



SECRET WEAPON

The tech trick helping explore new hydrogen frontier

INTERNATIONAL

Driving Technology Into Pole Position

RACE TECH

Motorsport Engineering

NOVEMBER 2024 No. 288 UK £5.95 USA \$12.75 racetechmag.com

Bernoulli

ROAR SPEED!

The power behind Cadillac's sportscar glory



• SUPRA GT4 EVO 2

• DALLARA F3 2025

• THE RECYCLED RX CAR

www.racetechmag.com



How WEC's David became Goliath!

We go the distance – for quality that endures

bosch-motorsport.com/lmdh



Drivers and material pushed to the limit: endurance racing is the ultimate test of durability in motorsports. The year 2023 ushers in a new era for one of the most important and prestigious forms of motor-

sports with the new prototype class – Le Mans Daytona hybrid (LMDh). Bosch Motorsport is lining up to prove its expertise, endurance, and performance as the supplier of the unified hybrid system.

Invented for life



BOSCH



RACE TECH
Motorsport Engineering

Volume 31 Issue 12

Published October 2024

The next issue will be published
in early November 2024

ISSN 1356-2975

SUBSCRIPTIONS

Subscriptions from Kimberley Media Group Ltd
841 High Road, Finchley, London N12 8PT
Tel +44 (0)20 8446 2100

Overseas copies are sent via air mail

12 issue subscription UK: £71.40

Europe: £118, USA/Rest of World: £149

All major credit cards accepted. Cheques and
money orders only in Pounds Sterling payable to
Kimberley Media Group Ltd.

BACK ISSUES AVAILABLE:

8,9,10,11,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,
30,31,32,33,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,
52,53,54,55,56,57,58,59,60,61,62,66,67,68,69,70,71,72,73,74,
75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,
95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,
111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,
126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,
141,142,143,144,145,146,148,149,150,151,152,153,154,155,156,
157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,
172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,
187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,
202,203,204,205,206,207,208,209,210,211,212,213,214,215,
216,217,218,219,220,221,222,223,224,225,226,227,228,229,
230,231,232,233,240,241,242,243,244,245,246,247,248,249,
250,251,252,253,254,255,256,257,258,259,260,261,262,263,
264,265,266,267,268,269,270,271,272,273,274,275,276,277,
278,279,280,281,282,283,284,285,286,287

Price including post & packing:

UK: £5.95, Europe: £6.50, Rest of World: £7.55

You can pay by cheque or credit card but please
note the minimum on Switch & Delta is £14

Race Tech (ISSN: 1356-2975) is published
monthly by Kimberley Media Group Ltd.

Cover image: Richard Prince/Cadillac

Design & Production: Paul Bullock

© Kimberley Media Group Ltd.

All rights reserved. Reproduction (in whole or in
part) of any article or illustration without the written
permission of the publisher is strictly prohibited.
While care is taken to ensure the accuracy of
information, the publisher can accept no liability
for errors or omissions. Nor can responsibility be
accepted for the content of any advertisement.

ROAR SPEED!

The power behind Cadillac's sportscar glory

COVER STORY PAGE 50

ON THE COVER

24 HOW WEC'S 'DAVID' BECAME 'GOLIATH'

Gary Watkins discovers how the boys from
the farmyard came good – inspired by a
dressing-down from Bill Gibson

32 EXTREME H'S SECRET WEAPON

If you thought active suspension had been
consigned to the history books, think
again. Chris Pickering explains why

50 THE POWER BEHIND CADILLAC'S SPORTSCAR GLORY

The distinctive soundtrack of Cadillac's
LMDh powertrain has accompanied the
dawn of the WEC's Hypercar era. Chris
Pickering talks to Russ O'Blenes, director
of the performance and racing propulsion
team at General Motors

6 INDUSTRY NEWS

Adrian Newey: Aston Martin's £30
million "bargain"; electrification message
lures Hyundai into LMDh project;
Supercars lands Toyota after 20-year
wait; IndyCar charter finally passed;
Firestone signs IndyCar extension;
Extreme H car passes crash test
milestone; CTS24 set to break records

74 COMMENT with Sergio Rinland

A new F1 star is born: Sergio Rinland
discusses The Colapinto Phenomenon

40 THE RECYCLED RALLYCROSS CAR

Hal Ridge reports on a Rallycross
revolution: the FC2 concept created
through a process that recycles and
updates the current Supercar Lites platform

60 NEW CARS: F3 2025

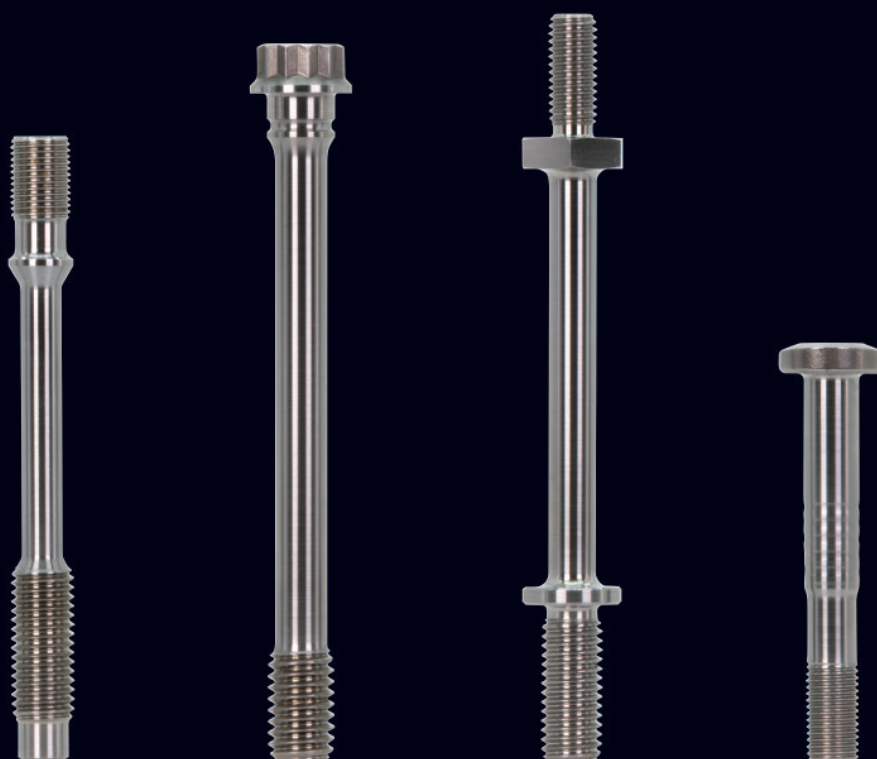
Damien Smith examines Dallara's new F3
car, designed to deliver unprecedented
safety, spectacle and sustainability. No
pressure then...

68 NEW CARS: Toyota GR Supra GT4 EVO 2

Toyota's GR Supra GT4 has more than 500
podiums to its credit and has won titles
across the world, but the EVO 2 version
that takes its bow in Florida next January
will be a further improvement still. Chris
Pickering finds out how



CUSTOM FASTENERS



ARP has available stocks of all high strength materials, including Custom Age 625+, and our custom fastener manufacturing turnaround times are continuing to drop. Call us to discuss your custom fastener project.

ARP Fasteners are tested and proven in the most demanding environments on Earth...and beyond.

ARP fasteners are used in racing all around the globe and applications from space to below the earth's surface.



All ARP fasteners are manufactured entirely in our own facilities in Southern California and raced all over the world.

5,000 catalog items and specials by request

Special Orders +1.805.525.1497 • Outside the U.S.A. +1.805.339.2200

1.800.826.3045 • arp-bolts.com

GROUP FOUNDER

William Kimberley

EDITOR

Mark Skewis

**HEAD OF OPERATIONS
& DIGITAL**

Sara Kimberley

PHOTOGRAPHY

LAT

ART EDITOR

Paul Bullock

ACCOUNTS

Fiona Keeble

ADVERTISING EXECUTIVE

Kourosh Najmabadi

COMMERCIAL DIRECTOR

Maryam Lamond

MANAGING DIRECTOR

Adrian Goodsell

PUBLISHING DIRECTOR

Soheila Kimberley



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

www.kimberleymediagroup.com

KIMBERLEY
MEDIA GROUP LTD



@racetechnmag

facebook.com/
RaceTechmagazine

BLOWN AWAY BY 'THE DAVOS OF MOTORSPORT'

FIRST, a confession: I used to avoid Race Tech's World Motorsport Symposium!

Yes, I'd heard the excellent reports; seen the glowing recommendations from industry heavy-hitters. But I'd also had my fill of the ASI Show and staging the Autosport Awards, so shied away from any prospect of encountering big names and even bigger egos.

I regret my absence now because, when I eventually capitulated and attended 'The Davos of Motorsport', I was blown away. There were no egos, just an eager gathering of industry professionals, all of whom were encountering similar technical and economic challenges as they tried to navigate the fast-changing motorsport and automotive landscape.

Motorsport engineers are renowned for their cunning, devious ways, and it was a revelation to see them in a relaxed environment where they actually volunteered information to each other.

Moreover, the WMS isn't about those embarrassing sales pitches we all hate. Far from it. People offer their knowledge and experience, with no price tag attached.

The Chatham House rules – whereby the knowledge disclosed can be acted upon, but without identifying the source – are a key feature of the event. It means no journalists; no being quoted; no fear of being dragged before your angry boss for an explanation!

By way of an example, last year the FIA's aerodynamicists presented a detailed update on their efforts to improve the safety of Formula 1 cars in rain and bad visibility. Precious little had been reported in the media, not least because not all the tests had gone stunningly well. Yet every race series experiences the same problem, and to gain an understanding into F1's experiments, both

good and bad, offered an invaluable insight.

The same goes for the updates on battery technology, electrification, sustainable fuels, hydrogen and the harnessing of Artificial Intelligence – the latter a standout takeaway from WMS 2023.

Even disciplines that would once have been considered the staple subjects, the likes of aerodynamics, brakes and chassis integration, have been revolutionised by electrification. Stand still these days and you drop behind, so everyone is eager to learn.

It's worth noting that this truly is a *World Motorsport Symposium*. In the last two years we've enjoyed the input of delegations from NASCAR, a keynote speech from the president of IMSA, and this year we welcome a contingent from IndyCar. I'm fascinated to hear their take on the future direction of America's leading single-seater series.

The theme of this year's symposium – held at the prestigious Royal Automobile Club, in Pall Mall, London on November 26 & 27 – is speed with sustainability.

As the energy transition unfolds and the climate crisis deepens, sustainability increasingly underpins every move we make. Whether you run a championship, a manufacturer, team or supplier, none of us are immune: sustainability is no longer a tick-box issue, but one we need to embrace.

I hope we can do it together. **RT**



Mark Skewis
EDITOR

ASTON'S £30 MILLION "BARGAIN"

Why Newey coup could change more than just the order in which cars line up on the grid. By **Mark Skewis**

THE press conference announcing Adrian Newey's signature on an Aston Martin contract could change the face of Formula 1 forever.

The event was, as one rival commented, "extraordinary". Not just for Aston having lured the most successful designer in Formula 1 history – although beating off Ferrari's advances certainly ranked as a coup – nor even for Newey's reputed £30 million salary, which his new boss Lawrence Stroll described as "a bargain".

The event was notable not just because of its potential consequences for the sport's pecking order on the racetrack, but for its implications for the way that teams behave towards each other.

The accepted practice for the F1 merry-go-round of personnel moving between teams is that they are placed on 'gardening leave' from the moment they reveal their intention to depart. Usually, they are immediately ushered out of the team's headquarters, their email account terminated and a short statement issued confirming their next destination. The tech figure in question then holds their tongue until they officially start work for their new employers.

Yet here was Newey, who is renowned in the paddock as a highly principled man, paraded on stage in front of Aston Martin's F1 car, sponsors and dignitaries, months ahead of officially commencing work for the Silverstone-based squad.

Even footballers – who are *not* renowned for their principles – aren't pictured wearing their new team's shirt before they leave their old club.

When tackled on the timing of the conference, a slightly bemused Red Bull team principal Christian Horner confessed he felt the fanfare was "a bit premature", given that Newey was still under contract and in the process of finishing Red Bull's RB17 supercar.

Was the conference an indication of Newey's irritation at Red Bull's attempted undermining of his contribution

BELOW Newey is not at his most comfortable in the spotlight, but there was no avoiding it during the Aston unveiling

to the squad's success? Or was it merely a demonstration of new boss Lawrence Stroll's refusal to take no for an answer?

The one thing about which there can be no debate is that Newey's defection to Aston Martin has the potential to rip up the F1 formbook once the new 2026 regulations come into effect.

It was a point acknowledged by Mercedes chief Toto Wolff, who believes the partnership of Newey, Honda and Andy Cowell – who is group chief technical officer at Aston Martin – gives Stroll's team every chance of joining McLaren, Red Bull, Ferrari and Mercedes in fighting at the front of the field.

"I think the track record that Adrian has in Formula 1 speaks for itself," he said. "A great designer, the greatest designer in Formula 1 when you look at the stats, and if you combine it with somebody like Andy Cowell who is, for me, one of the strongest leaders I have ever met in any industry, and if they can make that work, I think it's a package to be reckoned with."

Mercedes did, Wolff revealed, contemplate



a move to secure Newey's services.

"James [Allison, Mercedes tech director] and I discussed it, elaborated about it, and came to the conclusion that the structure that we have today is the one that we have faith in and we want to continue with," Wolff said. "Having said that, also we have great respect for Newey, but we passed on that one because we believe in our team."

McLaren, although it benefited from Newey's Midas Touch, was another team that in the past struggled to accommodate F1's most successful designer within its structure. It's true that Newey's approach marks him out as an almost anachronistic figure in F1 these days – an old-style technical director, if you like – and perhaps that was one of the attractions to him of Aston Martin under Stroll's leadership.

"If you go back 20 years," Newey said, "then what we now call team principal were the owners, and in this modern era Lawrence is unique in being the only properly active team owner. It is a different feeling when you have someone like Lawrence involved like that."

Newey's approach, his fabled preference for a drawing board, was a point to which Horner alluded (in slightly catty fashion) when asked about Aston's new superstar, noting that "Adrian tends to do his own thing".

"Adrian is obviously a very creative guy," he said, "and he is not your average designer, I think he is the only person still in Formula 1 working on a drawing board,

so inevitably there will be a process of having to get to know each other and how each other works and so on."

So how *does* someone like Newey fit into a modern team? "He goes where he thinks he can add value," revealed one former colleague of Adrian's approach. Certainly that was the case with Red Bull's most recent period of domination, where Newey focused much energy on the suspension, knowing that it would be crucial in countering the porpoising inevitably induced by F1's return to ground-effect in its 2022 regulation revamp.

“Adrian is a racer and one of the most competitive people I have ever met”

Having lost its talisman, Red Bull pointed to the strength of the tech team beneath Newey. There were even suggestions that he only worked three days a week.

"I don't know where that came from," he countered during the Aston unveiling. In truth, he did know exactly where that rumour had emanated from, and it clearly rankled.

He will certainly be full-time when he starts work for Aston Martin next March, for he is faced with a complete reset of the technical rules for 2026, the integration of Honda works power units, sustainable


fuels by Aramco, and the newest wind tunnel in the sport.

Such is his formidable track record, bringing success to Williams, McLaren and Red Bull, that few would bet against him shuffling the established pecking order.

Little wonder that Lawrence Stroll, Executive Chairman, Aston Martin Aramco Formula One Team, was beaming at the presentation.

"Adrian is the best in the world at what he does – he is at the top of his game – and I am incredibly proud that he is joining the Aston Martin Aramco Formula One Team," he said. "It's the biggest story since the Aston Martin name returned to the sport and another demonstration of our ambition to build a Formula 1 team capable of fighting for world championships.

"As soon as Adrian became available, we knew we had to make it happen. Our initial conversations confirmed that there was a shared desire to collaborate in a once-in-a-lifetime opportunity. Adrian is a racer and one of the most competitive people I have ever met. When he saw what we have built at Silverstone – our incredible AMR Technology Campus, the talented group of people we have assembled and the latest wind tunnel in the sport – he quickly understood what we are trying to achieve. We mean business – and so does he.

"Adrian shares our hunger and ambition, he believes in this project, and he will help us write the next chapter in Aston Martin Aramco's Formula 1 story." 





Electrification message lures Hyundai into LMDh project

HYUNDAI Motorsport is to enter top-level prototype endurance racing with its premium Genesis brand.

The manufacturer is currently battling to win the World Rally Championship with Thierry Neuville, but has refused to commit to a full factory presence in the series beyond 2025.

The internal combustion element of the hybrid powertrain for the sportscar project will be developed in-house by Hyundai Motorsport at its base in Alzenau, Germany, which has been responsible for the engines that have powered its line of WRC and TCR contenders. The imminent arrival of the LMDh work has fuelled rumours that the rally program will be out-sourced to a privateer operation from 2026.

Hyundai said in a statement: 'Genesis is proud to announce its ambitious entry into the world of endurance racing through the LMDh programme. Genesis is actively exploring programmes to strengthen


its high-performance image, and after a thorough evaluation of various options, LMDh emerged as the most strategic choice for us at this time.

'We have carefully analysed LMDh and found it to be a natural fit for our motorsport ambitions and a valuable platform to drive the development of future mobility technologies for road cars. Endurance racing presents an unparalleled opportunity to showcase Genesis' cutting-edge technology, design philosophy and performance-driven character in a highly competitive arena. This project is part of our broader vision for the future of mobility.'

The LMDh category, which is eligible both for IMSA competition and the World Endurance Championship, which includes the Le Mans 24 Hours, requires entrants to use the spine of one of four nominated constructors. Hyundai is believed to have allied itself with ORECA, whose chassis underpins both the Acura ARX-06 and the Alpine A424 Hypercars.

