the fence. At the same time, he feels a majority backing should be sufficient for changes to be made: “I think we need the opinion of the competitors – we need to listen and we need to have the majority of competitors in favour of these ideas,” he said. “And I think if you can’t convince

the majority, then you’re failing that. If you get one or maybe two people stopping something which the vast majority want and F1 want and the FIA want, that’s frustrating.”

The FIA is confident with the F1 calendar it has released up to the race at Monza in September, but beyond that remains fluid. “I have just read that the number of recorded COVID-19 infections is still climbing in many places, with both North and South America increasing rapidly, so we are chasing our tail a bit,” stresses Symonds.

“It’s really hard because you say the US GP at the end of October will surely be okay by then, but you don’t know how it’s going to work there. We’ve got countries where they’re not prepared to lockdown in the way that some of the European countries have done and it’s hard to model it.

“We know that where we had hoped to go after that are no longer available to us, such as Singapore, so we are investigating having more races in Europe. That isn’t a problem, as there are places we can go to and places we can return to, so it’s a very dynamic situation.” ►



Red Bull

Customer car debate reignited

Mark Skewis says racing's not the only thing that's returned

AS reigning World Champion Lewis Hamilton ruefully reflected at Melbourne's aborted season-opener, at which F1 appeared to be burying its head in the sand as the Coronavirus pandemic took hold, "cash is king". As F1 roars back into life this month, rarely have finances been as high on the agenda as in the post-COVID-19 struggles.

Two of the sport's grandee teams, Williams and McLaren, are both reported to be urgently seeking investment – in spite of the fact that each spawned divisions leveraging their F1 developments in other sectors. Sky News reported on 24 June that it had learnt that McLaren is in detailed negotiations to borrow more than £150m from the National Bank of Bahrain. However, sources said that an agreement between McLaren and the Bahraini lender remained far from certain.

F1 used the break to introduce a raft of measures: a lower budget cap; a sliding scale aero 'handicap' system; a delay to its new car; and an ever-increasing list of frozen components. Nevertheless, everyone remains jittery about the prospect of keeping the grid full.

Red Bull team principal Christian Horner argues that the figure of the cost cap actually misses the point. "F1 teams will always spend whatever budget they have available to them. Plus an extra 10 per cent," he says. "It is impossible to compare the spending of Ferrari to Haas, of Mercedes to Racing Point or even from Red Bull to AlphaTauri. They are all completely different structures and business models.

"I believe the solution should be looking at what drives those costs up in the first place and that is the R&D cost of building and developing cars in the hope of being competitive.

"I fully support the need to reduce costs and ensure that all 10 teams remain in the sport, but there are many ways to accomplish that goal and they

are not all just about lowering the cost cap. If the main target of a cost cap is about being competitive and helping the smaller teams, especially as we come through the current crisis, then I would be fully open to selling our cars at the final race of the season in Abu Dhabi."

The scab at which Horner picks is an old one. The customer car argument is one that is perennially raised and discarded – or worked around with sleight of hand! But he urges people to think again.

"Some people say that customer cars are against F1's DNA to design and build your own car," he acknowledges in a column for Red Bull TV. "Well times have changed and we need to find the best way to make the smaller teams competitive and survive the current crisis. This approach works well in MotoGP and it could even attract more teams to the grid, which we would all welcome.

"Teams spend fortunes over winter copying others; why not just give them the opportunity to buy last year's car?

"It would make far more sense for a team to be competitive, rather than spending money developing something if the funds are not there to do so.

As the business model of the smaller teams evolves and they become more competitive with customer cars, they can bring in increased revenue and then look to build their own cars again.

"I truly believe the customer car solution could help in the short term and should be a serious consideration. There has certainly been some opportunism by some teams during the current crisis, but I believe we need to look at all options rather than making a knee-jerk reaction that could see many jobs lost.

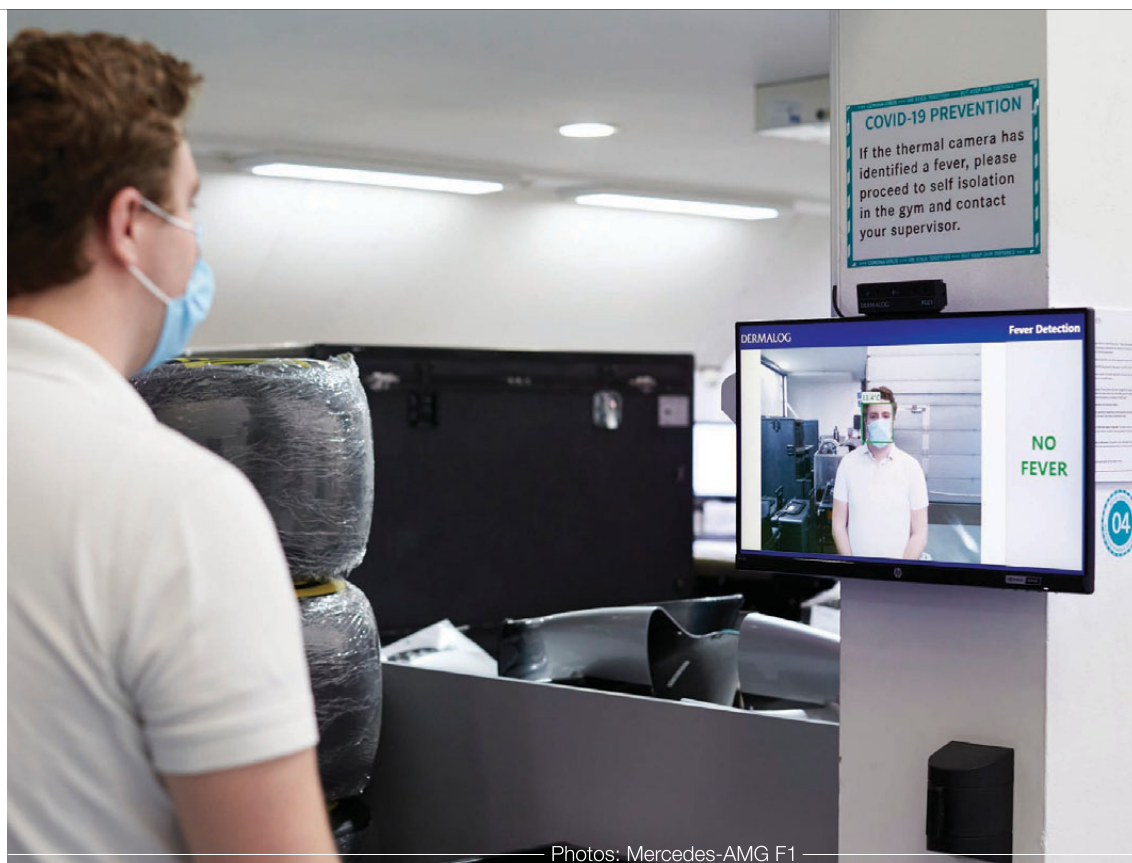
"We should be less obsessed about the cap and more focused on making the sport competitive." **RT**

RIGHT Could Red Bull's RB16 fall into customer hands?

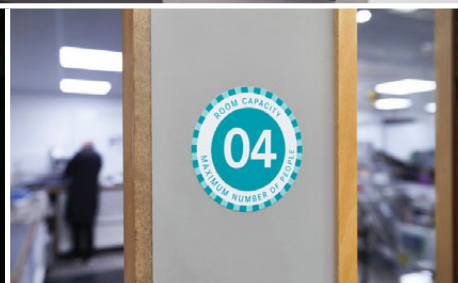


RIGHT Horner argues that MotoGP successfully uses the customer model

BELOW & RIGHT Both Mercedes F1 Technology Centres in Brackley and Brixworth went through a social-distancing makeover before the end of shutdown



Photos: Mercedes-AMG F1



WHAT SHOULD WE EXPECT?

As the teams emerged from lockdown, there was a sudden flurry of testing as everyone scrambled to acquaint personnel with the new protocols put in place to ensure safety.

"Being able to run through the new procedures and protocols away from the pressure of the race weekend, to work out all the pinch points so that we can get them right in Austria, when it really counts, was an invaluable experience that yielded plenty of learnings – from adopting working in face masks and other personal protective equipment to reassessing the garage layout," observes James Allison, Technical Director at Mercedes-AMG F1. "There are a lot of considerations that we as a team, and indeed as an industry, have had to bring to bear so that we can race in this new – and I hope not too long-lasting – world of having to deal with COVID-19."

The cars might not have raced yet

this year but, as Allison points out, their performance will have already moved on.

"We have been utterly paranoid to use the few weeks we had to make sure that the interruption didn't throw us off our normal balance and poise and that we could get everything back up to the ramming speed that we normally have at the end of winter testing and prior to the start of a normal season," he says.

"We haven't done a single race, but quite a lot of time has passed since we launched this car. The launch car was frozen back around Christmas – owing to the lead time required for manufacturing and testing various components – meaning the team had already developed the car for some three months before the shutdown started. In other words, at the time the car was going to hit the track in Melbourne, we had already found a bit of extra performance in the wind tunnel and in our simulations. So we've got quite a lot of ideas on how to make the car

quicker and a lot of those were already in train, in process, through the design office before we were forced to shut down. Our challenge has been to make sure that quarter-year of development could get off the drawing boards and onto the car as swiftly as possible."

NASCAR blazed the trail, becoming the first series to return to the circuits. So what did we learn from its experience? The drivers looked like bank robbers in their facemasks, and the victory celebrations were awkward, but one leading racer confessed that he felt safer at the racetrack than he did when he went to the grocery store.

The atmosphere at the circuits was flat without the fans, but neither the drivers themselves, cocooned in their cars, nor the TV viewers felt it detracted too much from the show.

If the F1 drivers in Austria defend their position half as ferociously as their teams do off the track, then the on-track action will be as fierce as ever. **RT**

THE NEXT BIG THING?