Hyundai does have pedigree in endurance racing, with class victories in the Nürburgring 24 Hours every year from 2020 to 2023. But its relationship with IMSA could well have proved pivotal in its decision to opt for an LMDh program.

Hyundai has been a manufacturer partner of IMSA since 2019, when it began competing in the Touring Car (TCR) class of the IMSA Michelin Pilot Challenge. Since that time, Hyundai has claimed five straight TCR driver and team championships (all with Bryan Herta Autosport with Curb-Agajanian) and four consecutive (2020-23) manufacturer titles.

IMSA successfully introduced an electrified powertrain last season, through collaboration between Bosch (hybrid system), WAE (now Fortescue Zero, which developed the battery) and Xtrac (transmission). 

ABOVE & BELOW

Hyundai's experience in IMSA (above) has helped pave the way for an LMDh program with its Genesis brand





TEST TO EVALUATE!

The AVL Brake Torque Sensor is the unique solution to validate and optimize brake performance on testbeds and racecars of any kind.

The sensor is tailored to fit any brake disc geometry to precisely measure forces exactly where they occur. This future-proof technology accelerates the brake development process and delivers measurement results to outbrake your competition.

INNOVATE. ACCELERATE. LEAD.



Read more!



Repco Supercars lands Toyota after 20-year wait!

POWERHOUSE brand Toyota Australia has sensationally confirmed the GR Supra will join the Repco Supercars Championship from 2026.

Toyota will field a minimum of four Gen3 GR Supras in 2026. Two will be run by homologation team partner Walkinshaw Andretti United, driven by Chaz Mostert and Ryan Wood, with a second team to be announced in due course.

Toyota has committed to racing in the Supercars Championship for five years, and will become the third brand to race in the Gen3 era alongside Ford and Chevrolet, extending the famous Japanese marque's commitment to Australian motorsport.

Toyota already supports its one-make grassroots Toyota GAZOO Racing Australia (TGRA) Scholarship Series and GR Cup, and the TGRA Rally Team alongside Neal Bates Motorsport.

Toyota is also a dominant force in international competition, winning championships in the World Endurance Championship, the World Rally Championship and NASCAR.

Toyota Australia has already begun initial design work on the GR Supra Supercar through its own in-house design team, based at Altona.

The GR Supra Supercar will use Toyota's 2UR-GSE all-aluminium, quad-cam V8 as its baseline engine. The engine has featured in a range of performance production cars, as well as the 2019 Dakar-winning Hilux.

It's the latest step in the brand's GR performance arm, which has a range of performance cars including the GR86, GR Yaris, GR Corolla and GR Supra.

Toyota Australia Vice President Sales, Marketing and Franchise Operations Sean Hanley said the news is an "historic moment" for both the brand and Supercars.

"At Toyota, we have been toying with the idea of competing in Supercars for more than 20 years and now with the right car, the right team, and a very strong partnership with the Repco Supercars Championship, the time is



ABOVE Toyota has used CAD and VR technology to produce a scale clay model of its Supercars challenger

definitely right," Hanley said.

"This is truly an historic moment. Our GR brand and performance cars were built on the knowledge that we gain from participating in top-level motorsport and our entry into the Supercars Championship will cement that connection and give us the opportunity to showcase Toyota GAZOO Racing excitement to a wide audience of passionate fans.

"It will also provide an opportunity for a continuous career pathway for drivers and teams that we first established when we launched the one-make Toyota 86 Series nine years ago as an affordable grassroots circuit-racing category run as a support series at select Supercars Championship events around the country.

"It has been the perfect environment for up-and-coming drivers to learn and hone their racecraft, and such has been its success, that it is well recognised as a career pathway into the top tier of Australian motorsport.

"For proof, you only need to look at this year's Supercars grid with Broc Feeney, Will Brown and Cameron Hill all having cut their racing teeth in Toyota 86s, with many more 86 alumni racing in Super2.

"With our entry-level Scholarship Series, and what is now branded the TGRA GR CUP continuing as a support category for Supercars, our joining the Supercars Championship was a natural extension of our support for Australian

motorsport at all levels.

"And with our strong and ever-growing partnerships with Walkinshaw Andretti United and Supercars, we are in it, to win it."

Supercars CEO Shane Howard welcomed the "landmark" news, saying it is a testament to the "immense popularity and international appeal" of the championship.

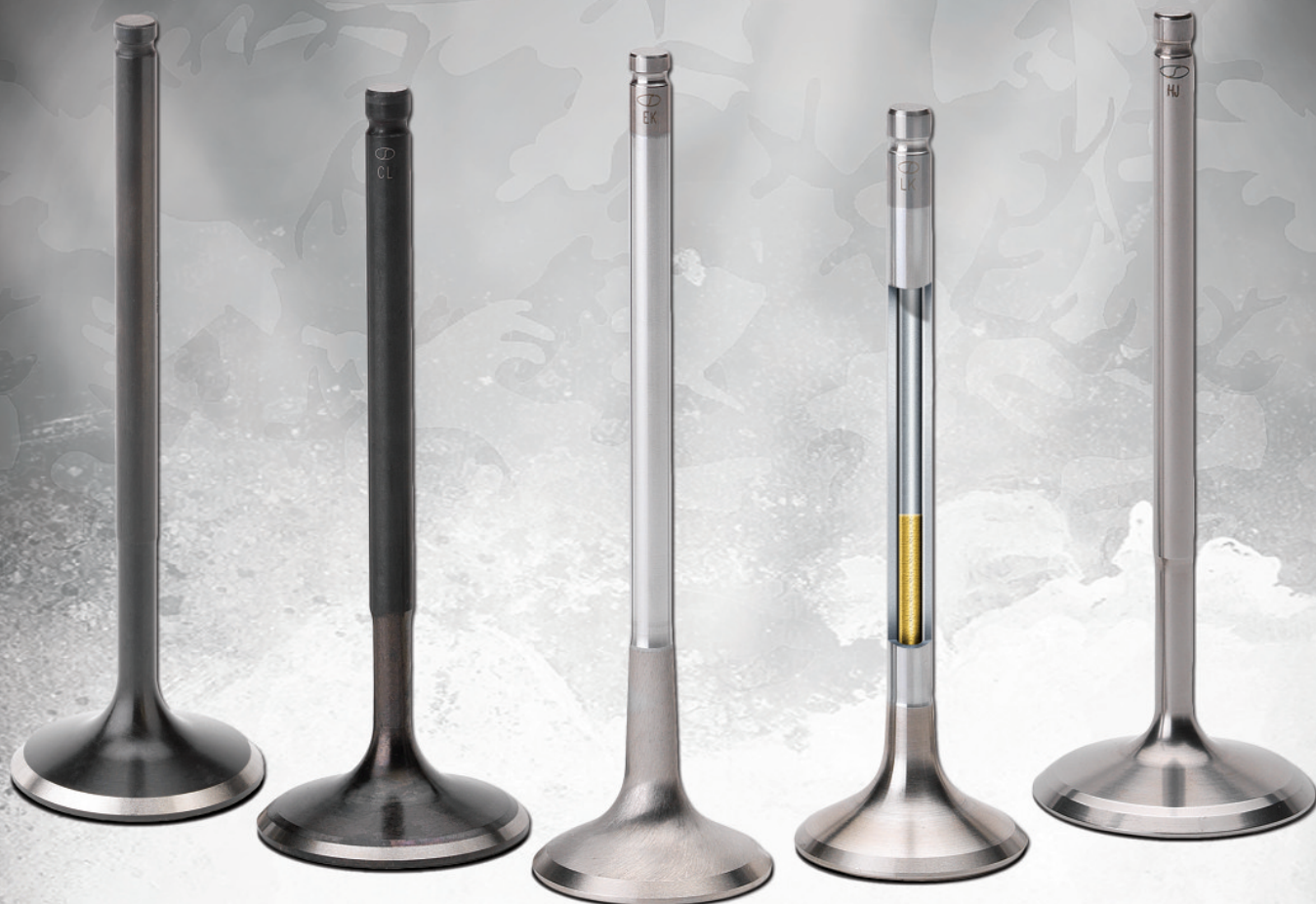
"This is a landmark moment for Supercars, solidifying an iconic global automotive brand on our grid from 2026," Howard said. "It's a testament to the immense popularity and international appeal of our sport that a powerhouse like Toyota has chosen to join our grid."

The deal is also a major coup for WAU, which began life as a Holden team in 1990, and after a long and decorated stint with Commodores, began racing Ford Mustangs in 2023.

From 2026, WAU – which was the Holden factory team for nearly 30 years – will be a homologation team, something of key importance to Team Director Ryan Walkinshaw.

"Toyota's commitment to our team and to the sport is a historic moment, and one that shouldn't be underestimated," Walkinshaw said.

"While the future is certainly exciting, our immediate focus is on the remainder of 2024 and the 2025 seasons, winning races, and sending off our relationship with Ford the right way." **TM**



CHOOSE YOUR

WEAPON

STREET PERFORMANCE / HIGH PERFORMANCE / INCONEL / SODIUM FILLED / TITANIUM VALVE

FUSING PERFORMANCE, DURABILITY, AND SUPERIOR CRAFTSMANSHIP THERE ISN'T A BETTER CHOICE FOR PERFORMANCE VALVE TRAIN COMPONENTS. CHOOSE YOUR WEAPON AND DESTROY THE COMPETITION.

WWW.SUPERTECHPERFORMANCE.COM



IndyCar charter is passed

INDYCAR has confirmed the establishment of a charter system that will effectively create an elite club for owners of 10 teams, for 25 entries, competing for a full season.

"This is an important development that demonstrates an aligned and optimistic vision for the future of our sport," said Mark Miles, Penske Entertainment Corp President and CEO. "I want to extend my sincere appreciation to our team owners for their collaboration and ideation throughout this process."

The first charter system to be introduced in the history of the series – different to the franchise system operated during the CART/IndyCar era – is also testimony to the power of Roger Penske. The concept has been years in the making and, until very recently, a couple of teams were still holding out on certain details.

A chartered entry will be guaranteed a starting position on the grid at all NTT IndyCar Series races, excluding the Indianapolis 500. An entry also must be chartered to qualify for the annual NTT IndyCar Series Leaders Circle programme – which compensates the 22 top finishers in the prior year's championship. The terms of the initial, long-term charter agreements are committed through the end of 2031.


The breakdown of charters, limited to three per team, is: AJ Foyt Racing (2), Andretti Global (3), Arrow McLaren (3),

Chip Ganassi Racing (3), Dale Coyne Racing (2), Ed Carpenter Racing (2), Juncos Hollinger Racing (2), Mayer Shank Racing (2), Rahal Letterman Lanigan Racing (3), and Team Penske (3).

The charter effectively introduces a cap of 27 entries per grid, outside of the Indy 500.

"It is incredibly challenging to get a large group of owners to agree on something, and certainly there was some give and take, but, in the end, I believe this is a path that is beneficial for all of the owners and for IndyCar, while also maintaining the availability for open competition," commented Larry Foyt, for A.J. Foyt Enterprises.

"When you look back in the modern era of IndyCar racing, you will look at a few important moments, the first being the unification of the sport, the next being Roger Penske buying the IndyCar Series and IMS, and I truly believe the third will be the charter system," said Chip Ganassi, Chip Ganassi Racing.

"The charter agreement, to me, is the single-most important piece for the future of the series," commented Michael Shank on behalf of Meyer Shank Racing. "I'm grateful that we all came together on this and thank the Roger Penske group for working with the team owners for getting it done." 



BELOW The IndyCar charter system has been years in the making

Penske Entertainment

McCool to rejoin Lola Cars

PETER McCool has returned to Lola Cars as its new technical director.

As well as being part of Lola in its previous guise between 2009 and '12, McCool's extensive résumé includes holding senior design and engineering positions at McLaren and Super Aguri in Formula 1, as well as at Mercedes' Formula E team which secured back-to-back drivers' and constructors' title doubles in 2020-21 and 2021-22. He will be a key part of the Lola operation as it returns to motorsport in the all-electric series in partnership with Yamaha and Abt.

"I'm looking forward to leading a team


of extremely talented engineers, designers and mechanics," said McCool. "Together we will maximize the potential of this iconic British constructor as we return to the top tier of motor racing, while also developing cutting-edge technologies that will re-establish Lola as a leader in sustainable engineering and motorsport."

McCool's predecessor in the technical director role, Mark Tatham, has led the development of Lola's Gen3 Evo powertrain so far, and will remain part of the company as a technical consultant.

"We're hugely excited to welcome Peter to the team as our new technical

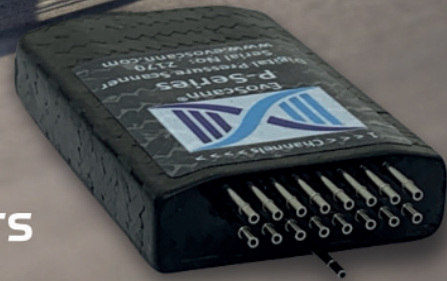
director," said Lola Cars chairman, Till Bechtolsheimer. "Peter's pedigree and expertise speaks for itself, and his familiarity with the Lola team will undoubtedly stand him in good stead to spearhead the technical development across our ongoing and future motorsport projects."

"Beyond his motorsport credentials, Peter's experience in applied technologies provides a valuable synergy with our overarching business aims, as we continue to expand our technology and capabilities."

Lola's return to motorsport via Formula E will commence in earnest in November when pre-season takes place in Spain. 

Real-Time Aerodynamic Data At Your Fingertips

with EvoScann® Miniature Pressure Scanners



Revolutionise your Aerodynamic testing with
EvoScann® miniature pressure scanners:

- Ultra-compact design
- Absolute or True-Differential pressure measurement
- CANbus/CANbus FD interface for seamless integration
- 8 or 16 channels of digital data
- High accuracy and stability: full-scale accuracy up to 0.1% and scan speed up to 1000 Hz
- Direct engineering unit output
- FIA homologated
- Robust carbon fibre construction



Request a quotation today

Call: +44 (0) 1264 316470

Email: enquiries@evolutionmeasurement.com

North America Enquiries: +1 512 210 2288

Email: alberto.villani@evolutionmeasurement.com



EvoScann®

www.EvoScann.com



Firestone signs IndyCar extension

BRIDGESTONE Americas (Bridgestone) and Penske Entertainment have announced a long-term extension to Firestone's role as the exclusive tyre supplier of all IndyCar-sanctioned racing.

The agreement will keep Firestone as the sole tyre supplier for all NTT IndyCar Series races, the INDY NXT by Firestone developmental series, and the annual Indianapolis 500 presented by Gainbridge.

Firestone is currently in its 25th consecutive season as the exclusive tyre supplier for the series. The Firestone brand continues its rich history in open-wheel racing, dating back more than a century.

"At Bridgestone, motorsports are our passion – always have been and always will be. This is particularly true for our Firestone brand, which has been part of world-class racing since winning the

ABOVE Firestone has used guayule-derived natural rubber in the sidewall of alternate race tyres the past two seasons

first Indy 500 in 1911," said Paolo Ferrari, executive chairman and CEO, Bridgestone Americas. "We believe motorsports are the ultimate challenge for premium performance and a proving ground for advancing in our goals toward sustainable innovation."

Through the Firestone brand, Bridgestone has worked closely with IndyCar to help advance developments in more sustainable racing. Bridgestone incorporated certain materials made from hard-to-recycle plastics and palm oil waste residue in Indy 500 race tyres in 2023 and 2024. The company has also used guayule-derived natural rubber in the sidewall of alternate race tyres the past two seasons.

"Our relationship with the team at Bridgestone continues to set an industry standard for success and innovation," said Roger Penske, chairman of Penske Corporation. "Firestone has been a foundational partner for our sport, from the very first Indy 500 to now, playing an integral role in the development of the NTT IndyCar Series and its highly competitive racing."

The long-term extension also renews Firestone's status as official partner and tyre supplier of Indianapolis Motor Speedway, the world's largest spectator sporting facility.

All Firestone Firehawk race tyres are designed and manufactured at the Bridgestone Advanced Tyre Production Center (ATPC) in Akron. The facility opened in 2022 across the street from the Bridgestone Americas Technology Center (ATC). This proximity allows the Firestone Race Tyre Engineering team to work side-by-side with other tyre engineers to transfer insights from racing into other innovation workstreams. **IT**

Xtrac wins third Princess Royal Training Award

TRANSMISSION pioneer Xtrac has received its third Princess Royal Training Award. It is the only company in the automotive and motorsport industry to win the apprenticeship training mark of recognition for a third time.

Her Royal Highness, The Princess Royal, will present the award at a ceremony where 52 award winners, including Bentley Motors and Lotus Cars from the automotive sector, will gather in November.

"We're delighted to receive this accolade again because it recognises our long-standing investment in developing the proficiency of all our multi-skilled employees," said Xtrac's chief executive,

Adrian Moore, who began his career as an undergraduate sponsored by Rolls-Royce.

"The hard work we put into our training schemes ensures the capability of our future workforce for the benefit of all



ABOVE The Princess Royal Training Awards were created by City & Guilds

stakeholders, including our customers, employees, investors, and suppliers. It is the cornerstone of our success."

Xtrac was previously recognised in 2018 and 2021 for its apprenticeship programme. Since then, it has opened its own in-house training academy and enhanced its mentoring network, resulting in a visit by Her Royal Highness in 2022. During the visit to Xtrac's global headquarters in Thatcham, located in Berkshire, Dame Ann Limb DBE DL, chair, and Kirstie Donnelly MBE, chief executive, were in attendance alongside Her Royal Highness, who serves as President of the City and Guilds of London Institute.

Over 30 per cent of Xtrac's employees are under 30. Hence, continual investment in training is crucial to its ongoing business growth, with recent investment in additional state-of-the-art test facilities and significantly increased manufacturing capacity to meet growing global demand. **IT**

Be last.

Being the last on the brakes isn't just a test of skill, it's also a test of how much confidence a driver has in their brakes.

With unique **Fade Resistant Technology™**, **Halo P1** has a far lower and far more stable level of compressibility over a wide temperature range than the competition—giving drivers the confidence that their brake fluid will perform as well on the last lap as the first.

Formulated for the art of braking.

halo.
By Orthene.

halobyorthene.com





ABOVE The new car is a significant step forward in terms of safety and sustainability

F3 2025 car carries FIA into new territory

THE FIA's new Formula 3 car has been hailed by the governing body's President, Mohammed Ben Sulayem, as "a pivotal moment" in developing the next generation of racing talent.

Built by Dallara, the F3 2025 features an unprecedented level of safety for this level of the sport, featuring greater anti-intrusion technology than its predecessors.

The machine also leverages the extensive aerodynamic research that informed first the latest generation of F1 cars, then subsequently the new F2 and F1 2026 designs. Those cars were developed heavily in Computational Fluid Dynamics, backed by the use of generative Artificial Intelligence, to minimise the generation of a dirty wake that would rob the following cars of downforce.

Even though F3 relies less on downforce than its big sister formulae, the new car is said to feature a 10 per cent improvement of the harmful wake of the previous model.

The new car, which will be raced in the 2025, 2026 and 2027 F3 seasons, also represents a major step forward in terms of sustainability. It will blaze a trail for the 100 per cent sustainable fuel due to be used in F1 in 2026, by running a fossil-free fuel under development by Aramco.

This fuel, also planned to be used in the F2 Championship, is intended as a step forward in the Formula 1 group's drive to be Net Zero by 2030. The new car will also run on new Pirelli 16" tyres which from 2025 will have a natural rubber component certified by the Forest Stewardship Council (FSC).

Several parts of the F3 2025 will even use recycled carbon.

"This car is more than just a step forward in technology and sustainability; it represents a critical step in the FIA's single-seater ladder," said Ben Sulayem. "By aligning closely with FIA Formula 2 and Formula 1 aerodynamics, the new F3 car offers young drivers an essential platform to develop their skills, preparing them for the challenges that lie ahead in the higher categories.

"In addition to updated safety and performance, we are proud that this new generation of cars integrates cutting-edge technology initiatives aimed at helping to reduce racing carbon emissions, running on advanced fuel that meets the FIA's 100% sustainable fuel standard, just like Formula 1 from 2026. This demonstrates our commitment to work towards lowering motorsport's greenhouse gas emissions while driving innovation.

"Moreover, the enhanced cockpit design reflects our ongoing efforts to make motorsport more inclusive, ensuring that drivers of all physical profiles have the opportunity to compete at the highest level. This new FIA Formula 3 embodies the FIA's vision of a sport that is progressive, inclusive, and sustainable."

The car is powered by a bespoke 6-cylinder 3.4-litre naturally aspirated Mecachrome engine, which delivers 380 horsepower at 8000 rpm.

Its new cockpit has been designed to improve the ergonomics and driver installation to accommodate a wide

range of racers. Car systems will still include marshallings such as Virtual Safety Car (VSC), an optimised Drag Reduction System (DRS) and a new Marelli Vehicle Control Unit (VCU), identical to the current F2 car.

The F3 2025 made a successful shakedown test in June in Varano, with former F2 driver Tatiana Calderon at the wheel. Since then, it has covered 2,000 kilometres across several development tests. A first car will be delivered to the teams before the end of December 2024.

"We have designed a machine that is challenging, safe, and the perfect tool to prepare young drivers who aspire to race in F1 in the future," said FIA Formula 3 Championship CEO Bruno Michel.

"As always, controlling costs has remained a hot topic when designing the F3 2025, so we have made sure to keep them as low as possible. We have also ensured that this new car can be managed with 11 operational people, as per the Sporting Regulations.

"I would like to thank our partners Aramco, Pirelli, Dallara, and Mecachrome, whose expertise and knowhow make this new car the best tool to prepare the F3 drivers on their way to the pinnacle of motorsport." **FI**



F3 2025
Page 60

Extreme H car passes crash tests

THE world's first hydrogen racing series, Extreme H, passed a significant landmark last month when its Pioneer 25 race car successfully negotiated its mandatory chassis FIA crash tests.

This marks a major milestone moment for motorsport, with the Pioneer 25 becoming the first-ever hydrogen-

powered car to meet the FIA's crash test regulations, centred around side impact and rollover safety.

Mark Grain, Technical Director at Extreme E, said: "I am pleased to say that the Extreme H Pioneer 25 passed with flying colours.

"We shouldn't underestimate this. It's

the first hydrogen race car that's met stringent FIA criteria. We've worked with the FIA to define these crash tests and there's been huge collaboration in order to achieve this important milestone. No other hydrogen racing cars have gone through crash tests like we have, so that's a big achievement. "The chassis itself is much stronger, however we've added carbon composite crash structures that are sitting over the two hydrogen tanks, and also for the side impact test we've got composite structures either side that are energy absorbing. The hydrogen high-pressure and low-pressure systems were also fitted during the tests. The systems were pressurised for both tests, and the pressures within them were monitored as live data. That was to ensure the systems were not damaged and lost pressure."

"I'm pleased to say that in each of the tests both high and low pressures were maintained and that's the indication that there was no damage to the hydrogen system."

The next significant step is for the Pioneer 25 car is to undertake FIA resilience tests for its tanks and battery packs. Further track testing will then be undertaken later this month.

Production of the Extreme H cars for its inaugural campaign will also begin in the coming weeks, with their delivery to teams expected before the end of 2024. **RT**



ABOVE The Pioneer 25 is on course for its 2025 debut season

Extreme E axes last three events

EXTREME E is "reviewing alternative solutions" to finish its season, having canned the last three events.

The electric off-road series will become Extreme H next year and has been carrying out development work for its new Pioneer 25 race car while simultaneously continuing with the final campaign of Extreme E races with the battery-electric Odyssey 21.

While the 2024 season was always envisioned as a flexible transition season ahead of Extreme H's full-scale debut next year, the huge level of resources

required to run both the remainder of the 2024 season while preparing for Extreme H in 2025 has led to the series taking a strategic pivot to where it will now focus all of its resources on Extreme H.

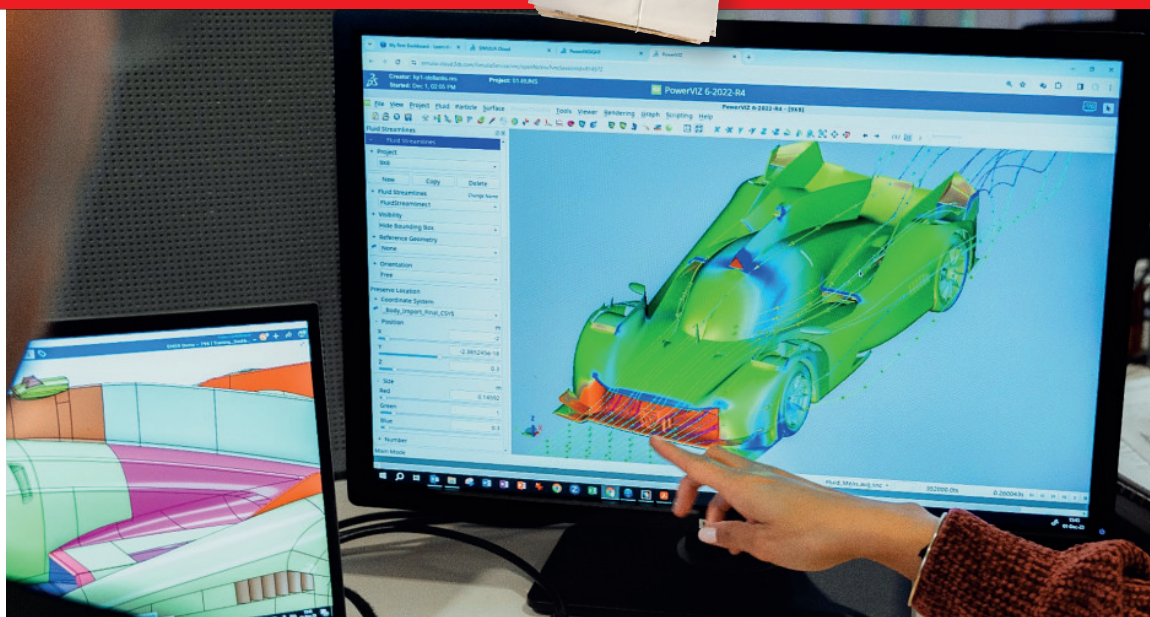
"In this current year of evolution, we all want to find a conclusion to Extreme E, which enables us to finish what we started, whilst at the same time, allows us to commit maximum resources into our Extreme H developments," said Extreme E founder and CEO Alejandro Agag.

"We are working closely with our teams and stakeholders to find alternative solutions

to fulfil Extreme E's final season schedule."

Despite the unexpected pause on the 2024 season, Extreme E insists the 2025 Extreme H debut is unaffected, and it is currently working through what that season may look like.

"As we continue our transition to Extreme H, we are fully committed to becoming the world's first hydrogen racing series," said Agag. "The investment and progress in the innovations are in full flow. Excitement grows every day as the industry continues to turn its head towards the possibilities hydrogen presents." **RT**



LEFT Dassault Systèmes is among the heavy-hitters represented at CTS24

CTS24 set to break records

NOW in its third year, the Motorsport Industry Association's CTS trade-only show is set to break new records when it returns to the Silverstone Wing on 16-17 October.

The event features more than 100 exhibitors from the motorsport and high-performance engineering sectors.

Among them will be Dassault Systèmes, a leading provider of 3D design, simulation, and product lifecycle management solutions for the motorsport industry with notable presence in F1, endurance racing and Formula E.

Partnering with Dassault Systèmes, Peugeot Sport adopted the 3DEXPERIENCE platform to build its new 9X8 hybrid Hypercar. "Time in the wind tunnel is expensive. In a well-organised session, we'd plan to test three underfloors, which we'd have to design and build, taking around three months in total," said Olivier Janssonie, Technical Director of Peugeot Sport. "Using SIMULIA on 3DEXPERIENCE through the Virtual Twin as a Service, we can do the same types of analysis in a single day. It's a huge time and cost saving."

Ricardo is another attendee boasting a stellar client list that spans F1, the WRC and Formula E.

Alongside its world-class capability in engineering and manufacturing, Ricardo will be showcasing its highly customisable

transmission solutions for high-performance and specialised electric vehicles at CTS24.

Among them will be its Epicyclic Reduction Drive, which is capable of handling up to 425 Nm with a maximum input speed of 20,000 RPM and is designed for flexibility in ratio and motor interface. This planetary reduction drive unit is suitable for hub-mounted applications. It is designed for customers requiring a dual motor solution on each axle and ease of torque vectoring.

Lola Cars, the most successful manufacturer of customer race cars of all-time, is in the midst of reinventing itself as an industry leader in sustainable engineering and motorsport, focusing on electrification, hydrogen and sustainable fuels and materials. The machine with which it returns to motorsport this November, its Gen3 Evo Formula E car, will feature at CTS24.

Renowned for its manufacture of chassis, Lola will place an unprecedented emphasis on its powertrain expertise in its latest incarnation. Its Formula E powertrain, developed in collaboration with Yamaha, is a spectacular introduction to this change of strategy.

M-Sport is another company which is adapting to the fast-changing landscape of global motorsport. The mastermind of Ford's World Rally Championship programme, with seven world titles to its credit, the Cumbrian outfit will now also

lead Ford's multi-year attack on the Dakar Rally. At the same time it is responsible for the BTCC TOCA control engine and the all-new Ford Mustang GT3 powerplant.


The M-Sport feature display at CTS24 will showcase six of its race engines, including the Puma Rally1, GT3 Mustang engine, Fiesta Rally2 engine, Ford Raptor, BTCC and RallyX.

Hydrogen is one of the next frontiers in motorsport. AVL RACETECH, one of the pioneers intent on conquering it, will be present with its prototype hydrogen combustion two-litre turbo engine.

Until now, H2-ICEs have been somewhat renowned for low performance figures and lean-burn. AVL RACETECH is banishing that preconception, using an intelligent PFI water injection to extract impressive performance from its innovative new powerplant.

Elsewhere, Alcon Brakes returns to CTS for the fourth consecutive year as both a partner and exhibitor. It will showcase the likes of its Aston Martin Valkyrie pedal box and brakes, its rally raid caliper range, currently featured on the Ford and Dacia challengers, plus its award-winning SMART insert technology.

The energy transition sweeping the automotive world has increasingly seen motorsport used as the proving ground for emerging technologies with EV/Hybrid powertrains a key area of research. The trend has posed huge challenges not just for the manufacturers of the alternative propulsion systems but – as demonstrated last year in both Formula E and Rallycross – for the innovators responsible for fire suppression technology when things go wrong.

Lifeline Fire & Safety Systems has risen to this challenge with the launch of its latest 8865-2015 system, the Zero EV, which will be available to see at CTS24. 

First continuation Rouse RS500s delivered

CNC Motorsport has delivered the first continuation Andy Rouse Engineering specification Ford Sierra RS500 Group A racecar.

Created in partnership with the four-time saloon/touring car champion, it is one of three RS500s that the road and race preparation specialist is building for use on track.

Alan Strachan, an employee of Andy Rouse Engineering during the period of 1989-96 and mechanic on the Team Labatts Sierra RS500 in the British Touring Car Championship, and his son Andrew, assembled the first car over the past 24 months alongside other projects including Group A BMW 635CSI build, the restoration of a Merkur XR4TI and period Sierra RS500.

The second car is already in build and it will use a brand-new motorsport specification bodyshell that was acquired at the start of the project. A third donor shell has already been sourced for the final car.

CNC Motorsport completed all the fabrication work to the bodyshell alongside

producing all of the machined parts, such as uprights, rear arms, hubs, brake calipers, wheel centres and roll cage in house, to the exacting specification of the period Andy Rouse Engineering cars. Input from Andy and drawing on his own time with the team, as well as access to a period Labatts Sierra that CNC Motorsport engineers today, ensured that the build was faithful to the original cars. That includes using Getrag five-speed gearbox, period style gauges, fuel tank enclosure and roll cage that matches the specific Rouse design. CNC Motorsport remains the only certified producer of period ARE cages by the governing body, Motorsport UK.

The first car features a 575 bhp Cosworth YB engine built by Harvey Gibbs and later 10" viscous differential.

"This project has enabled us to build a reliable, period correct car that will be competitive in historic motorsport for the fraction of the cost of an original," said Alan Strachan. "These are to be enjoyed, raced hard and fair and without the concerns of taking a valuable, period car on track. The fans love to see these flame-

spitting RS500s on the limit and they open the door to take part in a huge array of events across Europe."

The Sierra Cosworth RS500 was announced in July 1987. Just 500 were produced with a number of key upgrades to boost its performance in Touring Car racing. These included a larger Garrett turbocharger, bigger intercooler, a second fuel rail, different injectors and cooling system. Externally it featured an additional rear spoiler, front splitter and the fog lamps were removed to improve brake cooling. Just 500 road cars were produced with race cars built from 909 Motorsport shells just as the Rouse continuation car will be.

Father-and-son team Alan and Andrew Strachan run specialist motorsport engineering business CNC Motorsport, which is based in the heart of The Cotswolds, UK. Alongside a burgeoning machining operation, the pair restore and recreate historic 1970s and 80s touring cars, utilising new materials and processes such as CNC and 3D printing technologies to get more of these popular competition vehicles back on track. **RT**

BELOW With full HTP papers, the continuation car (left) can be used at historic race events





RACE TECH WMS World Motorsport Symposium

At the prestigious **Royal Automobile Club** in Pall Mall, London

Tuesday 26th and Wednesday 27th November

THE DAVOS OF MOTORSPORT 2024

Speed with Sustainability - Redefining Motorsport Technology

The worldwide energy transition and fight against climate change are influencing every aspect of racecar design. Topics will therefore include: **battery technology, sustainable fuels, hydrogen, hybridisation, aerodynamics, women in racing and the use of Artificial Intelligence.**

THE CHAIRMEN



ULRICH BARETZKY

Former Director, Audi Motorsport
Engine Development,
Audi AG



PAT SYMONDS

Former Chief Technical
Officer Motorsport Division,
FORMULA 1®

SAVE THE DATE

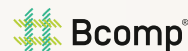
NOVEMBER

26

NOVEMBER

27

SPONSORS





PRICES



To order
tickets
scan here

2 days delegate pass and Awards dinner -£749

1 day delegate pass and Awards dinner -£595

2 days delegate pass - £695

1 day delegate pass - £450

Awards dinner only - £295



“Another great learning experience for the two of us that attended from NASCAR. The topics were very relevant to the future of motorsport, and challenged us to look deeper into some areas of development that we had not previously considered or perhaps considered seriously enough. As always, the collegial atmosphere and lively debates and conversations make for a great event. I am looking forward to seeing everyone again next year and hearing about the advancements another year brings.”