Chris Pickering examines the challenges faced by Hyundai, one of the pioneers committed to the world's first multi-brand electric Touring Car series

YOU'D have to be a pretty harsh critic to deny that electric racing has well and truly arrived since the second generation of Formula E made its debut. But perhaps there is an argument that the single-seater series – with its improvised circuits and strong focus on energy management – still lacks a degree of drama. For those who want to see electric cars trading paintwork, flat out around established circuits, the answer may well lie with the new Pure ETCR series.

Developed by the same organisation that masterminded the successful TCR format – now embraced by the World Touring Car Championship among others – the ETCR technical regulations allow manufacturers to produce their own electric touring car, based around a shared kit of parts for the electric powertrain. Hyundai was one of the first manufacturers to commit to the series with the Veloster N ETCR, which has since completed an extensive test programme. It's now ready to race – subject to a revised calendar being released for the Pure ETCR series, which was due to kick off with a time trial at the postponed Goodwood Festival of Speed.

The regular format will blend circuit racing with a hint of rallycross. Events will start with a live draw, where the drivers will be divided into two heats, with team-mates deliberately kept apart in the first heat. They will then be put into a one-lap time trial to decide their grid position in the finals. Each of the

heats is expected to cover around 8 to 10 km (5 to 6 miles), while the finals will cover 12 to 15 km (7 to 9 miles).

If that all sounds a bit complicated, the key message is that it should be high-intensity racing with no quarter between the competitors. "Everyone wants to have races where the capacity of the battery is not a limiting factor," comments Hyundai Motorsport team principal Andrea Adamo. "We want drivers to fight each other right to the flag, without having to keep anything in hand. That's important for demonstrating that electric vehicles are real touring cars with the excitement that we're used to seeing."

The 48-year-old Italian joined Hyundai Motorsport in 2015. Working from the company's facility at Alzenau, near Frankfurt, he is best known for heading the World Rally Championship effort but initially ran the customer racing department, before becoming team principal in January last year. Prior to stepping into management, ►

ABOVE The Veloster N ETCR is Hyundai's first-ever electric racecar



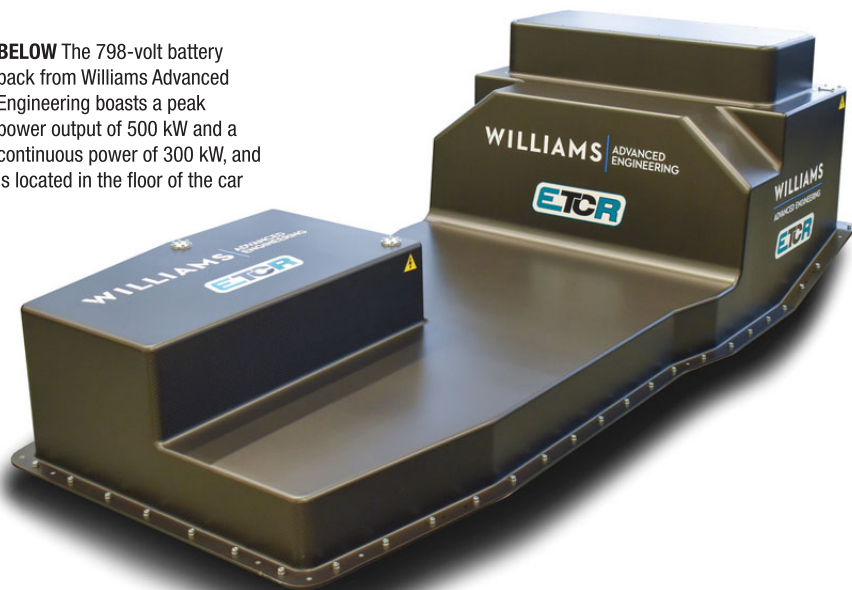


he held engineering positions in the DTM, the Italian touring car championship and the World Touring Car Championship (WTCC). It's fair to say he knows a thing or two about touring cars.

So how do you approach the challenge of building a whole new type of racing car? "No part of this project was easy," he confesses. "It's a blank sheet of paper, but far more so than you face when you normally develop a car. Usually you can get an idea what the others have done – even with a brand-new set of technical regulations you'd have some points of reference, but here it's totally new."

Even once the series kicks off, he predicts that the first year will be a very steep learning curve: "We have been very

BELOW The 798-volt battery pack from Williams Advanced Engineering boasts a peak power output of 500 kW and a continuous power of 300 kW, and is located in the floor of the car



ABOVE Adamo insists that the production model's front-wheel drive origin will not be an issue for a racecar that must run in rear-wheel drive configuration

conservative, because it would be stupid to push too far into the unknown. Instead, we've tried to optimise the package as best we can with a common-sense approach."

That package all starts with what's referred to as the e-kit. This is comprised of a 62 kWh battery pack and a vehicle control unit (VCU) that both come from Williams Advanced Engineering, DC/DC Converters from BrightLoop and a pair of inverter, motor and gearbox (IMG) units from Magelec Propulsion. There are a handful of other spec parts, including the cooling system and the tyres (the latter supplied exclusively by Goodyear), but the majority of the design is left to the manufacturers.



ABOVE The rules allow sufficient modifications for there to be almost no carryover from the Veloster N TCR or the closely-related i30 N TCR

REAR-WHEEL DRIVE

An unusual feature of the ETCR format is that all cars will be rear-wheel drive, with one IMG unit on each side of the rear axle. That still applies if the production model is front-wheel drive – as is the case with the Veloster road car and the combustion-powered Veloster N TCR racer.

There is expected to be at least one car in the series based on a rear-wheel drive model – the Alfa Romeo Giulia ETCR developed

“Having cars that made lots of noise and pollution used to be normal, but now it's not. We have to adapt”

by the independent Romeo Ferraris team – but Adamo doesn't see the Hyundai's front-wheel drive origins as an issue. "There are differences [in starting with a front-wheel drive model], but the rules allow us to carry out enough modifications to create the car that we want," he notes.

This also means that there's virtually no physical carryover from the Veloster N TCR or the closely-related i30 N TCR. Like those cars, however, the ETCR machine starts with a production shell. The first thing that's done is to cut out the floor to make way for the battery. This is effectively a flat slab (albeit with lumps at either end for the electronics) that sits as low as possible to offset its considerable weight.

"We're dealing with a starting point that was designed for a very different application," comments Adamo. "The floor needs to be cut out almost completely to fit the battery, which can affect many things. You need to make sure you maintain the integrity of the structure, but it also means that the seat position is raised, so you need to make sure that there's still enough room for taller drivers. It raises a lot of questions that wouldn't normally be an issue."

The battery operates at 798 volts – comparable to state of the art road-going batteries, such as those found in the Porsche Taycan. It's capable of producing a peak power of 500 kW and 300 kW of continuous power. Charging (from 10 per cent to 90 per cent) ▶

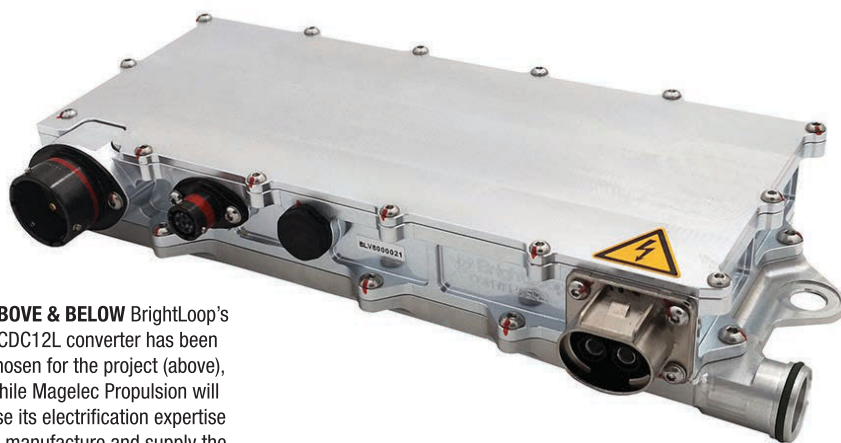


is said to take less than an hour, while the series plans to use low-emissions hydrogen generators to provide mobile charging.

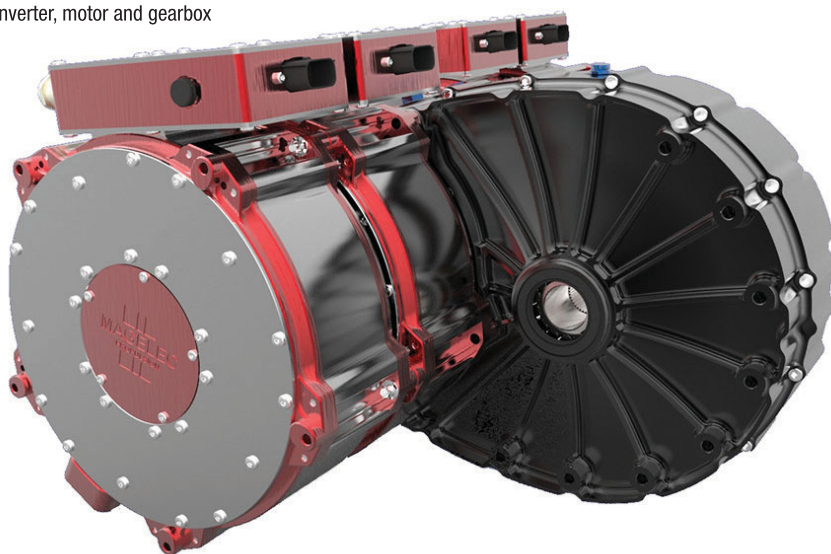
Williams Advanced Engineering developed the battery from start-to-finish in just seven months, with testing on prototype cells and modules beginning after just two months. Extensive FEA analysis was used to ensure that the composite enclosure would be able to survive a 50G crash load, as well as providing the required electrical isolation. Meanwhile, CFD analysis was performed at both cell and pack level to optimise cooling and weight efficiency.