Eric Jacuzzi, Vice President, Vehicle Performance, NASCAR



RACE TECH WMS World Motorsport Symposium

THE CHAIRMEN



ULRICH BARETZKY
Former Director, Audi Motorsport
Engine Development,
Audi AG



PAT SYMONDS
Former Chief Technical
Officer Motorsport Division,
FORMULA 1®



JOHN ILEY
Founder and Director,
Iley Design Limited

THE CABINET MEMBERS (Confirmed to date)



LARRY HOLT
Executive Vice President - Multimatic
Special Vehicle Operations Group
Multimatic Engineering



BERNARD NICLOT
ACO's Mission H24
Innovation Director



ERIC JACUZZI
Vice President, Vehicle
Performance at NASCAR



THIERRY BOUVET
ACO, Competition Director



PASCAL VASSELON
Vice President TGR Strategic
Motorsport Development



JASON SOMERVILLE
Head of Aerodynamics
FIA



DR VALERIA LORETI
Delivery Manager Motorsport,
Fuels Technology Group,
Shell Global Solutions
(Deutschland) GmbH



DAVE GREENWOOD
Director for Industrial
Engagement, and CEO of the
High Value Manufacturing
Catapult at University of Warwick



DAVID SALTERS
President of Honda Racing
Corporation USA (HRC US)



PIERRE-JEAN TARDY
Chief Engineer Hydrogen at
Alpine Racing



ADRIAN MOORE
CEO, Xtrac



DR. NEIL ASHTON
WW Tech Leader, CAE, Advanced
Computing and Simulation team,
Amazon Web Services



ROBIN TULUIE
PhysicsX, Founder



ALEX SUMMERS
Prototype Design & BIW Manager
at Aston Martin Lagonda Ltd

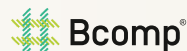


DOUGLAS CAMPLING
Head of Motorsport,
Fortescue Zero



DAVID SALTERS
President of Honda Racing
Corporation USA (HRC US)

SPONSORS





RACE TECH
WMS 
World Motorsport Symposium

AWARDS 2024

Award nominations now open

RACE TECH's Editor Mark Skewis and his panel of industry experts are looking for ground-breaking motorsport technology that enables a positive impact on the environment. If you believe that your product should be considered, **apply by 22 October 2024** with a short brief to info@worldmotorsportsymposium.com. A member of the team will then contact you for further information.

Nominees and winners will be announced at the World Motorsport Symposium Champagne Drinks Reception and Networking Awards Dinner on the evening of Tuesday 26 November 2024, to be held at The RAC Club in Pall Mall, in front of key influential global leaders in the motorsport and automotive industry.

WMS AWARDS CATEGORIES 2024

- Green Tech
- Most Innovative New Motorsport Product
- Race Powertrain
- Racecar Aerodynamicist



HOW THE BOYS FROM THE FARMYARD CAME GOOD!

Gary Watkins discovers how a dressing-down from Bill Gibson inspired the World Endurance Championship's 'David' to become a 'Goliath'

RIGHT A customer programme with Porsche's 963 was both a statement of intent and a way of getting a foot in the Hypercar door, but a works deal was always the target



DPPI

THE boys from the farmyard”, as they have taken to calling themselves, have ascended to the factory ranks in the Hypercar class of the World Endurance Championship. The British Jota squad, based on a farm near Tonbridge Wells in Kent, will mastermind Cadillac’s assault on the world championship with its V-Series.R LMDh in 2025. It sounds quaint, but behind the delightful name of the team’s location – Stubby Grove Farm – lies an ambitious and successful operation with a rich CV in the WEC and beyond.

Jota has no fewer than 10 LMP2 podiums to its name at the Le Mans 24 Hours in addition to a class drivers’ title

in the WEC (2022) and an outright one in the European Le Mans Series (2016), not to mention a first Hypercar class victory notched up at the Spa 6 Hours in May of this year. With that kind of pedigree it should be no surprise that a tie-up with a manufacturer as its factory representative was its aim.

That goal became a reality when Jota was announced as Cadillac’s partner for the WEC, in which it will run a pair of the General Motors brand’s LMDhs developed in conjunction with Dallara Automobili. Its deal is part of a major overhaul – and expansion – of the marque’s endurance racing programme for the coming season: Chip Ganassi

Racing, which ran a solo V-Series.R in each of the WEC and the IMSA SportsCar Championship in North America, has been replaced in the former by Jota with two cars as per new rules governing manufacturer entries in WEC and Wayne Taylor Racing with Andretti, also with a pair of V-Series.Rs, in the latter. Action Express Racing will continue to field a single entry in IMSA’s GTP class in 2025.

Jota moved up to the Hypercar ranks last year as a customer of Porsche, running a solo 963 LMDh from round three at Spa before a second car came on stream for this year. A customer programme was a way of getting a foot in the door, but a works deal was always ►



the aspiration. That, reckons Jota co-founder and director Sam Hignett, has come earlier than expected.

"When we first started looking at Hypercar we were thinking of ways we could get a manufacturer deal," he explains. "We always knew that the next wave of manufacturers wouldn't arrive until 2026 at the earliest and that was one of the things we were targeting. So to get on board with an existing manufacturer for '25 is great."

The ambition

It is not quite right to say that Jota was aiming to graduate to the top

class of international sportscar racing in Hypercar. The correct verb would be return. Because early in the team's existence it competed in the Le Mans Endurance Series with a Zytek 04S in 2004-05, competing with the LMP675 contender when that class was merged with LMP900 to create LMP1, and subsequently as a service provider for Zytek and entrants such as Charouz Racing Systems, Team Cytosport (nee Pickett Racing) and Corsa Motorsports. But Hignett admits that those aims were more or less unachievable in WEC during the LMP1 era when Audi, Toyota and Porsche were duking it out with high-tech hybrid

rocketships backed by nine-figure budgets.

"We always talked about there being a glass ceiling for us in WEC," he says. "We were always knocking on the ceiling trying to get to the next floor, but really LMP1 was unattainable when it was Audi v Toyota v Porsche. There wasn't a privateer-friendly rule book in the P1 days. The budgets were crazy and if you were a customer you never knew what the manufacturer who'd sold you the car was going to turn up with at the next race. It would have been impossible for a team like us to compete at that level."

The publication of the Le Mans Hypercar rules at the end of 2018 and then the



ABOVE David becomes Goliath next season: instead of chasing a works Cadillac, Jota will be running GM's two-car factory team

so-called convergence announcement in January 2020, offering a second route into the WEC's top class with LMDh machinery, modified the landscape of international endurance racing. But while regulatory shifts left the door ajar for Jota, the team felt compelled to yank it wide open by a further shift in the sands of sportscar racing. Or rather a rumoured one that eventually came to pass.

"We really kicked on when the rumours started that P2 was going to go away in the WEC," says Hignett of a move that came into effect this season on the arrival of LMGT3 in the WEC alongside the booming Hypercar division. "We were

facing the prospect of our business hitting a dead end. Were we going to go back to the ELMS? Nothing wrong with that, but we'd got to the level of winning world championship titles, so that's where we wanted to stay. Obviously we were always interested in LMH and then more so in LMDh, but the real call to action came when we realised that we could go out of business here unless we did something."

Porsche's commitment to provide customer cars in year one of the 963 opened a pathway for Jota's graduation, and an attractive one for a privateer: strict homologation rules in LMH and LMDh mean that an independent can go up against the factory team with identical machinery. Jota was able to push forward with its plans when it found backing from Hertz and Knighthead Capital Management, the venture group that rescued the global car hire giant from Chapter 11 administration in 2021. It is also an investor in Singer Vehicle Design, a company well known to Jota director David Clark, who admitted that he had "get creative" to find the backing necessary to step up to Hypercar.

Clark explains that he "sowed a little seed" with Knighthead co-founder Tom Wagner. The pitch was to create an iconic livery on a Porsche endurance racing car. There are Rothmans cars, Newman cars and there could be, teased Clark, Hertz cars. "One day he rang me up and said, 'I like it,'" says the former McLaren Cars sales director and, for a short time, motorsport boss.

“There are Rothmans cars, Newman cars and there could be Hertz cars!”

The ascent to a factory team

Jota made its mark – proved its credentials, if you like – almost immediately in Hypercar. The delivery of its first 963 might have been delayed until the third round of the WEC last year, but at round four – the big one in France on the middle weekend of June – the 'Hertz Porsche' led the race in mixed conditions on Saturday evening in the hands of Chinese driver Yifei Ye. Fast-forward to the Bahrain finale in November, and Jota had the fastest 963 in the place on the way to fourth position ahead of the factory Porsche Penske Motorsport entries with the car driven by Ye, Antonio Felix da Costa and Will Stevens. That was followed by a third-place finish in Qatar at the start of this year's WEC – Stevens now joined by Callum Hogg and Norman Nato – and then the victory at Spa, the first anniversary of Jota's ascension to the Hypercar ranks.

Jota's deal with Cadillac might not have been announced until July, but it was done, or as good as, by the time Stevens and Hogg notched up the Spa ►

victory with a little help from a controversial restart beyond the original scheduled finish time of the six-hour race. (Nato was absent on the big day because he was racing for Andretti in the Formula E World Championship in Berlin that day). The backstory of how it got there is a drawn out one that goes all the way back to WTR's defection to the Acura camp after the 2020 season for the final years of the Daytona Prototype international era in IMSA.

WTR was replaced by Ganassi with one DPi-V.R for the following season and two in 2022. That two-car effort was effectively split in half for 2023 when the V-Series.R LMDh came on stream: Ganassi again ran two cars under the Cadillac Racing banner, one each in IMSA and WEC. The US team was vocal last year in its ambition to run two cars in WEC like its major competitors, but it was vetoed on

“These cars generate so much data that you would need scores of engineers to analyse it all. AI shows you where the potential might be”

BELOW Jota has no fewer than 10 Le Mans LMP2 podiums to its name, both in its own right and in collaboration with other teams, including second and third overall in 2017 (bottom)



Red Bull Content Pool

grounds of costs. Mark Stielow, director of motorsport competition engineering at GM, explained that there were “cost constraints” for a manufacturer involved in multiple motorsport disciplines – and with an engine programme on the stocks for its proposed Formula 1 entry with Andretti Global.

Ganassi unilaterally announced that this season would be the last running Cadillac's prototype programmes back in March. That preceded the decision for Cadillac to go with Jota, but what was becoming increasingly clear was that GM needed buy-in from its partner teams on both sides of the Atlantic. Jota has Hertz as its primary sponsor, while WTR's primary backer is office technology company Konica Minolta. Laura Wontrop Klauser, GM's sportscar racing programme manager with responsibilities straddling the V-Series.R and the Chevrolet Corvette Z06 GT3.R, has alluded to this. “You have to consider everything; resources are part of the decision,” she says. “Let's be real, money makes the world go round. It is always part of the decision-making process but it is not the only part.

“You look at Jota's history and heritage, and they have been doing Le Mans for more than 10 years and they ‘podiumed’ in LMP2 almost every year and then stepped up to Hypercar, the first P2 team to do that, and immediately found success. It is very hard to argue with a resume like that.”

How will Jota change?

Not a lot, reckons team technical director Tomoki Takahashi. Additional engineering resource will come, he explains, not from an expansion of the team but from the input from Cadillac and Dallara.

“We have been bolstering the team since 2018, '19 time,” says Takahashi, who moved up to become tech director at the start of the 2021 season after joining Jota as a race engineer four years earlier. “We knew that we wanted to move up to



Photos: DPPI



Hypercar from that time and started to increase our engineering capacity, which happened to coincide with the arrival of heavyweight teams like WRT and Prema in P2 [in 2021 and '22 respectively] who were you could say already bolstered.

"When I joined Jota in 2017, it was just me and the other race engineer. Now it is rather more, though I would prefer not to say how many. The difference between a customer and a factory programme is that, as good as Porsche is in terms of its support, right now we don't have direct access to the person who designed that part or that widget. That will change when we become a factory team. We will have direct access to the people who developed the car: we will be able to tap into their expertise and knowledge. What Cadillac and Dallara will bring to the table is more context, if you like, as we try to get the most out of the car."

Harnessing Artificial Intelligence

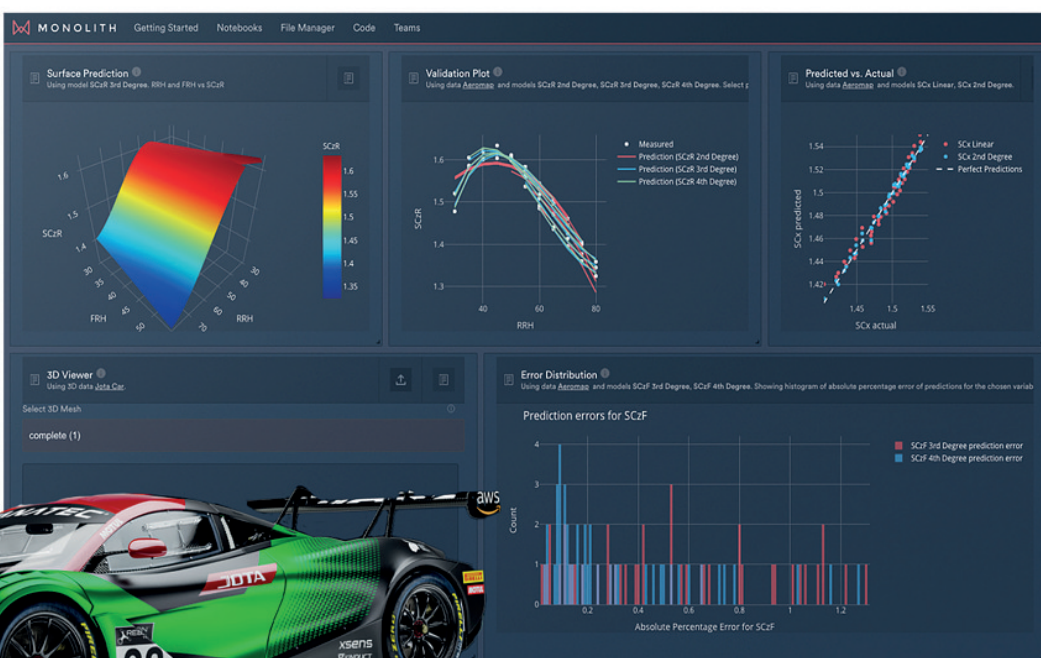
Jota will, however, bring its own expertise to the deal, including the use of artificial intelligence, an area in which it is believed to be a leader in the WEC. It forged a partnership with British company Monolith AI at the end of 2020 and believes that it will be an increasingly important tool now that it is in Hypercar.

The use of AI, says Takahashi, universally known as Taka at Jota, will allow the team to take short cuts in the development of a car. That will be important as it looks for the incremental gains necessary to achieve success in a strictly-controlled Balance of Performance formula.

"These cars generate so much data that you would need scores of engineers to analyse it all," he explains. "AI helps you process that data ►

ABOVE & TOP The squad also performed heroics at this season's Le Mans 24 Hours, but of a different kind, building up a spare 963 chassis after a heavy crash in free practice. The feat was accomplished in just 24 hours and the team given dispensation for a shakedown at the local airfield before the race

RIGHT Jota was one of the first sportscar teams to exploit the game-changing number-crunching of Artificial Intelligence



DPPI



and shows you where the potential might be – it points you in the right direction. AI helps you get there quicker. It helps you get the quick answer rather than the perfect answer, but it gives you something you can action quickly.”

There will be more testing once Jota becomes a factory team. It will be able to take up an allocation of what are termed ‘manufacturer’ test days in the strictly defined rules on testing and not just the ‘team’ and ‘collective’ days. It will also be able to participate in Hypercar tyre supplier Michelin’s development tests

ABOVE For all the excitement of the Cadillac deal, the focus has now switched back to signing off its stint with Porsche in style



DPPI



DPPI

ABOVE The British squad will mastermind Cadillac's assault on the world championship next season, taking over the running of its V-Series.R LMDh from Ganassi

LEFT Jota became the first privateer to win a WEC Hypercar race outright when it triumphed at Spa this season

as it works on a new range of sustainably produced tyres for 2026 (delayed from 2025).

"We will be doing all the testing available to us," says Takahashi. "That's really exciting. There were days in LMP2 when some of the new teams were doing crazy amounts of testing. We'd hear about WRT, Prema or whoever going here or there, and be slightly envious."

That test programme will not begin until after the end of the current season in Bahrain at the start of November, but Jota expects to be up and running with the first of its new-build V-Series.Rs pretty much straight off the bat after the conclusion of this year's campaign with its pair of Porsches. "It is going to be a very hard off-season," says Hignett.


Final frontier

Jota has enjoyed – endured even – a long history since its establishment in 2000 when Hignett and co-founder John Stack, a London estate agent, went racing in a Honda Integra Type-R that had been the latter's road car. They got to Le Mans only four years later with the Zytek, but that programme was on the wane after less than two years. For the final LMES round of '05, Jota had to bring in a new line-up of paying drivers.

"I was thinking I'd probably go off and be a race engineer, but Bill Gibson read me the riot act"

"We'd run out of money and we weren't sure where we were going as a team," recalls Hignett, who credits Zytek Engineering founder Bill Gibson, who recently stepped down from the helm of what is now known as Gibson Technology through ill health, giving the team the impetus to continue. "I was thinking I'd probably go off and be a race engineer or something, but Bill Gibson read me the riot act."

"He told me that as a young team owner I shouldn't underestimate what we could go on to achieve with Jota. He was the one who brought us in to help run their works car the following year and that led on then to working with other teams. I owe Bill a lot."

Nearly 20 years on from that dressing down, Hignett and Jota are finally a full-house factory team competing in the WEC. There can only be one goal, or rather two, reckons Hignett: "To win the world championship and to win the Le Mans 24 Hours." 

ACTIVE suspension holds a slightly shadowy – almost mythical – status in circuit racing. To those of a certain age, it still conjures up images of the Williams FW14B of 1992 and the cars developed by the other F1 manufacturers in a desperate bid to catch up. Seconds a lap faster than the passive systems, the concept was declared dangerous by some, and controversially outlawed at the close of the 1993 season.

But that's not quite the end of the story. Unbeknown to most, there's a form of racing where active suspension is commonplace, and it's about as far from the sanitised world of Formula 1 as it's possible to get.

If you've ever watched the hypnotic grace of a Trophy Truck floating above the surface at 100 mph, while its 40-inch wheels flail around below,

allowing the damper fluid to bypass the main piston assembly at various points along its stroke. Typically, this is divided into three zones. The middle portion of the damper stroke, where the piston spends most of its time, is referred to as the Ride Zone. The far end of the travel, encountered on big impacts, is known as the Bump Zone. And the first portion of the travel, when the shock is fully extended with the wheels on full droop, is known as the Rebound Catch Zone.

Bypass tubes positioned at different points along the body provide position-sensitive adjustment within this range of movement. A series of valves, and ultimately the diameter of the bypass tubes, control how

EXTREME H'S SECRET WEAPON

If you thought active suspension had been consigned to the history books, think again. **Chris Pickering** explains why

it's possible that you've already seen one of these systems in action. And next year it'll be coming to Extreme H – the hydrogen series' secret weapon to ensure its 2.2-tonne buggies outperform their smaller, lighter predecessors in Extreme E.

Next to a Trophy Truck, of course, the Extreme H car is a featherweight. The 1,100 hp monsters that blast across the Baja Peninsula can weigh more than 3 tonnes.

The springs and dampers used in Extreme H come from American off-road specialist FOX, which has supported the outgoing Extreme E series for two seasons now. Recognising that they would need to focus on the complete package rather than just the new powertrain, the championship organisers brought FOX in at the very start of the development of the Extreme H car.

In from the start

"It helped that we were able to be involved with the design of the car right from the beginning," says FOX design engineer Nicholas Leone. "For instance, in Extreme E we could only run one shock up front, but now we've been able to specify dual shocks, so each corner now has two shocks, with a coilover unit and an external bypass."

As the name implies, a bypass shock works by

much fluid can be diverted from the main piston at each stage, giving a significant amount of tunability.

The Extreme E car already had a twin damper setup on the rear, with an external bypass shock run in parallel with a conventional coilover unit. Packaging limitations, however, meant that a single shock had to be run at the front, which uses an internal bypass. Now, Extreme H applies the twin damper concept to both ends of the car. The diameter of the bypass shocks has been increased from 2.5 inches to 3.0 inches and the stroke has been increased, giving 10.6 inches of damper travel, which translates to around 1.5 inches of additional wheel travel compared to Extreme E.

"The Extreme E car had some packaging limitations and our job there was to optimise the performance within those constraints. One of the first things we recommended for Extreme H was to increase the suspension travel, so we were working in partnership with the Spark engineers who were also trying to ►



BELOW FOX's damper technology is an integral part of the performance package on Extreme H's hydrogen fuel cell-powered Pioneer 25





optimise the geometry for the new car,” explains FOX motorsports programme manager, Bryan Harrold. “The original packaging was a bit tight, but we were able to negotiate with the suspension designers and get a bigger envelope. We sent the CAD models for the standard 3.0-inch bypass and the standard 2.5-inch coilover and they were able to move the suspension components around to accommodate those.”

This collaborative approach has allowed FOX to meet the Extreme H requirements with dampers that were based around the company’s existing components,

without the costly exercise of developing a completely bespoke shock. The 3-inch damper body, for instance, sits roughly in the middle of the range. Its extra volume, compared to the 2.5-inch unit used on the Extreme E car, provides greater damping force, a larger surface area for the piston and more oil volume to dissipate heat – all of which are useful given the 300 kg weight increase that comes with the new car.

Next level

FOX has taken the adjustability provided by external bypass dampers to the next

level with its semi-active Live Valve system. This adds computer-controlled valving to the short compression and long rebound tubes to control, based on sensor data from an inertial measurement unit (IMU) along with speed, throttle position and brake pressure inputs.

The system takes readings 500 times a second for the ECU and 200 times a second for the IMU. It controls a solenoid-activated poppet valve on each Live Valve bypass, which can go from fully open to fully closed in 36 milliseconds, providing up to 2,550 lb of adjustment range on both compression and rebound.



LEFT Each corner of the Extreme H machine has two shocks, with a coilover unit and an external bypass

“We refer to it as semi-active, because it’s not actively scanning the track ahead. It has to react to an input,” explains Harrold. “Generally, what it’s trying to do is keep the car level. So, if the front hits a bump, it will stiffen up the rear in preparation. Or if it senses that the vehicle is in freefall off a jump, it will increase the compression damping all-round to prepare for the landing. Similarly, during cornering, we can increase the compression on the outboard shocks and the rebound on the inboard shocks to provide support on the outside tyres and improve stability.”

On the Extreme H dampers, the bypass circuits – both passive and active – are found within the Ride Zone. This leaves the fluid flowing through the main piston in the Bump and Rebound Catch Zone.

“The compression is more targeted around the Ride Zone on the short tube, but rebound Live Valve affects a little more of the stroke (both in the Ride Zone and what we would consider the ‘transition’ area going into the Rebound Catch Zone). We also have passive adjusters in the long compression and short rebound,” explains Harrold. “To give you an idea how dynamic the system is, we have a five-mile test loop for desert racing in the States, and in those ►

BELOW The semi-active system was originally designed for mountain bikes but has now been applied successfully to trophy trucks and Extreme H

“You can leave the semi-active system to get on with things, but you switch modes if you know you’ve got very different terrain coming up”





five miles it made 90,000 damping changes.”

FOX originally developed the system for mountain bikes and UTVs. The company partnered with Bosch to develop the electronics and software, which has now been applied to trophy trucks, Extreme H and the Ford F-150 Raptor road car.

The variant used in trophy trucks takes things a stage further. Alongside the sensor inputs used in Extreme H, it also takes data from a steering angle sensor, a GPS receiver and position sensors on each damper.

Compensation for dive and squat

“We’re not using steering angle sensors in Extreme H as that can get a bit complex with different drivers and different driving styles,” explains Harrold. “The IMU compensates for body roll experienced in steering though – i.e. stiffening compression on the outboard shocks and rebound on the inboard shocks. The same concept applies front-to-rear for brake dive and acceleration squat. There is the potential for expanding that in the future for XH.”

The exact software configuration for Extreme H had yet to be finalised as we caught up with the FOX engineers, but the expectation is that each car will have five preset maps. This would allow each of the two drivers that share an Extreme H car to store their own ‘firm’ and ‘soft’ maps, plus one extra. As well as overall firmness, each calibration can enable or disable additional functions, such as additional compression on the rear of the car under

ABOVE The bypass shock works by allowing the damper fluid to bypass the main piston assembly at various points along its stroke

RIGHT If the semi-active system senses a truck is in freefall, it will increase the compression damping all-round to prepare for the landing

FAR RIGHT FOX has taken the adjustability of the external bypass dampers to the next level with its semi-active Live Valve system



“From fully open to fully closed in 36 milliseconds”

acceleration to combat squat.

“It does take a slightly different mindset from the drivers. With a passive setup, you might back off coming up to a jump, because you know the car is set up quite soft, and you’re worried it’ll bottom out; with this you can keep pushing,” says Harrold.

Another feature taken from off-road racing is a button on the steering wheel to switch the system into a firmer mode for unexpected jumps or drops. This is less of an issue on the comparatively smooth Extreme H circuits, but it can be very useful on long distance point-to-point events like the Baja, where the crews come across obstacles that they may not have anticipated.

“The whole idea of the semi-active system is that you can just leave it to get on with things most of the time, but you can switch modes if you know you’ve got very different terrain coming up, like the rock beds that they had in the first Extreme E race in Greenland,” Harrold comments.

Spring setup

The spring setup on the Extreme H car has also been carefully tailored. It uses a dual rate spring comprised of two parts. There is a relatively short tender spring and a longer, stiffer main spring, separated by a ▶





LEFT FOX's off-road mastery, demonstrated here in the desert, rescued Extreme E when it hit damper trouble. Now it is raising the performance bar still further on its hydrogen successor

BELOW Packaging was tight on the Pioneer 25 but FOX's engineers have been able to negotiate with the car's designers from the outset

divider. The combination of the two springs provides a softer overall ride initially, with the divider free to slide up and down. However, there's a crossover ring that acts like an adjustable end-stop on the body of the shock; once the divider contacts this ring, it locks out the tender spring, forcing all further movement to go through the stiffer main spring.

"This provides more support as you get further down the travel," explains Leone. "For instance, when you're cornering, you can set the car up to be quite loose initially and then it rolls onto this crossover point and provides more support. Likewise, you can tune it to deliver a softer ride over the initial chatter before the car stiffens up."

Extreme H runs a position sensor on the dampers. The data from this allows the FOX engineers to keep track of when the crossover ring is engaged and where the piston is relative to the bypass tubes.

With some 72 different parameters that can be configured in the Live Valve software, the engineers tend to start with a completely passive system, only adding the active functionality once a baseline has been set.

Timestamp

"Live Valve is the cherry on top. It helps you to optimise the compromises that you otherwise have to make between, say, cornering stability and bump absorption," notes Harrold.

"Typically, during development, we'll focus on managing the balance of the car with the springs before we move on to the damping. We'll send the driver off to do a lap and then pull the data. If they come back and say, 'It's really soft, it feels like there's not enough resistance before it hits the crossover,' then we can look at the timestamp for that corner and see what both shocks were doing at the time," notes Leone.

Off-road racing involves far greater ride heights

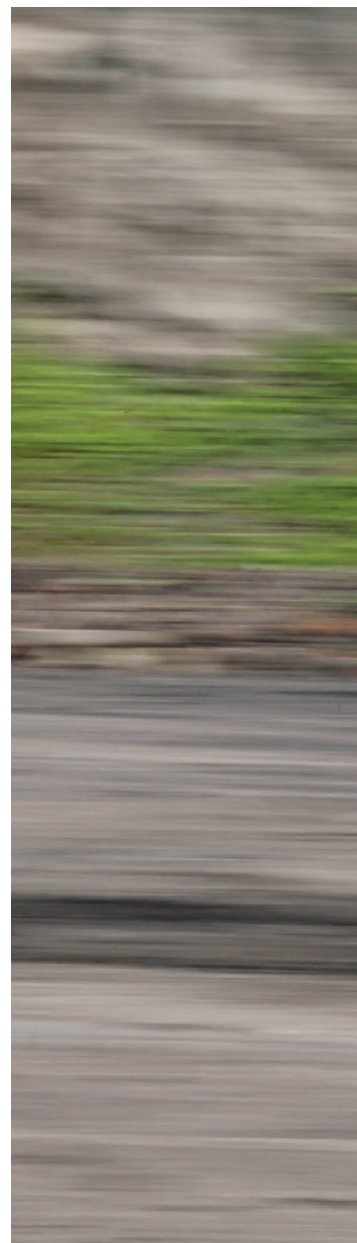
and much softer suspension than other forms of motorsport. This can feel quite disconcerting to drivers coming in from rallying or circuit racing backgrounds.

"Talking to the Extreme E drivers, a lot of them would like to run the car as low as possible, whereas in off-road they tend to want to raise it up and let the wheels move as much as they can," says Harrold. "Eventually you end up with a vehicle that's like a trophy truck. They can go over bumps four feet high at 100 mph, but they are slow to roll into the turns, which the rally drivers don't like at all. The Extreme H car would be way faster than a trophy truck over these kinds of courses, but the trophy trucks will go over terrain that these cars couldn't touch."

“Live Valve is the cherry on top, optimising the compromises that you otherwise have to make between, say, cornering stability and bump absorption”

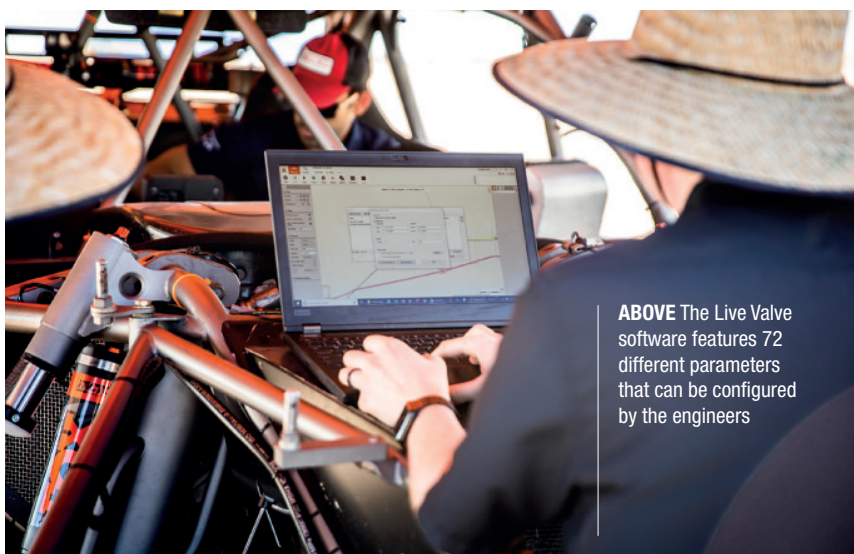
The beauty of this system is that it provides individual control from one condition to the next. Of course, the same would apply to circuit racing, where it could be used to optimise the car for any number of changes, such as cornering versus braking, left- or right-hand corners, and high or low speed downforce.

Even 30 years ago, the success of the FW14B demonstrated the potential of semi-active suspension in Formula 1. Ironically, the increasing cost and complexity of passive suspension systems used in the category has led to repeated calls for active



suspension to be brought back – notably in 2022 when many of the teams were struggling with porpoising. It's also conceivable that it could help to offset any weight increase and maintain lap times if the series was to move to new powertrain technology in the future, such as hydrogen combustion.

You could argue that's already happening in Extreme H. A whole raft of changes have gone into ensuring that the new hydrogen-powered car is faster over the course of a lap than its battery electric predecessor, despite gaining nearly a third of a tonne in weight. Semi-active suspension is just one part of that, but it's an intriguing solution that could possibly pave the way for its use elsewhere. **RT**



ABOVE The Live Valve software features 72 different parameters that can be configured by the engineers



RECYCLED RALLYCROSS

Hal Ridge reports on a Rallycross revolution: the FC2 concept created through a process that recycles and updates the current Supercar Lites platform



RIGHT Running 100% fossil-free fuel, the FC2 is billed as bringing a revolutionary recycling and regeneration approach to motorsport

SUSTAINABILITY has increasingly become a key buzzword in motorsport, largely surrounding the propulsion methods used but also regarding the running of events.

Such is the nature of the English language that the term is also used to describe the manner in which teams and manufacturers operate, financially more often than not, with a view to making it possible to continue. Seldom though, does the term 'recycling' get used, outside of referencing materials like metal being reprocessed.

In the scenario of the brand-new FC2 rallycross machine, both sustainability and recycling are terms that go hand-in-hand with the venture. This is in spite of the car being powered by a conventional internal combustion engine without an electric motor or hydrogen fuel cell in sight.

The concept, created by Swedish firm OlsbergsMSE – the most prolific rallycross car producer in the history of the discipline – is multi-faceted.

On one hand, it operates in America as part of the Nitrocross rallycross series,

for which OMSE has also developed and built the headline all-electric FC1-X single-make machines. Now the FC2s have been introduced as the new single-make NEXT EVO category.

In Europe, meanwhile, the car is intended to take on the existing Supercars at national and regional level. And, as OMSE has done with its fleet of Ford Fiesta Supercars, Supercar Lites and FC1-Xs, parts can be supplied from a single producer, something that remains relatively uncommon in the discipline, certainly at the highest level [Supercar/RX1].

For green credentials, aside from the

“The American tests were too safe. When we went for that power back in Europe, all hell broke loose”

two development cars that ran in the Nordic-based RallyX series this year being all-green in appearance, the new cars run on fossil-free fuel, produced by P1 Fuels. That's the sustainability box ticked, but what of the recycling?

Seeing the Lite

In 2013, the first Supercar Lites machines, developed by OMSE in collaboration with Turkish-based Avitas Motorsport, made their competitive debut in America, supporting the Global Rallycross Championship. They were based on a concept first conceived by late Olsbergs [the O in OMSE] owner Goran Henriksson. His vision was to create a category where talented drivers could compete against each other without their equipment being a limitation in achieving success. The four-wheel drive, tubular spaceframe, composite-clad cars have been a successful endeavour.

More than a decade on, 54 of the Supercar Lites machines have been produced, residing in the US and Europe, ►



with a successful category within the RallyX series structure still going strong today. But, in a bid to create a cost-effective increase in performance Stateside for a single-make category, and to fashion a machine with Supercar (RX1) equalling performance, OMSE, led by founder Andreas Eriksson, dreamt up a kit of parts that could be used to adapt an existing Supercar Lites car into a very different proposition, now called the FC2.

As part of the deal, OMSE, together with sister firm First Corner – dealing with the promotion of the project and a link with an online motorsport sales platform – is assisting in repurposing components from the existing Supercar Lites machines that are being converted.

No structural changes are made to the

tubular spaceframe chassis, which is recycled directly into the FC2 car. The existing naturally-aspirated engines are advertised for sale, and bought so far by other Lites runners, or those elsewhere in the motorsport sphere, in Rally, Rallycross and Hillclimb. The same goes for the dampers, suspension arms and the like, a concept the Swedish outfit claims “is an innovative recycling programme that supports OMSE and First Corner’s continuous commitment to sustainable motorsports.”

What is an FC2?

While creator OMSE is keen for the FC2 to be acknowledged as a new car, which it extensively is, naturally comparisons are drawn between FC2 and what came

before it.

The old Supercar Lites machine produced 310 horsepower from its 2.4-litre Duratec engine. Depending on what rubber has been fitted at different times, this was usually more than adequate grip for the power.

The FC2 boasts, in NEXT EVO single-make specification, 450 horsepower from a 2.3-litre turbocharged inline-four engine lifted from Ford’s Mustang. That unit is turned up to 550 horsepower and over 600 Nm torque in its Supercar-equalling form.

“We looked for different motors [engines] and in the end it came that I could buy them cheapest from Ford as a crate motor, and with the smallest conversion to do for what we wanted,” explains Eriksson. “It turned out to be much more work



BELOW & RIGHT
OMSE's renowned RX expertise transforms the Lites car into the FC2, featuring a redesigned body, turbocharged engine, the latest electronics and upgrades to the steering and suspension

than we expected, but we've made it safer [reliability-wise] than we were initially thinking. It's readily available and easy to get parts for, especially as Ford Performance are a technical partner for us like they have been for many years. Ultimately this was the best choice because it fits straight into the car, it bolts straight in just with a new engine mount on the right-hand side."