Apart from the floor, pretty much the entire production shell is retained. The roll cage is a bespoke design, which is somewhat beefed up in comparison to a traditional touring car to cope with the ETCR machine's circa 1,600 kg mass. At the front, the suspension is loosely based on the MacPherson strut design employed on the existing TCR cars (albeit modified in the absence of driveshafts). The rear, however, uses an all-new double wishbone design, fabricated to accommodate the IMG units.

With one motor on either side of the



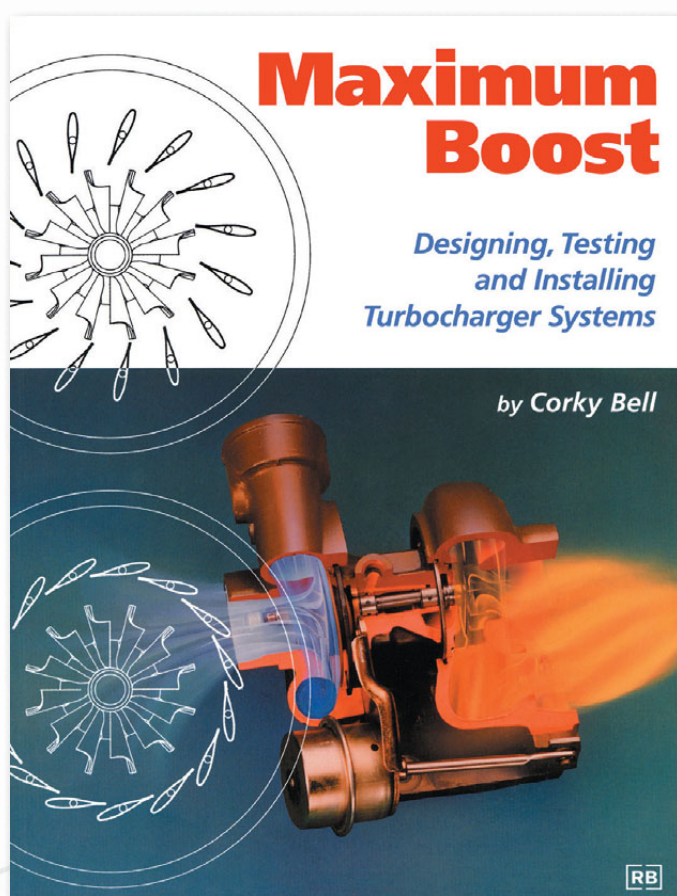
ABOVE & BELOW BrightLoop's DCDC12L converter has been chosen for the project (above), while Magelec Propulsion will use its electrification expertise to manufacture and supply the inverter, motor and gearbox



ABOVE The project is expected to lay the foundations for electric racing to become one of the pillars of a company intent on the development of high-performance electric cars

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rear axle, torque vectoring becomes a prerequisite. How far the teams will be allowed to push the development of this concept remains to be seen – discussions are still ongoing with championship organisers WSC – but there will certainly be some scope to explore this possibility. In its current form, the underlying software in the VCU will be the same for all teams, with a certain amount of freedom to vary the calibration parameters.

Even as it stands, there will be more than enough scope for the manufacturers to engineer a competitive advantage for their cars, Adamo believes. “The suspension and aero will obviously be very important to get right,” he comments. “Beyond that, you have things like the cooling package, which could play a very significant role in the performance if it prevents your car from de-rating due to battery temperature.”

LEARNING CURVE

The coronavirus situation may have put the championship on hold, but Hyundai Motorsport has been testing the car since September 2019, starting with a prototype powertrain developed by Croatian hypercar manufacturer Rimac (now replaced by Williams).

“We’re lucky that we’ve been able to do a lot of testing with the prototype using the original e-kit,” comments Adamo. “That’s given us plenty of



“It would be stupid to push too far into the unknown”



ABOVE A rallycross-style format will make for short, sharp races. In addition to a ‘push-to-pass’ facility, drivers will have a ‘fightback’ mode – an extra, smaller, power boost – to give the overtaken rival an opportunity to regain the initiative

LEFT Tyres are supplied exclusively by Goodyear



experience about managing an electric car. I'm not worrying too much about 2021, because that will be a learning curve and we have to train our people to work on these things."

In terms of dynamics, the ETCR machine is much like setting up any other touring car, he says, with the exception that the masses involved are slightly higher. Not surprisingly, it's the powertrain and the associated logistics where things get complicated: "The testing of a car like this requires a totally different approach. You can't just fill the car with fuel, change the springs and go back out. Sooner or later you're going to have to charge the battery. We plan a series of test slots, followed by a one-hour recharging break when we can check the data before we go out again. It means you really have to think about how you manage your time at the circuit."

Safety is also a critical factor, he points out: "You can never forget that you're dealing with a battery and a lot of high voltage electronics, so the people all have to be properly trained. You also find that

the skillsets are a bit different – we now have more software engineers and fewer mechanical engineers."

Adamo is understandably coy on exactly how long the Veloster N ETCR's battery will allow it to race. Reports from the car's launch at last year's Frankfurt Motor Show suggest a range of around 40 km (25 miles) at racing speeds, but the exact figure will depend on the circuits. WSC has yet to confirm which layouts will be used, but the venues on the original (pre-lockdown) calendar included the Salzburgring in Austria, Inje Speedium in South Korea and a support event at next year's Daytona 24 Hours. All of these circuits can be run in reduced length configurations, but they are recognised tracks that should help to boost the image of 'real' electric racing.

For the first year, the Veloster N ETCR will be run solely by Hyundai Motorsport's works team. Thereafter, the plan is to sell customer cars. These will be subject to a cost cap, which series organiser WSC has yet to announce, but it's likely to be higher than the €130,000

cap in place for combustion-engined TCR cars (and substantially lower than the €340,000 being introduced for the third generation Formula E cars).

Concerns have been raised by some about the potential for costs to escalate in ETCR. At the official launch of the series, Eurosport Events chief François Ribeiro warned that budgets were likely to match those of the TC1 formula that the WTCC abandoned at the end of 2018 to reduce costs. Adamo has also voiced his concerns. In a recent interview with the *Touring Car Times* he commented: "We have to be realistic and we know that the economy will be seriously affected [in the wake of the coronavirus]. If we approach the future as we have approached things up until now, we will kill the series because no-one will have the money in 2021 and I guess in 2022 to run the series the way we want to run it currently. We need to find a cheaper way of doing it. That might mean shrinking the calendar, changing the regulations a bit so that it's more cost-effective."

CHANGE OF MINDSET

Despite this note of caution, Adamo remains enthusiastic about the challenge ahead. "If you keep doing the same things all your life I think there is a certain point where you start to get old even if you are young," he says. "The challenge to manage this project is something very exciting and very new. You have to be prepared to face new things – I really think that the people who say 'motorsport has to be noisy' need to look at how other things have changed. Not so long ago you used to see people smoking in restaurants and drinking alcohol in talk shows on TV; now if you do that they put you in jail. Having cars that made lots of noise and pollution used to be normal, but now it's not. We have to adapt."

So, much like the rest of the world, motorsport finds itself facing the new normal. This is likely to include a continued shift towards electrification, not least as potential sponsors find it harder and harder to invest in traditional forms of motorsport, which aren't necessarily perceived as sufficiently green. If ETCR can satisfy our craving for high-adrenaline thrills it might just prove to be The Next Big Thing. **TT**

A DAY IN THE *new* LIFE OF INDYCAR

Packing everything into a one-day show ensured that the Aeroscreen's debut wasn't the only topic of conversation as IndyCar returned to the racetrack. Tino Belli, IndyCar's Director of Aerodynamic Development, gives **William Kimberley** a glimpse of life behind the scenes

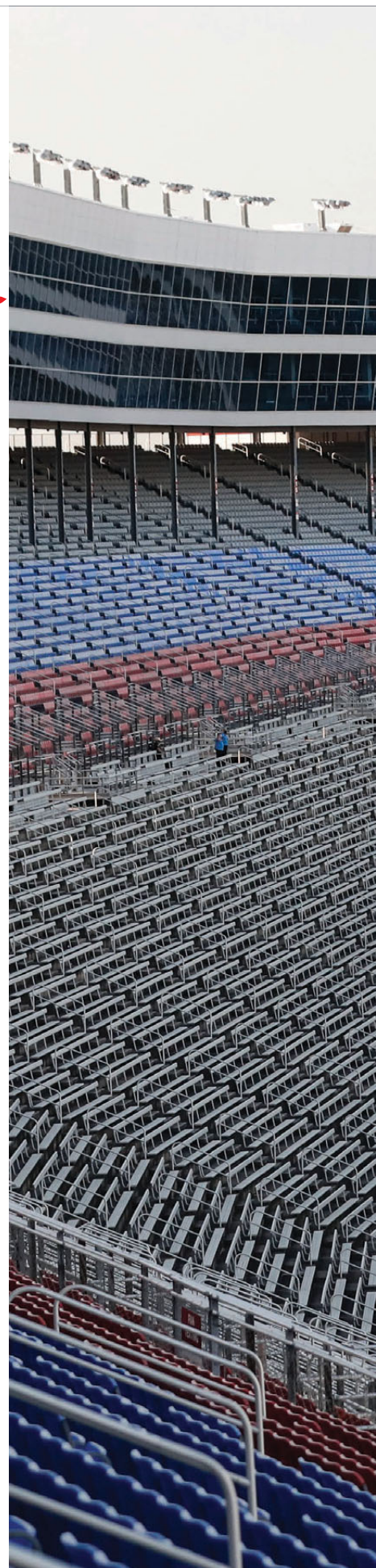
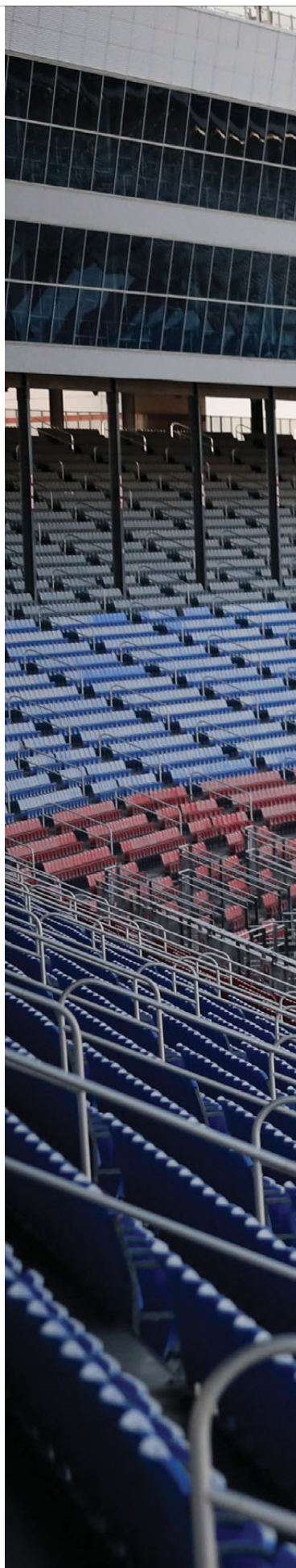
THE track at Texas for the first race of the season, following the lockdown due to the virus pandemic, was a scene of massive activity on race day. Even though there were not any fans, there were still something like 900 people at the circuit, all of whom had to be managed, but the event was considered a great success.

Exceptional times call for exceptional measures. Where Formula 1's attempts to change its format were frustrated by one of its heavy-hitters exercising its right of veto, IndyCar, like NASCAR, altered its format for its return to racing.

"We did it all in one day," says Tino Belli, IndyCar's Director of Aerodynamic Development. "The trucks arrived the day before to park, but they weren't allowed to unload while the mechanics weren't allowed in until the morning of the event.

"We all started to fly in at 5.00 am, and went straight to the track where we were screened before being allowed in. We went all the way through, tech, practice, qualifying, we impounded the cars after qualifying for the race, raced the 200 laps ►

RIGHT IndyCar roared back into life at Texas Motor Speedway with a marathon one-day format. No fans for now, but limited numbers will be allowed in at Iowa later this month





Photos: IndyCar

– down from 248 in 2019 – then flew out that night. It was a complete one-day event, so there are challenges in that scenario, but the main issue was the heat. We had a number of the mechanics and our tech guys suffering from heat exhaustion, which was compounded by the fatigue from starting early, otherwise it went very well.”

Just as some of NASCAR’s drivers reckoned the condensed format might actually offer the way ahead for certain events, IndyCar’s racers were receptive to the changes.

“The one-day show is actually interesting in many ways,” suggested Simon Pagenaud: “I thought it was very interesting because you had to be very decisive on your decisions. Obviously, after the first session, we kind of had to decide the race setup right away because the car was going to go to impound after qualifying. That’s a split decision you make in a very short amount of time.”

“Normally we would race with other series but at Texas, because we were there on our own, we were able to spread all the cars out in the available garages,” reports

“We tried to keep people coming from different parts of the US in their own bubble”

Belli. “Mechanics had to wear masks at all times and keep their distance and we didn’t let teams intermingle. We even kept Honda and Chevrolet apart from one another. We tried to keep people coming from different parts of the US in their own bubble as much as we could.”

UNWANTED GIFT FROM NASCAR

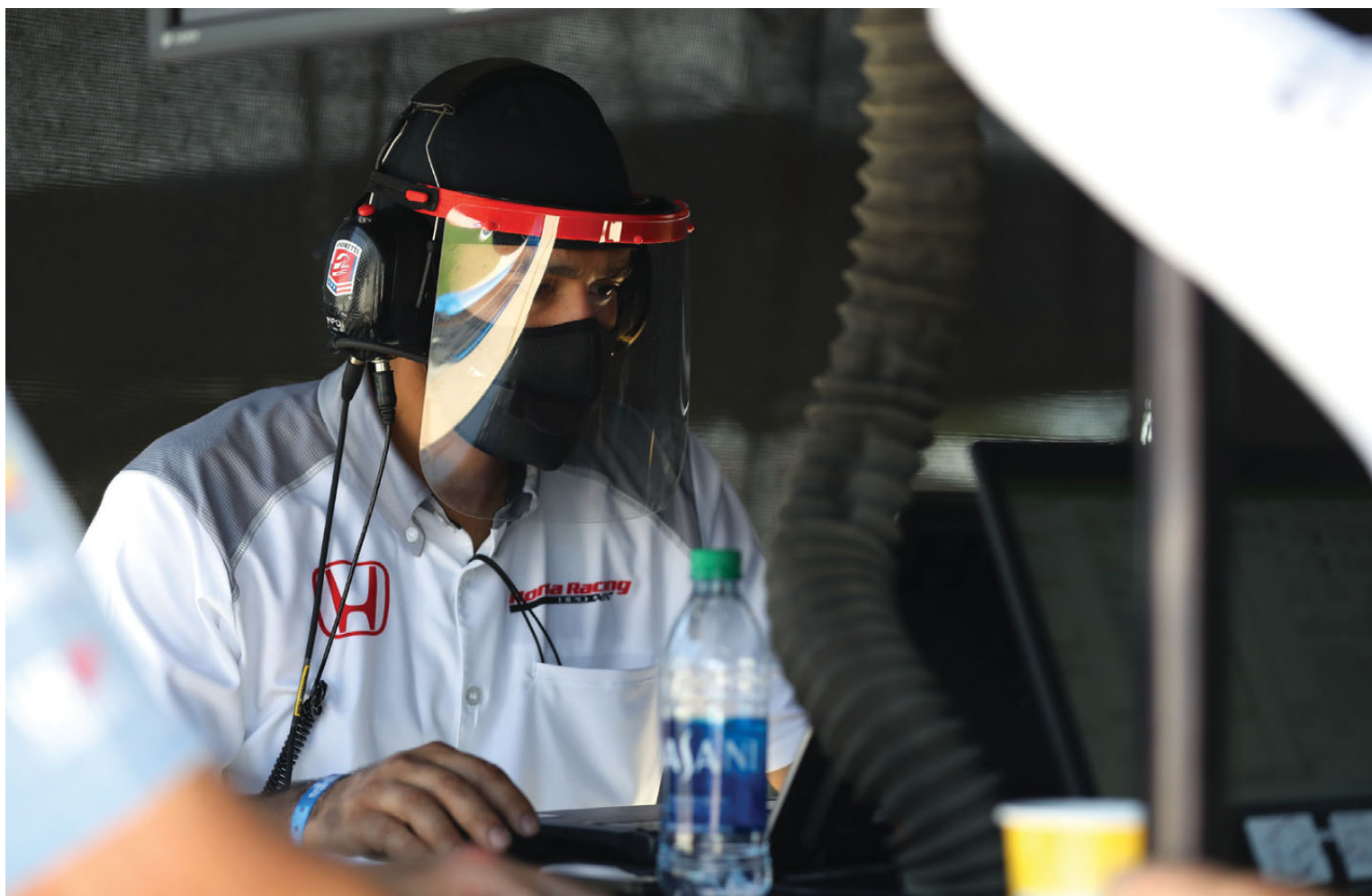
One of the unexpected problems encountered was the track surface, which caused many drivers to spin in practice, qualifying and the race after getting into the higher lane. The problem was that it had been coated with PJ1

traction compound, a custom-formulated synthetic resin typically black in colour, that increases the traction of a car’s tyres. It had been coated for the first time at the end of 2019, before the track’s NASCAR second annual weekend in November.

“Firestone measured the MU of the track and I think it’s fair to say we lost approximately 15% grip when on that line. It’s supposedly better for NASCAR but we now need to understand why that was happening,” says Belli.

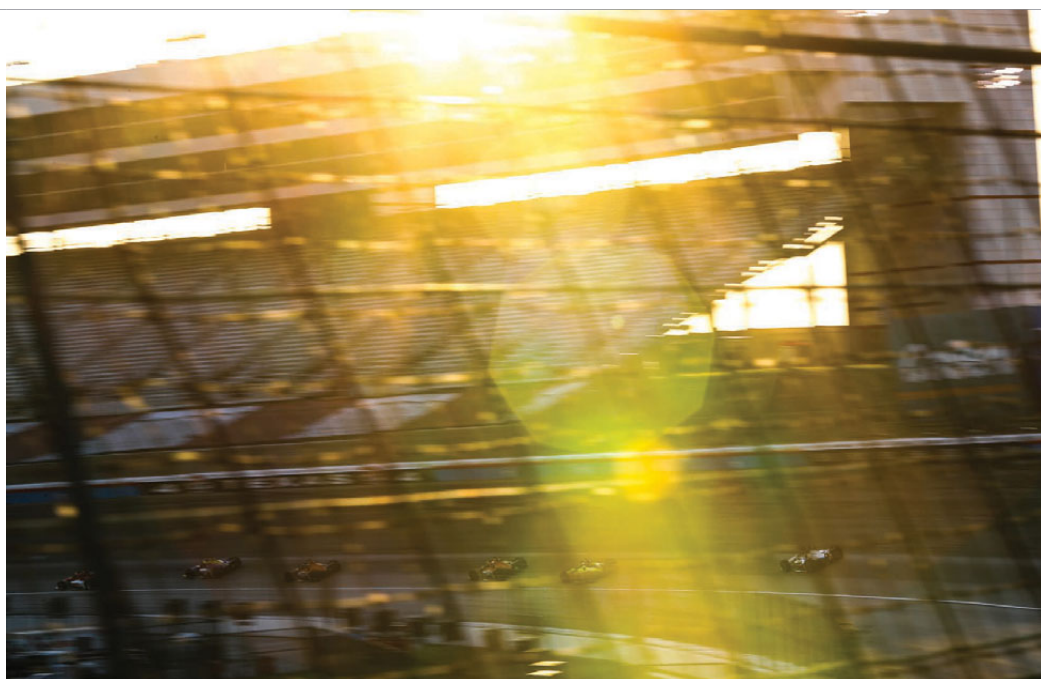
“I’m therefore not certain how we are going to handle track surfaces going forward. We have asked our track inspector to liaise with NASCAR to understand when they are going to apply this compound and on which track. We are talking to Firestone about this as well.”