The engine remains largely standard. This includes items like the BorgWarner turbocharger, that for Supercar or RX1 competitions will need to be fitted with a 34 mm air restrictor as per regulations.

With the previous Supercar Lites machine having also used a Ford-based engine, items like the flywheel, Alcon triple-plate clutch and bellhousing for the gearbox are also crossover bolt-on parts to the new unit. Controlling the engine is a MoTeC management system, which, Eriksson explains, has been critical to the development process.

"I can't see the management system being out of date 10 years from now. But what we can do with it certainly wasn't possible 10 years ago"

"We could have spent much less time and money on a different management system," he notes. "But, this is the same as how all our other cars are now, the FC1-X and the Supercars. It's important because we can create our own software. For us to do this project, we needed to be able to do that. We can write the code to solve anything we come across. We are seeing the fierce competition we are up against [in Supercar, many works-built machines from the peak of manufacturer involvement in the World Rallycross Championship from 2015-2018], so the management side needed to be as good as possible. It's super-modern, I can't see it being out of date 10 years from now, but what we can do just wasn't possible 10 years ago, that's for sure." ►



While the FC2 made its single-make competitive debut in the opening double-header of the 2024-2025 Nitrocross campaign at Richmond in early September, the development cars ran all through the summer in RallyX within the Supercar category, or Open 4WD as it is known in that series. It was a brave move indeed for OMSE, as the testing process was not without issues. It's an age-old saying, however, that there's no better testing than racing, and it was in race conditions where the FC2 ran into some teething issues.

Having conducted running in America in early 2024 with a test car, with early cooling issues resolved and new bodywork designed and manufactured from scratch, five of the new FC2 machines were readied for the opening RallyX weekend in Sweden. But all were withdrawn at the end of the opening day. It wasn't until the penultimate weekend of the campaign, in Denmark, where engine issues were finally solved.

Ton of problems

"We had a back-pressure issue with the turbo," explains Eriksson. "When we ran in America in testing, we ran it with too low boost, it was too safe. We had a concept with a motor that could do 550 bhp, but when we went for that power back in Europe, all hell



ABOVE The test car, seen in the USA earlier this season

broke loose. Nothing worked. The back pressure went up and that caused a ton of problems. It caused the cylinder pressure to peak, so when we started with using the gear cutting and things like that, it was way too much cylinder pressure, and the head gasket blew.

"So the first thought was to repair the head gasket and make it stronger, so that didn't break, so we went backwards for a while until we found the problem. When we found the problem, it was very simple. I never had ►

BELOW The public unveiling of the FC2 at the Tierp Arena was the culmination of a long-held dream





WE INNOVATE MOTORSPORT INNOVATES US

FIRST CHOICE OF TOP-LEVEL MOTORSPORT TEAMS AND RACE SERIES

STEERING WHEEL QUICK RELEASE



AIR JACK SYSTEM



NEW EQUIPMENT

SKATES (NEW PRODUCT)



REFUELLING SYSTEM



RFC-89-K-LM
NEW LOCKING
MECHANISM

NEW PRODUCT



**ULTRASONIC FLOWMETER
RFC-FM20**
COMPATIBLE WITH ALL
COMMON REFUELLING
SYSTEMS ON THE MARKET



QUICK DISCONNECT COUPLING



KRONTEC MASCHINENBAU GMBH | Obertraubling, Deutschland | +49 (0) 9401 - 52530
KRONTEC DESIGN LIMITED | Swindon, England | +44 (0) 1793 - 422000



FOR MORE PRODUCT INFO
WWW.KRONTEC.DE



GO TO OUR WEBSITE TO VIEW OUR
FULL RANGE OF MOTORSPORT ELECTRONICS
WWW.CARTEKMOTORSPORT.COM

POWER DISTRIBUTION PANELS

A switch panel and Power Distribution Module in one. Our Power Distribution Panels are a fully integrated solution designed to replace all the fuses, switches and relays of your race car.

- CONFIGURE CHANNELS IN 5A STEPS UP TO 30A.
- CHANNELS CAN BE PROGRAMMED TO CONTROL HEADLIGHTS/WIPERS/RAD FANS/STARTER MOTORS etc.
- EACH OUTPUT IS PROTECTED FROM SHORT CIRCUITS AND OVER-CURRENT.
- ADDITIONAL INPUTS ALLOW CHANNELS TO BE CONTROLLED BY ECU OR SWITCHES ON STEERING WHEEL.
- COMES WITH LABEL SHEETS FOR FULL CUSTOMISATION - RETRO EDITION NOW AVAILABLE.
- NO COMPLEX CONFIGURATION SOFTWARE - AMP SETTINGS AND LOGIC FUNCTIONS ARE SELECTED THROUGH THE FRONT PANEL.



8 and 16 channel versions available

SOLID STATE BATTERY ISOLATORS

Cartek Battery Isolators are designed to overcome all of the problems and restrictions associated with mechanical and electro/mechanical battery disconnects.

- FULLY ELECTRONIC WITH NO MOVING PARTS - COMPLETELY RESISTANT TO SHOCK AND VIBRATION.
- MUCH SMALLER AND LIGHTER THAN TRADITIONAL KILL SWITCH.
- MEETS NATIONAL AND FIA REGULATIONS.
- STATUS LED FOR FAULT DIAGNOSIS.
- SEALED INTERNAL AND EXTERNAL SWITCHES REPLACE TRADITIONAL PULL CABLES THAT ARE PRONE TO SEIZING.
- MOUNTS CLOSE TO THE BATTERY FOR REDUCED CABLING.
- QUICK AND EASY TO INSTALL.



BATTERY ISOLATOR XR
Designed for motorsport
ECU's/PDM's



BATTERY ISOLATOR GT
Designed for DEM
ECU's/ignition systems

a problem with testing in public, because the reality comes when you put them on the track. You either have to simulate a race perfectly, or just go racing. Otherwise you just don't find out what will happen."

And, as the manufacturers in the World RX peak era pre-2018 had discovered, simulating a rallycross race with all the variables of ever-changing grip, dust, mud, visibility and the inevitable bump and barge of the quick-fire racing, is fundamentally impossible.

"Now I look on it backwards," notes Eriksson. "We could have solved those things [engine problems] very easily earlier, but it's always learning. All the time we were working on refining the car too, even if we lost quite a lot of time, but in Richmond we had no FC2-related issues, and a lot of small details can evolve too. It was so important it worked for the first proper weekend."

Discoveries

The nine cars that contested the opening Nitrocross weekend also benefited from other new developments, like the Sadev electro-hydraulic paddleshift system. As in a Supercar, drivers still need to use the clutch when the wheels are spinning, to break the drive. The Sadev gearbox, located at the rear of the car behind the engine, and mechanical differentials, remain the same as in the Supercar Lites. However, different ratio options will be made available for 2025 for the cars racing

"I never had a problem with testing in public, because the reality comes when you put them on the track"

against Supercars: the need for gears four, five and six to be longer was one of the discoveries made from running the cars in RallyX this season.

While the chassis has carried over from the Lites machine, and the FC2 also maintains use of driveshafts, Alcon four-piston brakes (with 325 mm x 28 mm vented discs at every corner), fabricated uprights and the hubs, new dampers from R53 and new suspension arms by OMSE have been developed. These continue the inboard damper concept that the Swedish firm has also utilised on its most-recent Honda Civic and Fiesta Supercar evolutions, on the back of the Lites chassis dynamics.

"We have the same pickup points, but better dampers all round with hydraulic bump stops on the front and basically the same dampers as the FC1-X on the back, so really it's a bit over-damped on the rear you could say," observes Eriksson. "And new chromalloy arms so they are stronger and the un-sprung mass is lighter, and we have more to come there too. But, we have over 40 mm longer travel on the back, and we're at 300 mm total travel, which is like any Supercar really. ►

BELOW The FC2 made its competitive debut in NEXT EVO guise in Nitrocross at Richmond last month



THE TESTING, CLEANLINESS
& CALIBRATION LABORATORY

young
calibration

Powered by **NMI** Group

TESTING SERVICES

Heat Exchanger Performance
Component Durability
Cleanliness Assessment

See us in Hall 10.1, Stand 1030 – 13-14 November, 2024

Professional
MotorSport
WORLD EXPO

Tel: 01273 455572 Email: enquiries@youngcalibration.co.uk

www.youngcalibration.co.uk



MOTORSPORT ENGINEERING & TECHNOLOGY SHOW

CTS24

16-17 OCTOBER - SILVERSTONE WING
#MIACTS24 REGISTER NOW FOR FREE



Gold Partner



Event Partners



For enquiries about exhibiting please contact
gary.plahe@the-mia.com

+44 (0)2476 692 600 • www.the-mia.com/event/MIACTS2024



LEFT The classic Supercar Lites category still continues but the FC2 concept will breathe new life into the cars once used

BELOW LEFT The FC2 includes a 40 mm increase in suspension travel through upgraded front dampers and new rear dampers

That's where you need to be to get the traction."

The specs sound good, and even impartial drivers who sampled the car in testing were impressed, but what of the costs?

The first 24 FC2 kits are being sold for Lites conversion. If someone did not already own a Supercar Lites to convert, a donor Lites car to begin the conversion would cost anywhere between €50,000 and €110,000. The original kit cost was €75,000, although that has now raised after the development process.

New broom!

"The next batch will be slightly higher [cost]," says Eriksson. "We lifted the level during the process, and actually the cars are better than we expected them to be. When we ran into a few roadblocks, we needed to change things to raise the level. Mainly on the electronics, which are now Supercar level. We've done that because it's hard to beat a vacuum cleaner with a broom if you're not f***ing fast with the broom. Now we've done it. We didn't need the developments for NEXT EVO, but we do to go against Supercar, and it means the kits will be around €10,000 more. Everyone who invested in the project early got a better deal, that's how it is."

With the car and kit in place, OMSE believes it is around 100 hours of work in reality to have a race-ready car, including the new bodywork fitted and painted ready to go. With labour factored in, along with recycling and reselling old parts, a ready car is expected to stand at around €180,000.

"So often people can't sell their race cars, they can only buy new ones and every time they do that, they lose money. And that's negative for the sport. And it becomes too expensive, and you can't get into a



proper car,” continues Eriksson. “Here you can upgrade what you have: you can do Lites and then Supercar; you can rent one if you need to or build one.

“My goal has always been to make a fast and affordable race car that we can see the best drivers in. The whole concept with Supercar Lites was who is the best driver, and how you develop the best drivers. Now the power is not the limitation and you don’t need a certain driving style to go fast with a car with less power, like was sometimes the case in Lites. The best

drivers in the world, in my opinion, should be rallycross drivers.

“The budgets with FC2 are already much less aggressive than running a Supercar – we need more time to understand the whole picture exactly, but overall running costs will be closer to Supercar Lites than a Supercar, and that will be the key to success.”

Renowned in the rallycross world as a forthright character, Eriksson is no stranger to going against the grain and doing his own thing. While that has been scoffed at in some circles, nobody can argue

against his firm’s output and success: it has developed and produced over 33 Supercars (Fiestas, Honda Civics and Dodge Darts); 54 Supercar Lites; over 20 of the new FC1-X all-electric machines; and now another new era with the FC2.

A taster day for potential FC2 drivers is set to take place in America ahead of Nitrocross’ third weekend in Phoenix in November, with similar days in Europe to follow. If previous form is any guide, the FC2 is likely to be well-received by teams and drivers, and a success on track too. **RT**

LEFT As drivers progress up the racing ladder, a kit of parts is used to adapt an existing Supercar Lites car into an FC2 featuring performance good enough to rival RX Supercars



CADILLAC ADOPTS A SOUND APPROACH

The distinctive soundtrack of Cadillac's LMDh powertrain has accompanied the dawn of the WEC's Hypercar era. **Chris Pickering** talks to Russ O'Blenes, director of the performance and racing propulsion team at General Motors

THEY say that if a car sounds fast, it usually is. The Cadillac V-Series.R sounds like a greatest hits compilation of American muscle cars. And sure enough, it rumbled its way to the teams', manufacturers' and drivers' championships in IMSA's GTP category last year, with only a revitalised Porsche challenge capable of preventing the champions retaining their crown at this season's finale.

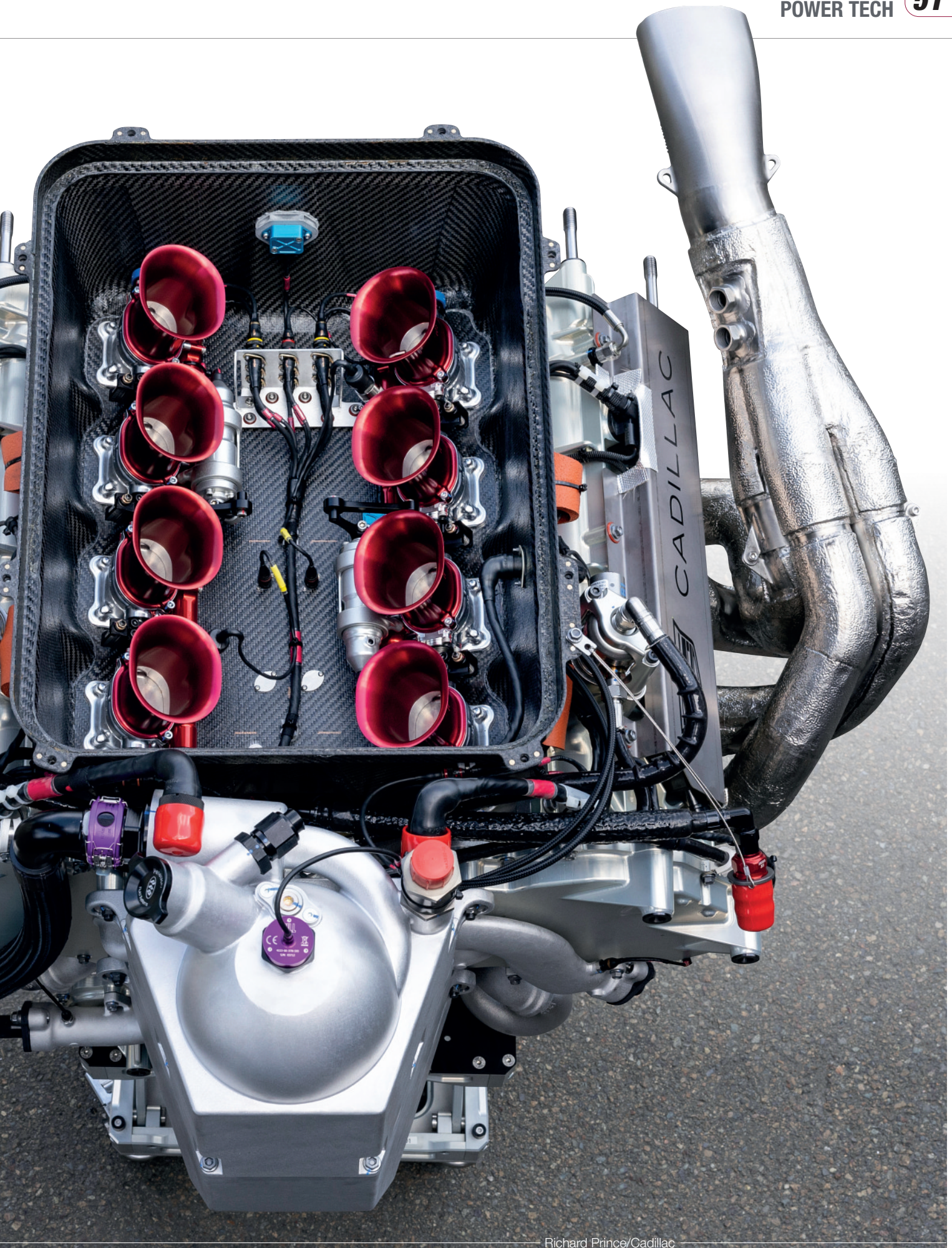
In fairness, the LMDh machines in the category are *all* very fast cars. Every single manufacturer picked up at least one victory last year. But the Cadillac's 5.5-litre naturally aspirated V8 gives it an instantly recognisable soundtrack that sets it apart from the rest of the field.

That's not entirely a coincidence, as Russ O'Blenes, director of the performance and racing propulsion team at General Motors, explains.

"That visceral sound has played a big part in the history of Cadillac Racing," he comments. "We made a number of changes to get that very particular tone. As you go through the step test on the dyno you can tell if the engine is happy or not, and luckily that tied together very well with the tuning and the design of the exhaust for maximum performance. It's a good combination of form and function, which is always pleasing." ►

RIGHT Beyond a few fasteners, the LMC55R shares nothing with other General Motors engines





Richard Prince/Cadillac

Cadillac recognised the marketing value of a big, naturally aspirated V8 from the outset, but other concepts were considered, ranging from a four-cylinder turbo to an IndyCar-style twin turbo V6. “One of the most exciting things about LMDh from an engineering perspective is that the engine rules are wide open. There aren’t many categories where you can find a 2.4-litre twin turbo V6 racing against a 5.5-litre naturally aspirated V8,” comments O’Blenes.

“We needed to balance complexity against risk. Any time you’re starting completely from scratch there’s more danger of something going wrong”

“We looked at a lot of different options initially, but we knew that we had to meet our power target and our weight target. We also had a pretty short timeframe, so we needed to balance complexity against risk. Any time you’re starting completely from scratch there’s more danger of something going wrong.”

General Motors does have a longstanding relationship with forced induction in high performance road cars. It pioneered turbocharging with the Chevrolet Corvair Monza and the Oldsmobile Jetfire, both introduced in 1962. More recently, the range-topping Chevrolet Corvette ZR1 and Cadillac CT5-V Blackwing have both used supercharged V8s. A turbocharged LMDh engine wouldn’t have been an affront to the brand, but it would have meant abandoning the simplicity of a big, low-stressed, naturally-aspirated engine.