The lockdown had also created a problem for Firestone, the championship’s tyre partner. “It’s a very large organisation and once the parent company says it’s shutting down, the racing department had to comply,” explains Belli. “The tyre we use for Texas is unique and usually it’s



ABOVE & BELOW RIGHT

Racing under the sunset: The new Aeroscreen had a tough but successful baptism of fire. The sun was low in the sky, but no visual difficulties were reported by the drivers



LEFT A Honda technician peers at the data through a protective visor. A few months ago, with the Aeroscreen due to be introduced, we thought the only impediment to vision might be the concern of the drivers alone



one of the last tyres Firestone makes. They tend to make road and street tyres early, because we run the same street tyres on all of the streets and it's our early-season tyre. We also have a lot of Indy tyres but once Firestone has made those, it then moves on to the track-specific ones such as Texas. "Texas is a very hard track for us due to the high duty cycle. After they repaved it in 2017, we had a huge increase in mechanical grip which puts a lot of heat into the tyres that can lead to blistering. At the end of last year and at the beginning of this year, before lockdown, they were testing compounds to come up with a tyre for the track, but then they could not produce it due to the shutdown."

Instead, the teams ended up using the

back-up tyre from 2019 on the right-hand side of the car and an Indy tyre for the left-hand side. To mitigate this situation, a 35-lap limit was imposed on the tyres.

As events transpired, race winner Scott Dixon later opined: "I think we could have gone 65 laps!"

"Got to give a big shout out to Firestone," he said. "I know everybody was a little bit worried coming here on a tyre that was a bit unknown. The thing was fantastic."

AEROSCREEN DEBUT

Texas marked the long-awaited first competitive appearance of the ground-breaking new Aeroscreen. Although we have become used to seeing the device,

it has, until now, raced only in IndyCar's popular e-sports series.

The Aeroscreen that was fitted to every car is a ballistic, canopy-like windscreens anchored by a titanium framework. The laminated polycarbonate screen is hard-coated, features an integrated anti-fogging heating element, and has tear-offs produced by Racing Optics.

"From the Aeroscreen point of view, it's been really, really good," says Belli. "There were some concerns, but we believe they have all been addressed properly. It was a sunset race with the sun low in the sky, which was a little bit concerning, but we had no reported visual issues and no reflection. We also had no tear-off issues, although most of the teams will tell you ►

that they removed too many tear-offs because they were being conservative.

"The cockpit is warm but not too hot, so drivers weren't falling out of the race or crashing because of the heat.

"We did have some dust and sand going in through the helmet cooling duct. We only mandate the ducts that go on the side, the tubing and everything after it. Filtering air into the helmet is all a team's responsibility. I think they will all start filtering that air, and that was probably the only unexpected thing to happen at Texas."

IMPRESSIVE

Belli gives credit to Red Bull Advanced Technologies, Dallara, Pankl, PPG and local company Aerodine, which did the carbon fibre modifications to the tub. "All parties have worked incredibly well together, including us at IndyCar and our teams," he says.

"It's quite an impressive retro modification to a tub, the monocoque dating back to 2012, which has seen quite

a few modifications over the years. It was a bit nerve-racking that everything would fit together, as everything is very tight with no leeway for any errors. If you miss anything by a quarter of a millimetre, then it isn't going to fit together. However, right from the beginning we've had no problems at all. Racing Optics have worked with us on the tear-offs and it's gone so much better than I could ever have hoped for."

Team Penske's Josef Newgarden, who placed third in the race, admitted that

the revised centre of gravity caused by the screen made the car "a very different animal to drive". But he also confessed: "Other than the handling differences, I didn't notice the screen, to be quite honest with you. You can take that as a very good thing. I didn't notice it. It's there now. I mean, it felt like a normal IndyCar race to me. I didn't notice a big difference to last year. The handling is different in the car, but as far as the driver's experience, I don't even know the thing was there any more. It's crazy how ▶

RIGHT & BELOW

The change of format, squeezing tech, practice, qualifying and the race into the same day, helped facilitate IndyCar's return to the racetrack amid the pandemic





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good a job they've done with the ducting. The visibility was fine. I had zero issues with it."

HYBRID DELAY

The COVID-19 pandemic has set back most major championships' ambitious plans for 2021, and IndyCar is no exception. The last thing any teams need right now is more expense, and everyone accepts that the planned switch to hybrid technology for the new engine formula would involve both money and time.

On looking to the future, Belli says that everything is in negotiation: "Chevrolet, Honda and the teams will be included in any decisions going forward, but economics is a bigger part of the next few years than we were expecting it to be and so anything is possible right now. I would say the situation is fluid.

"IndyCar president Jay Frye is working with all parties and from a technical point of view we have a

number of projects we are working on, but not knowing exactly when they are going to come to fruition."

Asked how the suppliers have survived during the crisis, Belli does not know of any that have been lost. "Dallara LLC have been classified as an essential company, so they have worked through the shutdown as they are diversified into aerospace and military work," he notes.

The plan is for the Indy 500, scheduled for August, to have one week of practice before the weekend of qualifying, which will be similar to last year and over two days. There will be around four days to prepare for Carb day, which will be on the Friday and the race day on the Sunday.

FEELING THE HEAT AT INDY?

"The actual schedule in the week before qualifying might be changed a little bit – the running hours – and one day might be lost at the beginning of it, leaving a three-day

run-up rather than a four-day one," says Belli, "but essentially it's going to be the same. Will it change for the teams? Probably. In its traditional time in May, the teams have to contend with increasing temperatures during the month, although Indiana sometimes throws a spanner in the works, so that it can be really hot or really cold.

"Normally, though, the temperature increases up to race day, but in August they are probably going to compete in high temperatures all month. If anything, it might start decreasing as race day on 23 August comes, but when they practise in the weeks before qualifying, it will probably be very hot and similar to race day temperatures. In some ways this is good so now the teams aren't anticipating extra heat on race day."

Before then, the gates will be open to a limited

ABOVE & BELOW

RIGHT A social distancing decal on the tech garage floor (above). Once over the wall, however, the necessities of the pit stop dictated the crew's position (below)

LEFT Ryan Hunter-Reay speaks with NBC during qualifying. The Texas race averaged a total audience delivery of 1.285 million viewers to rank as the most-watched non-Indy 500 IndyCar race since Detroit in 2016

LEFT The Texas track surface had been treated with a synthetic resin to increase traction for NASCAR, but it posed problems for the IndyCar racers on the higher lines





number of fans for the two full-points races on back-to-back nights at Iowa Speedway on 17-18 July. Under the guidance of public health officials, medical experts and local, state and federal authorities, social distancing will be observed with enhanced hygiene and safety precautions for all fans in attendance at the event.

Social distancing is easily feasible in the grandstands but, as F1 has already conceded, impossible in the cut and thrust of a racing pitstop.

"Once they go over the wall, wearing some specially-made balaclavas, the position of each mechanic is pretty much dictated by his job," says Belli. "So you couldn't keep the fueller and the two left-hand tyre-changers and the extra guy who does the tear-offs six feet apart. However, when on the pit side of the wall, they had to maintain their social distance." **RT**



THE CORE OF THE MATTER

William Kimberley finds out how AMD chip technology has eliminated workflow interruptions in Palatov Motorsport's design process

DESIGNING cars for motor racing is a precise business. High-speed vehicles will be pushed to their limits, putting their drivers' lives on the line, so the designs need to achieve the best performance and reliability possible.

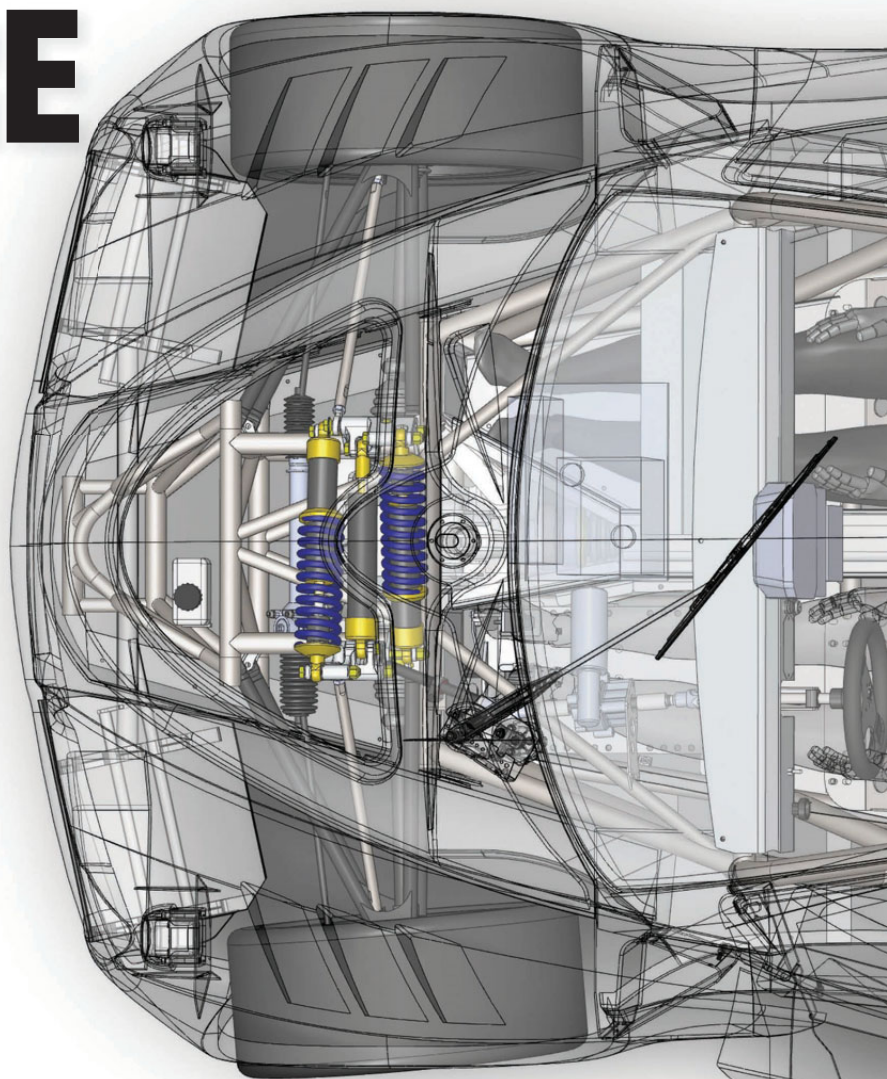
Oregon-based Palatov Motorsport has been at the forefront of creating original racecar designs for over a decade. Its designs range from bespoke racers for track day driving to limited-run supercars and one-off vehicles aimed at specific challenges. For example, the company's 2019 electric collaboration with Cascadia placed second in its class at the Pikes Peak hillclimb competition.

"At Bonneville, we did 197 mph in the standing mile on slush," says Dennis Palatov, owner of Palatov Motorsport. "We design, build, and race cars from scratch. Cars are very complicated systems. There are literally thousands of pieces that all have to go together, and they all have to work. The top-level car design is an artistic endeavour.

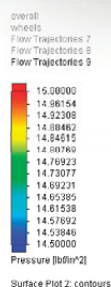
"Ten times the modelling frame rate"

"However, beyond art, cars are held to a much higher standard because they have to perform at many different levels. They have to be safe; they have to be fast; the aerodynamics have to work; all the mechanical parts have to function correctly, so there is a lot to it."

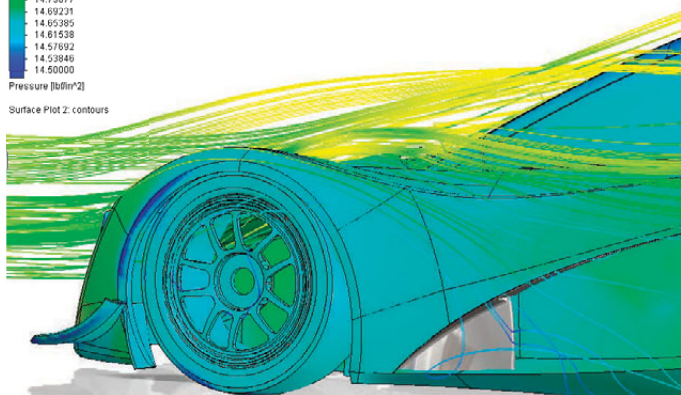
In order to obtain this high level of achievement, Palatov's work primarily employs SolidWorks software from Dassault Systèmes. "I've been using ▶

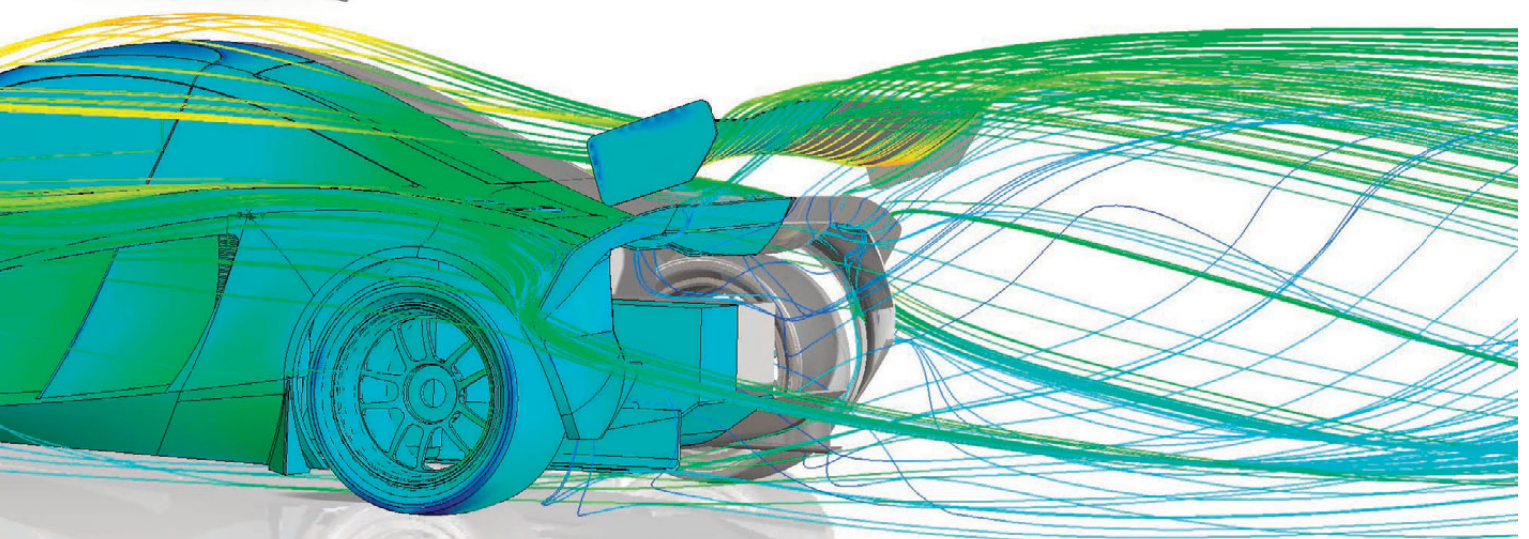
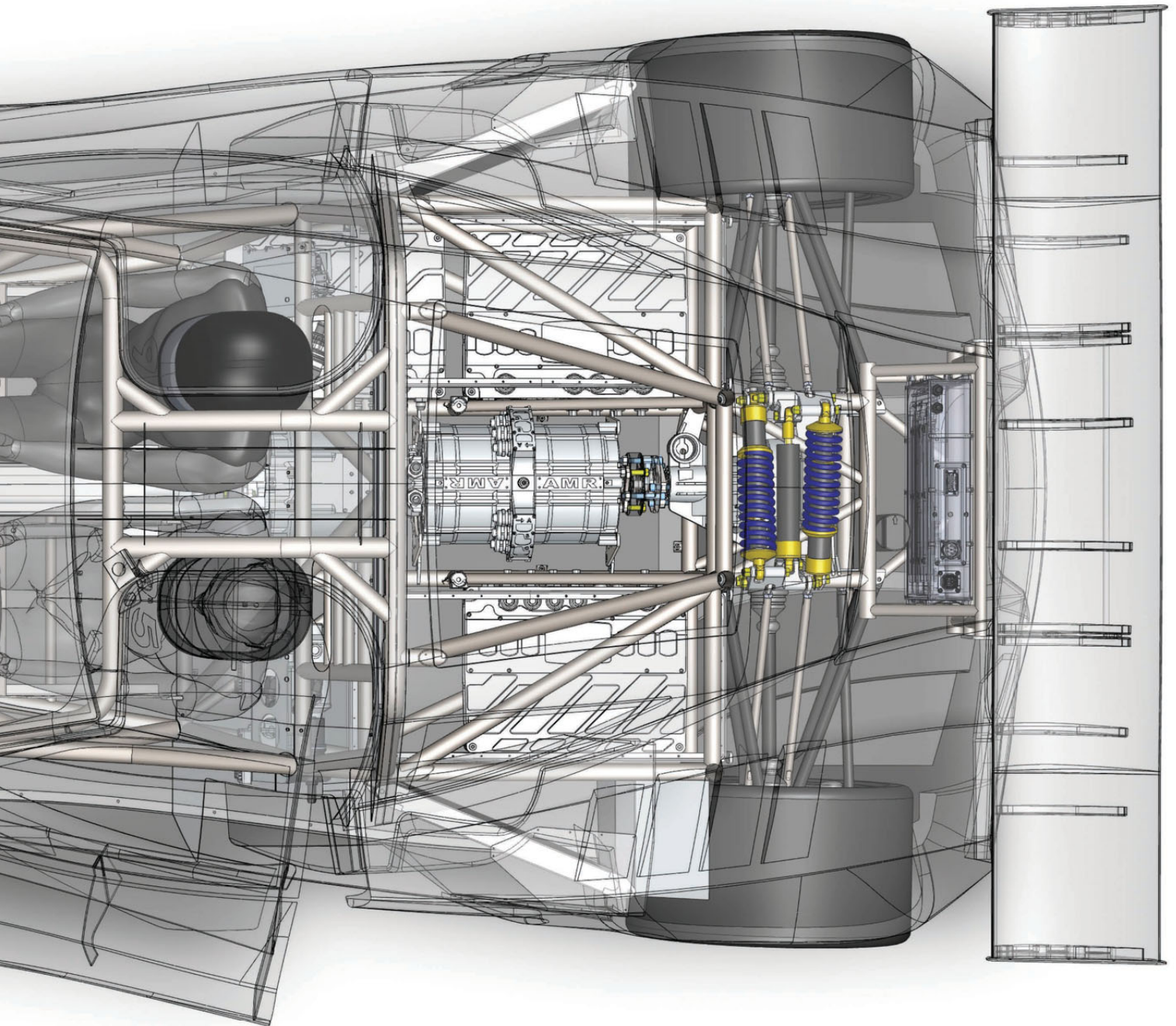


ABOVE The Palatov D2EV full assembly model in SolidWorks



RIGHT The new technology has transformed the company's CFD capability. Here we see analysis of wing/body interaction





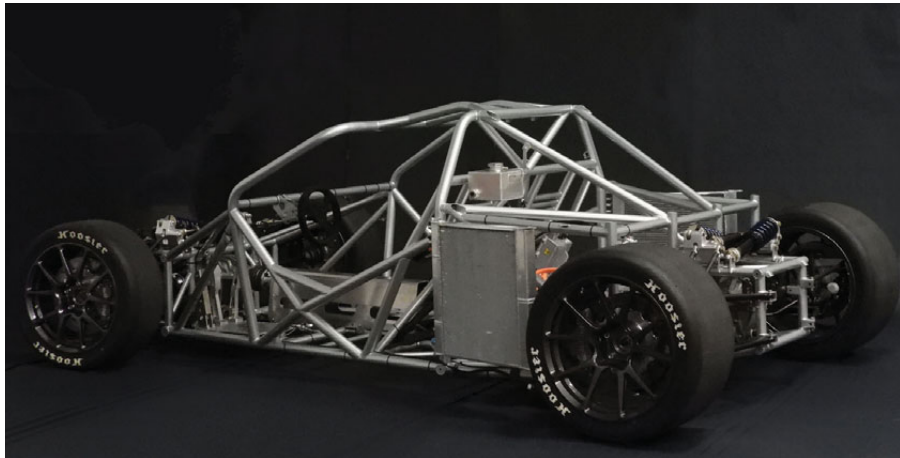
it since '95 when it first came out," says Palatov. "We have the overall design software, and we have the CFD package."