“You get a lot of baggage that comes along with turbos,” O’Blenes explains. “There’s more heat to manage, there’s wastegate control, turbo lag, a lot more connections... all of those things could be potential failures. We’ve had a lot of luck in endurance racing over the years at GM, and a lot of that comes down to reliability.”

Mass reduction

Previous experience had shown that a naturally aspirated V8 of this sort of size should be capable of hitting the 500 kW power limit for LMDh. The only question mark that remained over using a large V8 was its mass. O’Blenes and his colleagues were keen to hit the 180 kg minimum weight restriction laid out in the LMDh regulations.

“We were very, very focused on hitting that target,”

RIGHT The 5.5-litre naturally aspirated V8 is much larger than anything used by the IMSA opposition, whose engines range from 2.4 to 4.6 litres, and is the only LMDh car without turbochargers

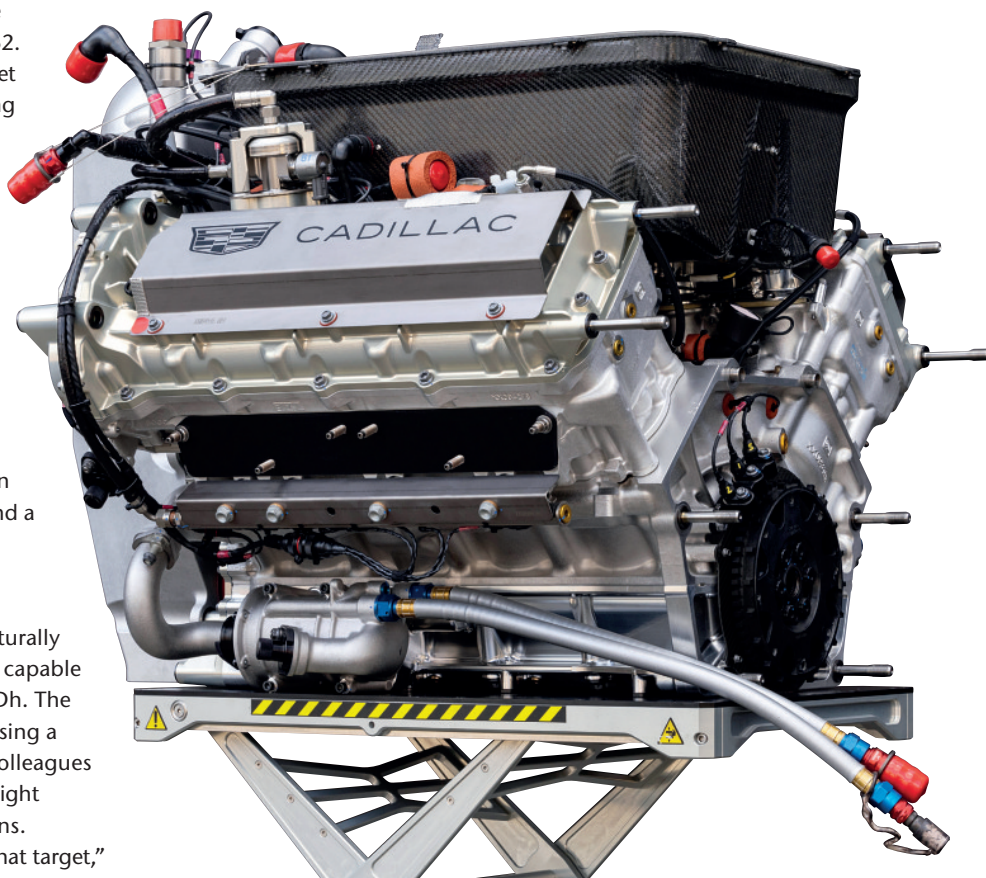
he recalls. “That includes all the coolers and lines, so it’s a pretty lofty target. After some initial analysis we were pretty comfortable that we could reach that if we optimised all the components.”

It’s this fastidious focus on mass reduction that led Cadillac to develop a bespoke race engine – albeit one that shares a number of similarities with the existing GM Small Block family, including the LT6 in the Z06 and the LT4 in the Blackwing. Notably, the chain-driven quad overhead cam valvetrain draws heavily upon the LT6 engine used in the previous generation Corvette C8.R racecar.

Extensive use of FEA helped to ensure that excess material was shaved away wherever possible – with some components fulfilling multiple roles in an effort to maximise weight efficiency. One area where the new engine differs considerably from GM’s previous endurance racing projects is that it was designed from the outset to be a fully stressed member.

“We ran a lot of structure around the engine in the old DPi car, because that was a production-based engine that was never originally intended to be a stressed member,” O’Blenes recalls. “For this project, we were absolutely adamant that we weren’t going to have any additional support around the engine. So, we spent a lot of time working on that balance of mass and structure to ensure that we didn’t have any degradation in performance, either in terms of chassis stiffness or deflection within the powertrain.” ▶

BELOW The engineers kept to an aggressive weight target for the engine





Images: Richard Prince/Cadillac

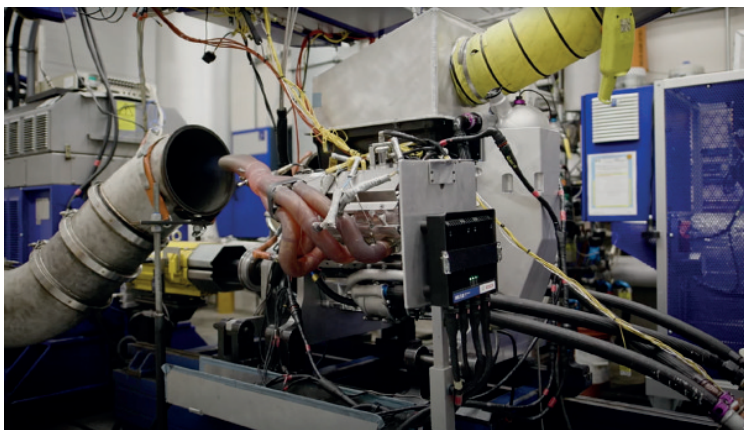
Hybrid boost

Just occasionally, the roar of that big V8 is conspicuous by its absence. Leaving the pit box, the Cadillac – as with all LMDh cars – whisks away to the sound of an electric motor instead. This momentary lull is perhaps the most obvious giveaway to the presence of IMSA's spec hybrid system.

Developed by Bosch, Xtrac and WAE (now Fortescue Zero), the hybrid system provides a modest 50 kW (67 hp) boost under acceleration, but it's capable of regenerating at up to 200 kW. The system's power output had yet to be finalised at the start of the ICE engine's development, so the main target for the Cadillac engineers was to be able to meet the overall power limit of 500 kW without hybrid assistance. In order to ensure that the maximum power limit is respected, a pair of torque sensors are mounted on the rear driveshafts (similar to the system used in the World Endurance Championship). This also means that the torque curve can be defined across the entire rev range as part of the performance balancing process.

"This is the first time in motorsport that we've had to meet a combined power output governed by torque sensors," notes O'Blenes. "From the very beginning, we understood how important it would be to run efficiently on that torque curve. So, when we were developing the control system and the initial testing, we really concentrated on making sure that we knew we would have the ability to control the torque very accurately. A major part of the puzzle in LMDh is how you integrate the electric motor and the combustion engine to maximise the area under that curve."

One of the aims of this performance balancing approach is to eliminate the potential torque advantage that the ►



TOP Engine 001 clocked up over 100 hours of dyno time, plus initial track testing

ABOVE The airbox, which is the largest in GTP, provides cooling air to the ICE, battery and MGU

BELOW Cadillac swept the Drivers', Teams' and Manufacturers' titles in the first season of the reborn GTP category



LAT Images

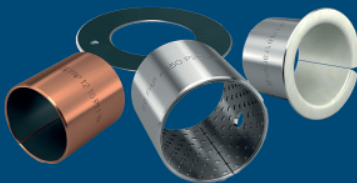


ROD ENDS
SPHERICAL BEARINGS
BUSHING
ACCESSORIES



**AURORA®
RODOBAL®**

**Seals-it®
PERMAGLIDE®**



Broadest range in Europe!

Your demand, our efficiency

www.getecno.com

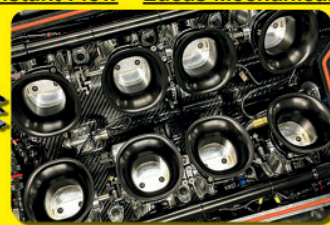


KINSLER

Billet Alum and Cast Alum & Mag manifolds. Elec & Mech Pumps, Testing & Calibration. Road race, Sprint cars, Boats, IMSA, FIA, Indy 500, NASCAR Cup, Drags, Motorcycles, Bonneville, Pullers, Street, etc. **EFI Constant Flow Lucas Mechanical**



**Garage 56 Camaro,
Completed 2023 Le Mans**



K-140 Pressure Relief Valve

Hard coated
billet housing
has four
grooves
above and
below two
diaphragms
to lock them
in place.

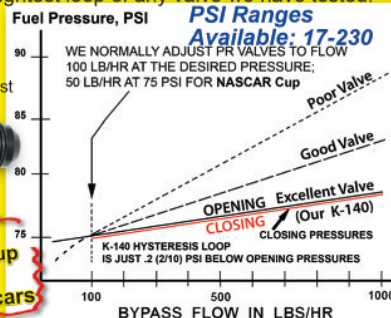
Zero
failures
since
introduction
in 1996.

**Monster
Mesh™
Filter**



10/3 Element

All the components, are carefully measured for each valve build, and recorded. This valve has the tightest loop of any valve we have tested:



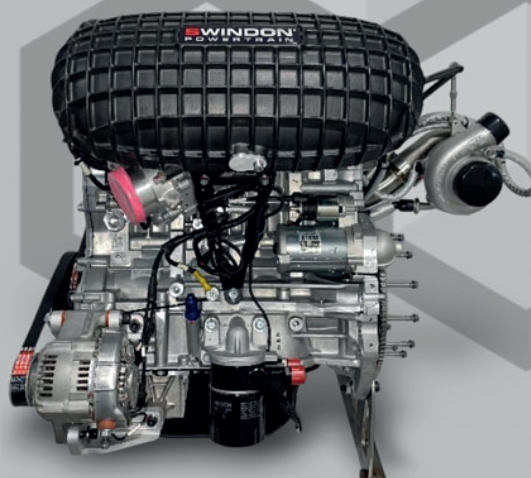
EFI Injectors, all makes of Pressure Relief Valves and Lucas Mechanical Metering Units, need 3 micron protection, but 3 micron filters plug up too quickly, so most racers use 10 micron, which is too coarse. We made this new element for NASCAR Cup cars: 10 micron premium paper top layer to take out 95% of the dirt, with a 3 micron precision Fiberglass lower layer.

Details: Kinsler.com

**sales@kinsler.com
(248) 362-1145**

kinsler.com

CHAMPIONSHIP WINNING 3D PRINTED PERFORMANCE PARTS



FIND OUT MORE



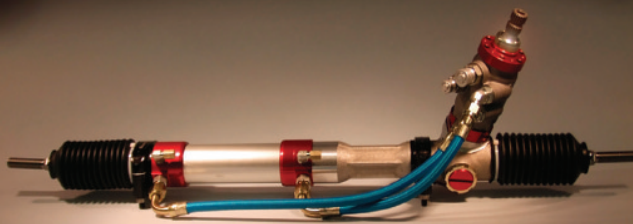
GRAPHITE
ADDITIVE MANUFACTURING

SALES@GRAPHITE-AM.CO.UK

01296 482673

Woodward.

Euros, pounds or dollars,
we give you more
engineering for your money.



Power steering racks for left or right
hand drive, front or rear steer, in an
almost infinite variety of dimensions
...with a 3 to 4 week lead time.



Download a Type CF design worksheet at woodwardsteering.com



Photos: DPPI

ABOVE & BELOW Alex Lynn delivered Cadillac Racing its first-ever pole position in the FIA World Endurance Championship at Fuji last month, where the car led the field for the first hour



turbocharged engines might otherwise have. In fact, it's another area where the simplicity of a natural aspirated engine might even prove an advantage.

"With a naturally aspirated engine, we don't have to deal with transient boost control or anything like that," comments O'Blenes. "Our time-to-torque is obviously very good with four-valve cylinder heads and individually-tuned runner lengths.

"We spent a lot of time on developing our combustion system to make sure that it would run well in all load conditions. One of the slightly sad things for an

“Good correlation between our simulation and the real-world engine is one of the biggest engineering wins in the project”

engine designer, with the torque sensors and the hybrid system, is you spend a lot of time in part load. You're always balancing the engine with the hybrid to maximise efficiency, which does give you a lot more options with your fuel economy."

The challenge at part load, he explains, is how to limit the power output without using the throttle and incurring pumping losses. One option is to reduce the power output by running lean, but this requires careful optimisation to maintain combustion stability.

"There's a number of knobs that you can turn to be able to run lean but still have consistent combustion in the chamber," comments O'Blenes. "Whether it's chamber shape or injection timing, injector flow characteristics or the shape of the plume. We have our own in-house analysis team, but we also collaborated a lot with the production team to understand how to use all of the simulation tools to iterate as quickly as possible to a solution. Some of the lessons that we learned in that will come out in our road car products further down the road."

Digital prototyping is a hot topic right across the automotive industry, with manufacturers aiming to reduce the time and money spent on prototypes. ►



ENGINEERING | MOTORSPORT | PERFORMANCE

9 - 12 January 2025 | NEC Birmingham

To keep up to speed on all show news visit:
[autosportinternational.com](https://www.autosportinternational.com)

Powered by  **motorsport**
EVENTS



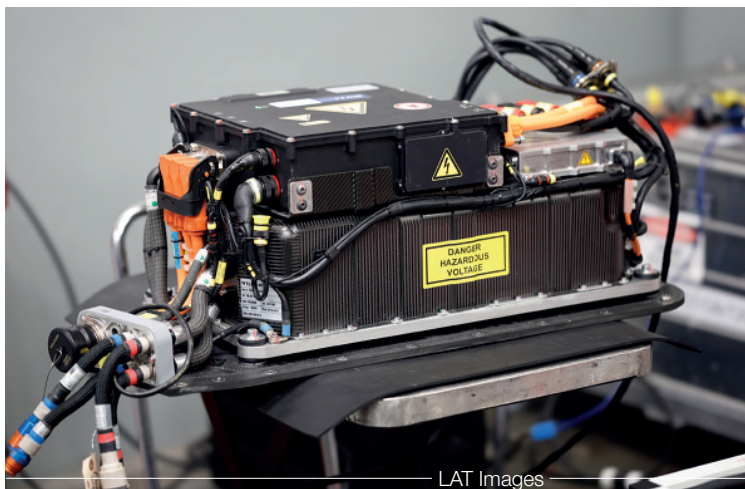
Europe's Largest Motorsport Show

CELEBRATING
OF FORMULA ONE **75**
YEARS

It's a point of pride for GM that the very first prototype engine worked first time.

"Engine 001 was the first engine that we started up. It's clocked up over 100 hours of dyno time and it did all the initial track testing too, and it has never had the cylinder heads off. It was a huge comfort that we had such good correlation between our simulation and the real-world engine. That, for me, is one of the biggest engineering wins in the project," comments O'Blencs.

He describes the group's simulation capabilities as the skills that take good fundamental engineering to the next level. A good example of this, he says, is the FEA analysis, which had to consider thermal effects, structural loads within the engine itself and chassis loads. A variety of tools used by different groups of



LAT Images

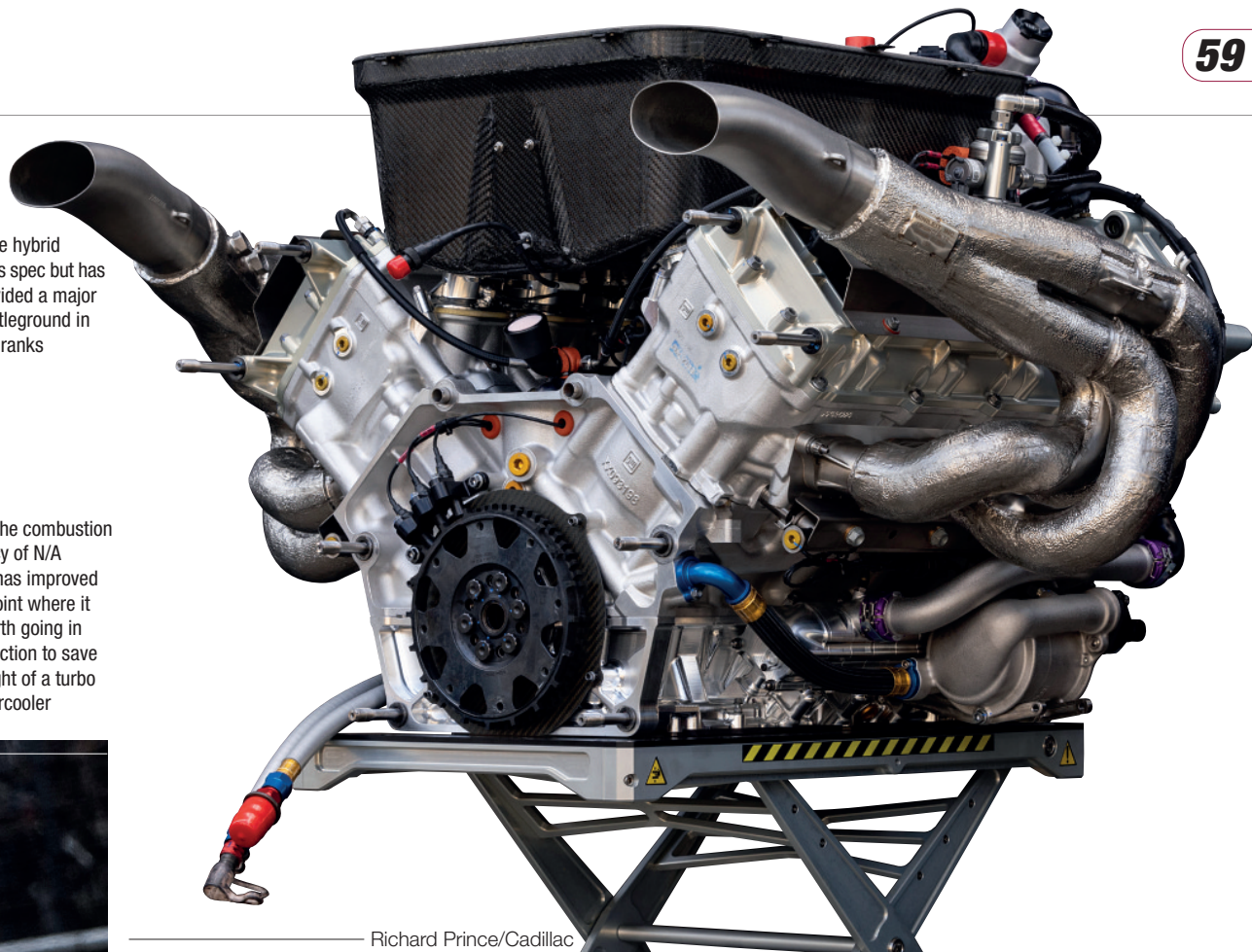
DPPI

BELOW Victory at the Le Mans 24 Hours remains the Holy Grail for the Hypercar program. The team was in contention until the final stages of a rainswept edition this year



LEFT The hybrid system is spec but has still provided a major tech battleground in the GTP ranks

RIGHT The combustion efficiency of N/A motors has improved to the point where it was worth going in that direction to save the weight of a turbo and intercooler



Richard Prince/Cadillac

engineers were combined to ensure that the engine wouldn't suffer from issues such as cylinder bore distortion or valve guides that might stick.