The main SolidWorks application is used to create components and fit them together into a car design, and then the flow simulation CFD software will be called upon to test the airflow, mechanical and thermal performance. This will be fed back into further design updates.

"I have to work with every single aspect of the car," says Palatov, "from industrial design, doing the surfacing, the bodywork, doing the mould for the bodywork, how that all fits together, designing the chassis, designing the chassis components, integrating the engine and lately the electrical drive systems. You can't work on one component at a time. You have to load the entire thing into the system, spin it around, look at it from multiple angles and really get a feel for how things interact."

With a single car comprising 750 to 1,000 individual components, this places a huge load on processor and graphics subsystems. The CFD simulation is an equally massive processing job. It means that every part of a workstation needs to provide the best possible performance.

The complex engineering models require the most powerful graphics and processors, which led Palatov to try AMD Radeon Pro GPUs and Ryzen CPUs, with revolutionary results.



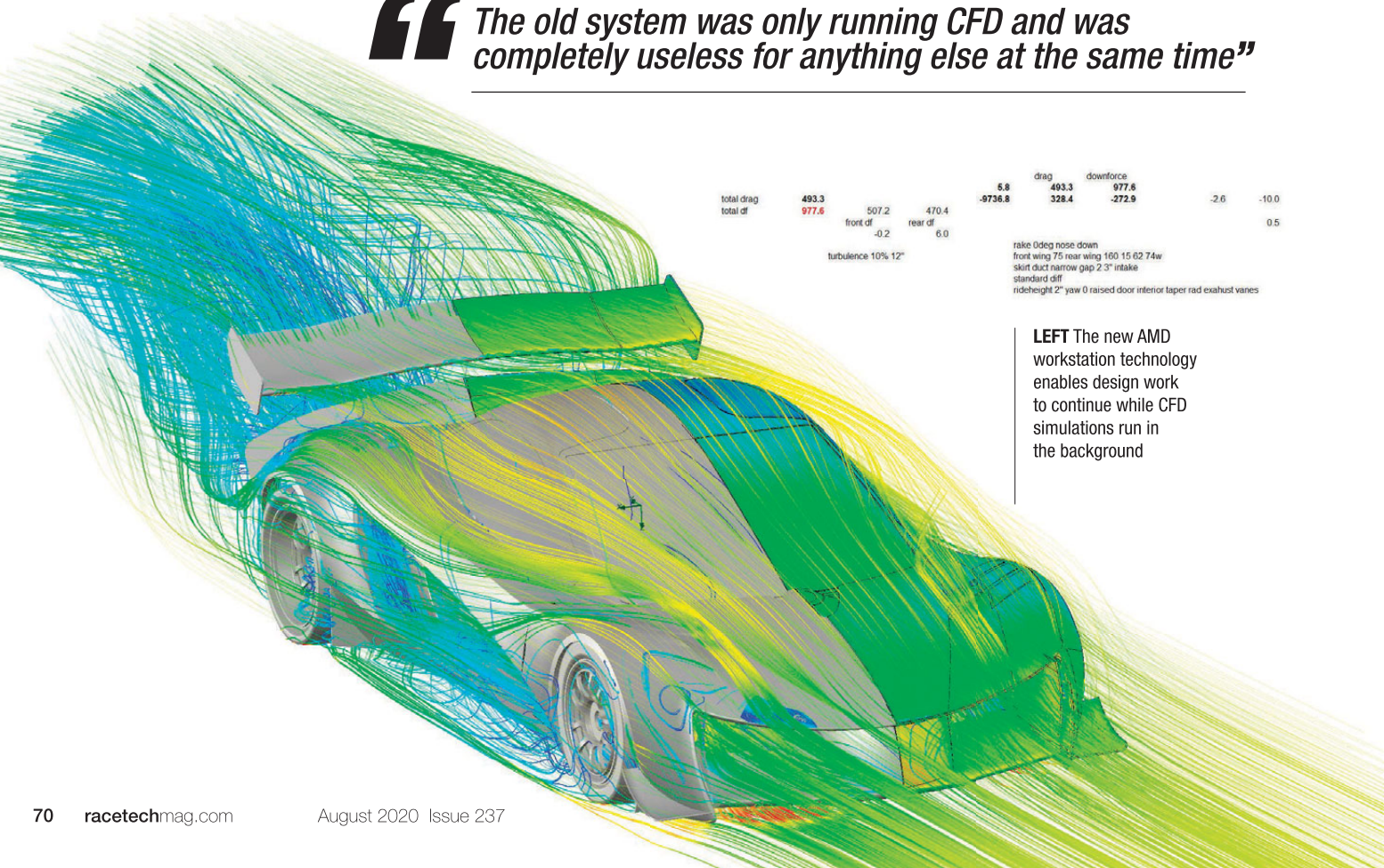
ABOVE Palatov's Gen III chassis takes shape. With a single car comprising maybe 1,000 individual components, a huge load is placed on processor and graphics subsystems

BETTER PRODUCTIVITY

Palatov was experiencing workflow interruptions at two points in the production cycle. “If I’m spending a lot of time just twiddling my thumbs waiting for the model to re-orient itself or to zoom in and out, that slows down the process a lot,” he points out. “The second interruption was when it came to testing the designs with flow simulation.

"CFD is very incremental. You change one little thing and you rerun it. Normally it takes 12 hours, so I used to set it up last thing at ►

“The old system was only running CFD and was completely useless for anything else at the same time”



LEFT The new AMD workstation technology enables design work to continue while CFD simulations run in the background

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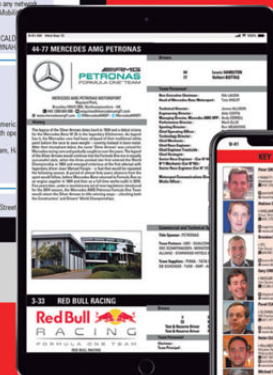
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night, let it run overnight, come in, get the results and then go on with the rest of the day."

The company had been using workstation technology based on the Intel Core i7 processor with AMD Radeon Pro WX 7100 graphics. This provided an adequate modelling experience, but when a simulation was running it was a different story.

"CFD used to be an overnight project," says Palatov. "The key thing is to visualise and evolve the design in real time and see where everything fits. So the tools really have to move at the speed of my thought. If I have to wait, then it's very disruptive and it really negatively impacts productivity."

This all changed when Palatov

switched to all AMD technology using the 16-core AMD Ryzen 3950X processor and AMD Radeon Pro W5500 graphics. Modelling was smoother than before.

"When I was rotating the full model with the old system, it used to be about a half second per iteration before it would move. Now it's perfectly smooth," says Palatov. However, the revolutionary shift from the new AMD workstation technology was in the simulation workflow.

"With this system, not only does it take a lot shorter time to finish the simulation – about eight hours – but also I found that I can run CFD and still have full usability of SolidWorks on the same computer."

FASTER DESIGNS, FASTER CARS

Using the new AMD workstation technology, Palatov could carry on developing its designs while running the CFD simulations in the background. This multitasking prowess is a key benefit from AMD graphics combined with an AMD Ryzen processor.

Benchmarks with SPECviewperf's SolidWorks viewset running at the same time as a CPU workload have shown that the AMD Radeon Pro W5500 provides 10 times the modelling frame rate than NVIDIA's Quadro P2200 in this scenario – the difference between usable and unusable.

The 16 cores of the AMD Ryzen 3950X also meant that it could use 8-10 of these



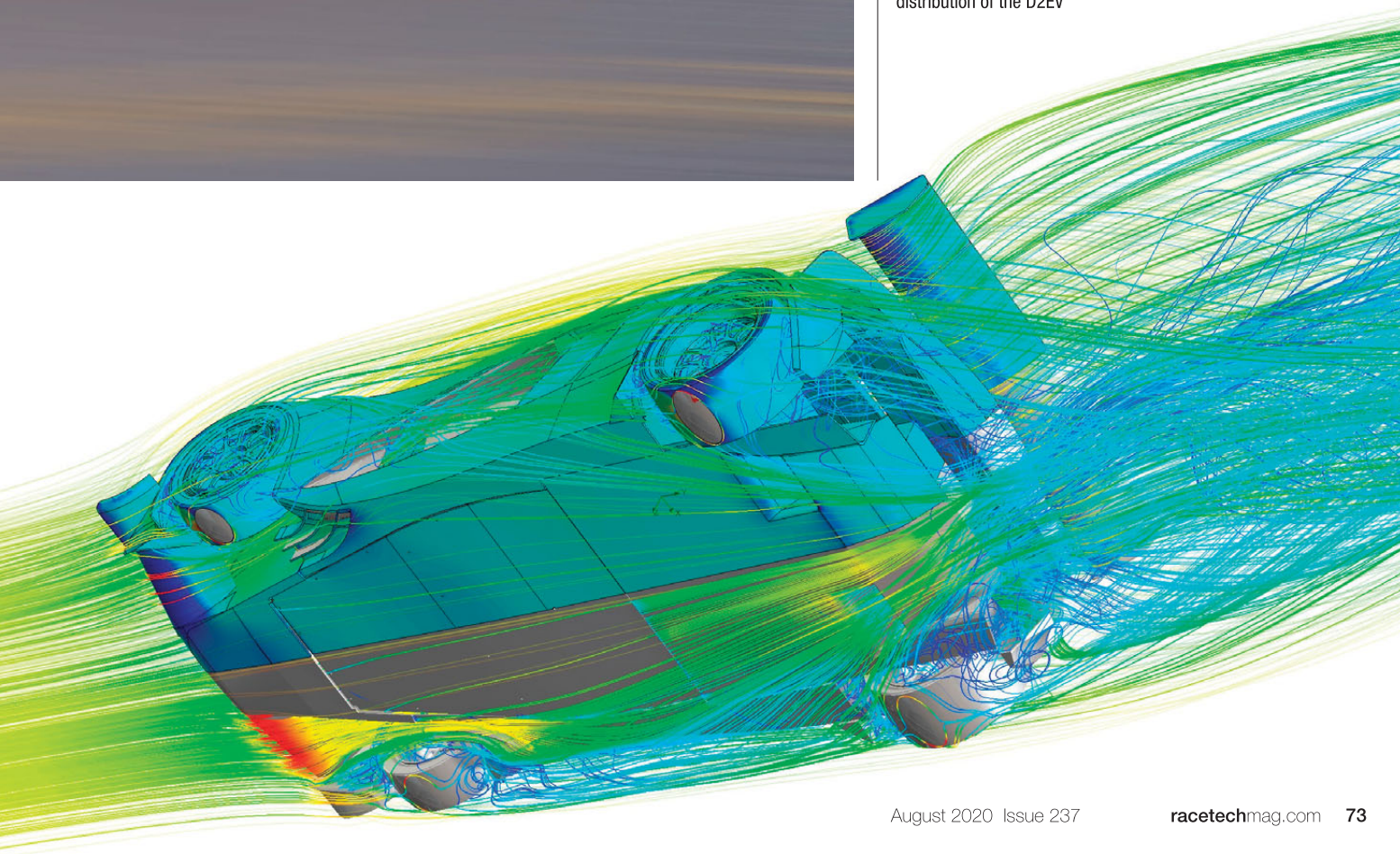
for flow simulation and still have some leftover for modelling. Palatov has a specific example with one of its car design simulations.

"The old system took seven hours and 24 minutes to finish it. The new system took six hours and 22 minutes, but I was also using SolidWorks in the foreground simultaneously. The old system was basically only running CFD and was completely useless for anything else at the same time.

"The productivity is the payoff. The value proposition is very easy. You save a significant amount of time and do a lot more with every day, so you look at your personnel costs and opportunity costs versus equipment costs and it becomes very compelling. It makes me enjoy the work far more and it makes me more excited and motivated. It's not just work, it's actually fun when the tools get out of your way and just let you be creative." **RT**

LEFT Palatov's assaults on the formidable Pikes Peak hillclimb have helped forge its reputation. Here its D2EV takes on the famous hill last season

BELOW The underbody airflow and pressure distribution of the D2EV



BOP BY A DIFFERENT NAME

With F1 poised to introduce an aero 'handicap', **Sergio Rinland** searches for method in the madness. But will he find any?



LEFT Tunnel vision: the last aero clampdown fostered technology of no use to the wider world. Why does F1 not learn the lessons from its mistakes?

MUHAMMAD ALI won 56 out of 61 fights in his unparalleled boxing career. Imagine for a moment if the powers that be in those days (Don King, the Mr E of boxing), had mandated that Ali would have to fight with one hand tied behind his back so that his opponents could have a chance of winning? No, of course you cannot imagine this, because all sports are a meritocracy, even motorsport, especially Formula 1.

When the ACO and FIA initially announced the Hypercar regulations, we hailed the concept: they finally understood that to control performance and hence cost in a top discipline, they could not tell people how to design a car to control its performance (a 120-year-old fallacy of regulating motorsport).

Instead, they regulate what performance designers can achieve by measuring it, because now you can. But then, in the quest to attract manufacturers from all quarters, the ACO said they would apply a Balance of Performance (BoP) using weight and air intake handicaps, on top of limiting power and aero, so that everybody could have a chance to win, no matter how good (or bad) they are. There and then they ruined a good idea.

Now, Formula 1 teams have approved plans to introduce the new 'aero handicap' rule to the sport. There is no method in that madness. To stop Mercedes' domination in F1, they will have to literally close their wind tunnel for six months at least.

What they are proposing – a sliding scale of 90% for the best team and 112.5% for the bottom of the list, of an arbitrary number of runs a week – is like tying Ali's arm with a loose rope. I am sure the top teams will devise something to compensate for that loss of tunnel time.


When the wind tunnel and CFD reduction came into force a few years ago, Formula 1 teams spent fortunes in reducing the 'start up' and 'shut down' times of wind tunnels so that they could have a few more minutes of full speed running and with that, increase their testing capabilities. Also, to increase the amount of CFD simulations with the 'terabytes' limitation, they developed very expensive computers to circumvent that rule. Both techniques are completely useless outside of Formula 1. Did they manage to save money? Of course not!

I have said this before and will repeat it again, to paraphrase Albert Einstein: "The true definition of madness is repeating the same action, over and over, hoping for a different result". Why is Formula 1 so insistent on devising rules that are so complex that they are difficult to implement and create dubious outcomes?

I once asked a Formula 1 influencer why they did not implement a regulation, similar to what was suggested for the Hypercar category, limiting power at the driveshafts and aero downforce measuring at the pushrods. Their answer was: "We are F1, we cannot do that!". Well, Formula 1 cannot do an aero handicap.

Formula 1 is a meritocratic sport, so balancing performance to allow people who do not do such a good job to have a chance of being closer to the front, is a fallacy, in my opinion.

I have previously expressed in these pages what I believe motorsport rules should be in the 21st century. The ACO went in that direction with its ideas for Hypercar. I would like someone to explain to me why that is not a good idea, so I can stop insisting on it.

The Roman Empire took chariot racing with it when it collapsed; this pandemic is threatening to do the same with Formula 1. 

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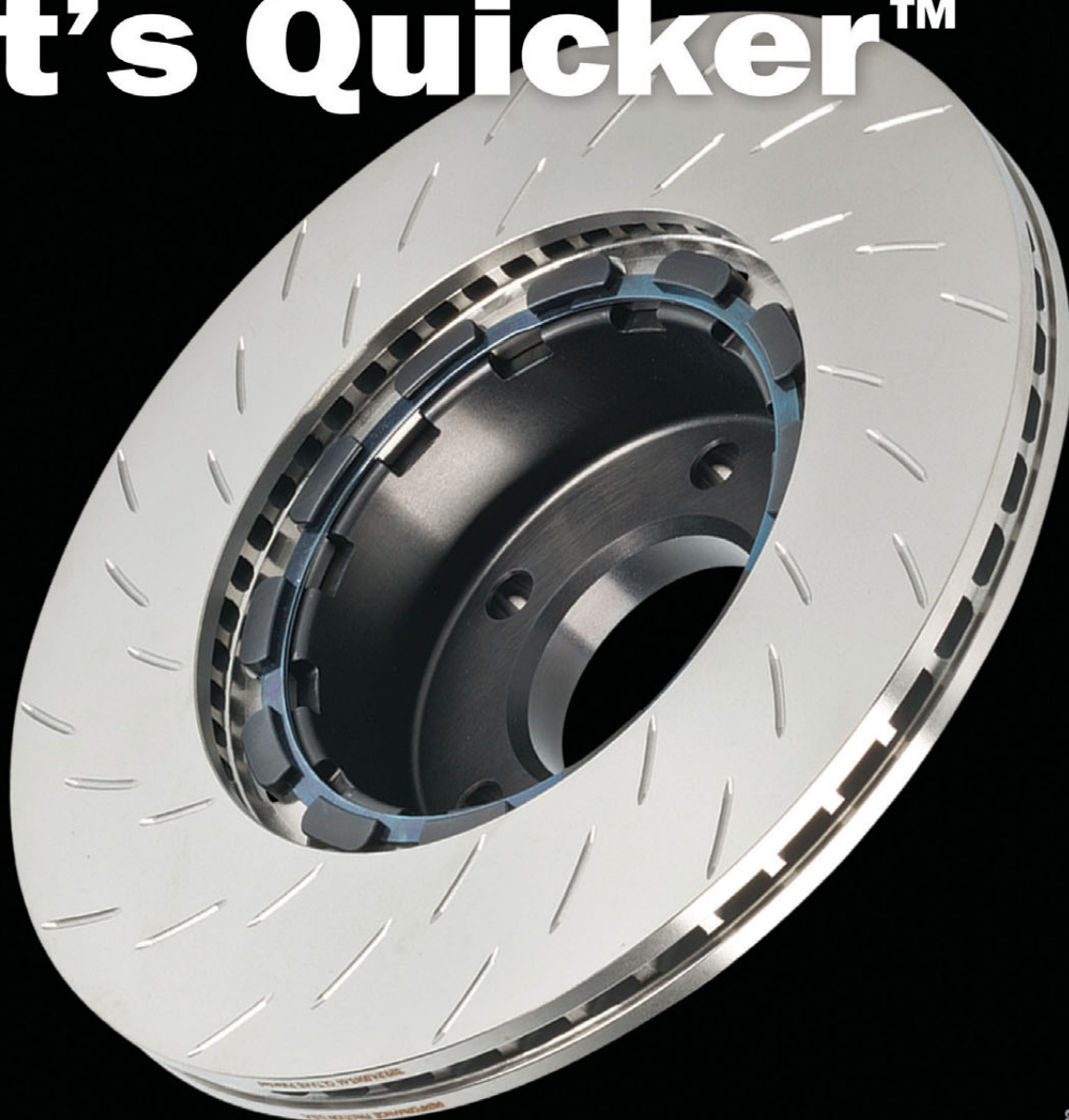


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