"The approach is similar to the one we used on the IndyCar programme, but this was the first time we'd applied it on a much bigger engine with very different loads," he notes.

Virtual energy

As with LMH, the LMDh cars use a virtual fuel tank system, which combines the energy usage from both the electric motor and the combustion engine, based on torque sensor data. The car's virtual fuel tank allocation is specific to the track and it's also part of the balance of performance criteria.

The virtual energy replenishes at a set rate once the refuelling hose is connected in the pits, but the fuel doesn't actually have to be pumping; in theory, you could pit and brim the virtual tank without taking on any actual fuel. Conversely, a car may well have enough fuel to continue lapping once its virtual energy tank is exhausted, but doing so incurs substantial time penalties. Furthermore, no charge is physically added to the battery in the hybrid system when the car pits, despite the virtual energy being topped up.

"Some days I still don't know if I fully understand the virtual fuel tank system," jokes O'Blenes. "The use of the hybrid system and the use of the fuel that we have onboard the car gives us a lot of different options."


Understanding how much to rely on the electrical side of the hybrid system is a deceptively complex topic, and it's a major technological battleground

in LMDh. It's also something that the engine designers have to consider right from the start in the development of the engine.

"We always knew the power window we were given at the beginning of the project could shift," says O'Blenes. "With a turbocharged car you might be able to just turn the boost up or fit a larger turbo, but with a naturally aspirated engine it is more of a concern. So, we wanted to be sure that we could exceed the torque target at any given point on the rpm curve. In our spare time, we've often talked about putting a more aggressive cam in, and really letting her fly."

Cadillac has remained at the sharp end of the LMDh field this season. At the time of writing, it lies second in the manufacturers' standings, very much in the fight for a second consecutive title. With so much already accomplished, I ask O'Blenes if there's anything in particular he'd still like to see the team achieve with this engine.

"Win Le Mans," he replies. "I've been at General Motors Racing for 33 years now, and I've been lucky enough to be involved with programmes that have won pretty much everywhere else – we've won our class at Le Mans, Daytona overall, Indianapolis. But winning Le Mans overall is, for me personally, the goal."

It's by no means a fantasy. With just three hours to go at this year's Le Mans, the #2 Cadillac was leading the race, with a very real chance of beating the Europeans at their own game. Changeable weather conditions and increased tyre usage on the drying track put an end to the dream on that occasion. But Cadillac will be back. 

BUILDING a new single-seater to a spec formula is a challenge akin to the porridge in the old children's nursery story Goldilocks and the Three Bears: make it too hot and you'll risk scolding the young racing drivers behind its wheel; make it too cold and they'll complain it's lumpy. The key is to make it just right – which is easier said than done.

The new Formula 3 car set for introduction in 2025, and revealed

recently at the Monza season finale, promises to have the right ingredients blended to hit the spot. 'Just right' in the case of F3 equals catch-all inclusivity for drivers of all shapes and sizes, a key thrust in the brief for the new car.

"We have to choose the right balance in what we want to achieve in each of the car's parameters and still have a nice racing car that performs well and delivers a good show," says Corrado Casiraghi,

the FIA's technical chief on single-seater feeder categories. "We mustn't get too extreme or too conservative to achieve that kind of balance."

While everything on a Formula 1 car is optimised in design, for spec racers a degree of moderation is required. In other words, as Casiraghi puts it, "make everyone happy and at the same time a bit unhappy!"

The latest Dallara monocoque pulls single-seater racing's third tier into line

RECIPE FOR SUCCESS

Damien Smith examines Dallara's new F3 car, designed to deliver unprecedented safety, spectacle and sustainability. No pressure then...





ABOVE The longer nose and switch to 16-inch Pirelli tyres dictate the car's striking looks

BELOW Beneath the sculpted looks of the F3 2025, the biggest step forward is the improvement in side impact protection

“Simulation showed that the previous generation was losing more than 30% in downforce while following another car closely. The new design is well below this”

with F1 and the new-for-2024 Formula 2. Propelled still by a bespoke six-cylinder normally aspirated 3.4-litre engine built by Mecachrome and delivering 380 horsepower at 8000 rpm, it features a six-speed longitudinal gearbox designed by 3Mo, commanded by a Marelli electro-hydraulic steering wheel-mounted paddleshift. This new F3 car will be in use for at least the next three seasons.

“The previous generation, which has been racing since 2019, was becoming a bit outdated,” says Casiraghi. “So first of all the target was to align the car with the latest specs, safety, performance and general look of the single-seater pyramid and in line with F1.”

Wake management

That means not only raising the bar on safety – always essential – but also enhancing the ability of F3 cars to follow each other closely and encourage more overtaking, partly through the use of a scaled-down venturi underfloor as seen in the FIA's senior categories. Improving the show, after decades of upper-surface ‘dirty air’ aerodynamic disruption, is at the heart of modern single-seater design, even for a category less defined by the chase for downforce and subsequent creation of turbulence in a car's wake.

“We have seen the concept coming down from F1 to F2, how they are getting better at chasing and getting close to another car, improving the overtaking ▶





LEFT The likes of Oscar Piastri, George Russell, Yuki Tsunoda, Oliver Bearman and Lance Stroll all graduated to F1 through F3. The latest car has been designed to familiarise the next generation of stars with the technology they will encounter as they rise through the ranks

chances,” says Casiraghi. “Everything has been transferred down to F3 as well. It’s a natural transfer from F2 to F3, while keeping in mind we had to keep the cost down.”

Casiraghi openly admits the ‘following closely’ element has been less of a problem in F3 than for its larger siblings, for a category that continues to offer its young drivers a first experience of using a Drag Reduction System [DRS]. But still, the gains in efficiency for the new Dallara should make a significant difference in this regard.

“Ergonomics and safety are not really matters we want to trade with”

“It’s mainly an improved efficiency of the whole package,” says Casiraghi. “The numbers in simulation show that the previous generation was losing more than 30% in downforce while following another car closely. The new design is well below this downforce reduction in the same condition, which hopefully will further enhance overtaking and the show in F3, which was already quite a good car for this. The improvement is promising, although we haven’t yet tested cars running together.”

Modern trend

By natural instinct, designers always want to go smaller and lighter – but the new F3 car follows the modern trend of heading in the other direction... Casiraghi smiles in acknowledgement. “We know the direct effect of making cars bigger is they get heavier and this is always a headache for performance,” he says. “On the other side, we have to accept [this trend] because most of the dimension changes are related to safety or inclusivity. Ergonomics and safety are not really matters we want to trade with, so it’s something



we have to accept, although we always try to make weight gain less painful.”

A longer nose and bigger 16-inch Pirelli tyres are characteristic features. “This car represents quite a big jump in looks because the old one was still on relatively small 13-inch tyres,” states Casiraghi. “Now we move to 16-inch which gives a nice proportion closer to F1 and F2 [which run on 18-inch wheel rims]. The shoulder of the tyre is smaller which will make the car more reactive, which will lead to a different

way for the teams and drivers to set up the car. The survival cell is a bit bigger, very close to the F2.

“In particular we wanted to improve the ergonomics of the F3 car, using the findings of the FIA in recent years on drivers’ seating and to have a cockpit that can accommodate drivers from 1.50 metres to 1.97m; not just for taller drivers but also for shorter drivers. Historically one of the points that was critical for short drivers was reaching the pedal box, a problem which tended to leave them very flat in the car or moved forward, resulting in a strange and uncomfortable position at the steering wheel. So we worked quite a bit on that in the past year to reach something that is more comfortable.

“The first feedback has been very positive. During ▶

BELOW The concept of the 2022 F1 aero overhaul has been passed down to the new car





Red Bull Content Pool

testing a couple of female drivers jumped from one car to the other and the general feeling of both was much better in the new one. Hopefully it is a good step forward for inclusivity.”

Yet in contrast to F1, the new F3 car – like the new F2 – still avoids the use of power steering, which would surely be a leveller for female drivers. Why?

“A good step forward for inclusivity”

Acceptable steering effort

Casiraghi explains that meeting targets for load levels has been achieved without the need for a power steering system.

“We are working with the chassis and tyre manufacturers and the promoter to contain the steering effort and stick to the targets that we provided for the design,” he says. “It’s in the technical regulations now, the load we deem to be acceptable, but it’s an ongoing process.

“In general, the trend we expect to see in single-seaters is 10 Nm torque per lateral G. So a car featuring 2G lateral acceleration will require 20 Nm on the

ABOVE Like its bigger brothers, the current generation of F3 cars struggle to follow each other closely, an aspect that has been addressed on the new car

BELOW More than 2,000 kilometres of testing had been racked up by the time the car was launched

steering wheel and a car like the F2, which creates over 3G, will be around 30 Nm. This is considered to be the cap we don’t want to exceed, so that it doesn’t become too high effort, so that it is accessible for all drivers. Also it makes the car simpler and less expensive not to have power steering. It’s on the table, but it’s quite a big step especially for the budgets. It would add weight as well.”

The safety gains with the new Dallara sound impressive. “We have made quite a big improvement ▶



The **Second Edition** of this best-selling book is now a two-volume set. This book offers a comprehensive guide to students and teams involved in the series

Learn & Compete

Formula SAE®/Student book

Second edition

Written by respected judges

From aerodynamics to engines, and suspension to simulation, with project management, sponsorship and everything else you could possibly need in between, this is the most comprehensive book yet published on how to prepare your Formula Student/SAE car.

To order online scan here:



FORMULA STUDENT
Institution of
MECHANICAL
ENGINEERS



Published by Kimberley Media Group, producers of RACE TECH and Historic Racing & Technology magazines and organisers of the RACE TECH World Motorsport Symposium

kimberleymediagroup.com



“The rollhoop is now 26% stronger than the previous generation. It’s a remarkable jump”

in the impact structure, over 40% higher in absorption capability than the old car,” asserts Casiraghi. “It makes the car heavier, but also much safer. If we put it as a percentage, safety is growing much steeper than the weight.

“The biggest step is probably the side impact protection. In the case of a T-bone impact we have the same protection as an F1 car, so the sidewall of the car can take up to 380 kN, so 38 tonnes that the sidewall of the cockpit must resist. This is the same as the F2 as well, so it’s a natural carryover from the big sister.

“We also have the same rollhoop as the F2. Dallara could have scaled it down because the car is lighter than an F2 but they decided on carryover for efficiency of design and to be on the safe side. To give

you a comparison the rollhoop is now 26% stronger than the previous generation. It’s a remarkable jump. We have linked the rollhoop load to the weight of the car, related to how many G we expect in the impact.”

One aspect considered ahead of schedule is the development in use of sustainable fuel, as the FIA moves towards its goal of eventually switching to fully synthetic non-fossil fuel and to meet the Formula 1 group’s drive to be Net Zero by 2030. The new F3 is planned to run on Aramco’s advanced fuel, which is being developed to be compliant with the FIA’s 100% sustainable fuel standard in 2025 – a year ahead of F1’s planned introduction of similar fully sustainable fuel in 2026. The new fuel, also planned to be used in F2 next season, is already powering the new F3 as it logs its test mileage.

“A car to challenge you”

The car was first shaken down at Varano near Dallara’s Italian HQ, with former F2 driver Tatiana Calderon at the wheel. By the Monza launch, 2,000 kilometres across several development tests had been covered, with more added since. Delivery of the 2025 F3 to its teams is scheduled for January, ahead of the first race

ABOVE The new car continues to offer young drivers their first experience of a Drag Reduction System

ABOVE RIGHT The larger wheels have helped create a car that will be more reactive for the drivers than its predecessor, which had 13-inch wheels

RIGHT Power is provided by the 3.4-litre six-cylinder, naturally aspirated engine built by Mecachrome



weekend of next season in Melbourne, Australia on March 14-16.

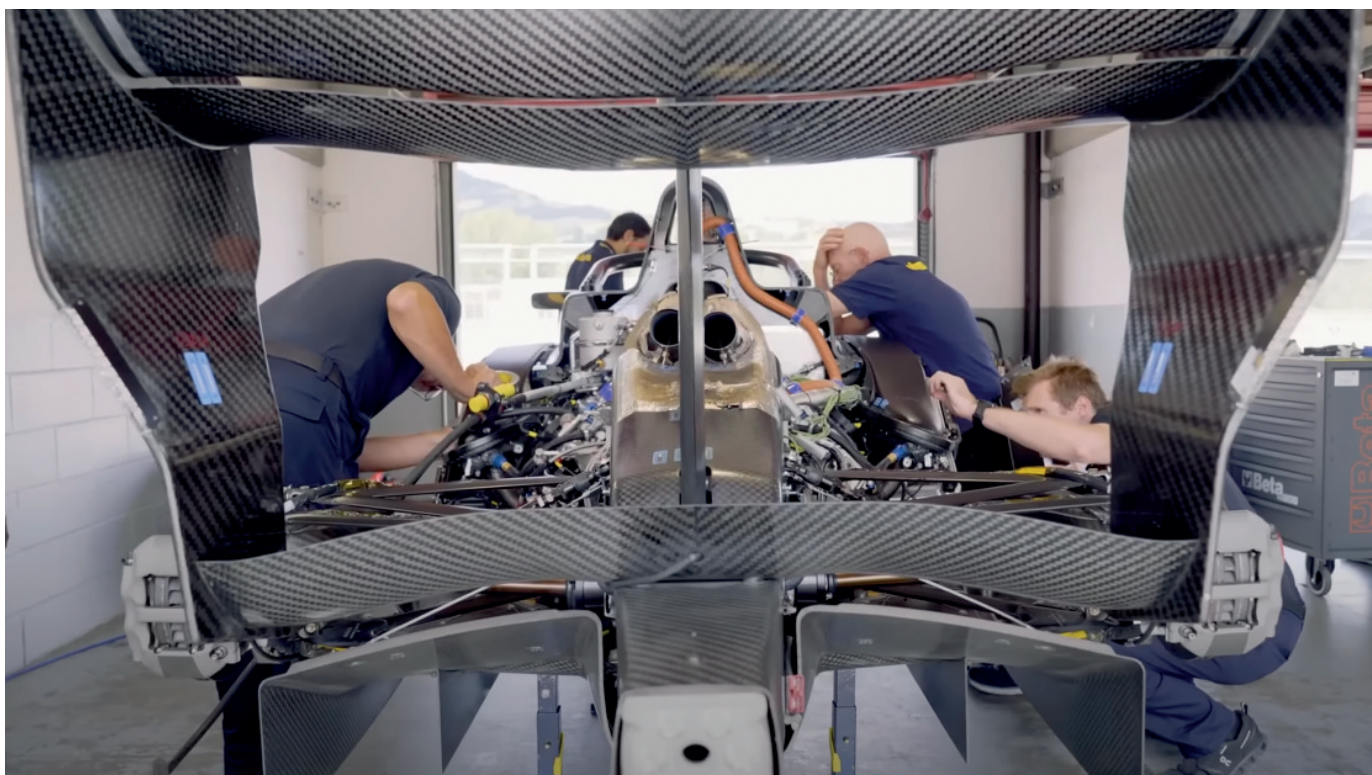
"It's a step forward, more in accordance with the 2026 F1 regulations," says Calderon. "This will definitely help the drivers get a better preparation in F3 to jump into F2. That transition will be easier. It's one of the best championships in the world, so definitely it's a car that will challenge you."

The introduction of a new spec single-seater is always a nervous time, to meet the high expectations of the teams and the drivers – who, lest we forget, are the

real customers in F3 given the budgets they must find to pay for their racing. But as Casiraghi admits, the pressure is higher for Dallara than the FIA. After 20 years as technical director of another Italian single-seater powerhouse, Tatuus, it's an aspect of the job he understands only too well.

"I'm pretty sure it will be a stressful period because if people are not 100% happy they will always knock on the door," he says with another smile. "You know how motorsport works!"

We do. 'Just right' is the only recipe racers are prepared to ingest. **RT**



DESTINATION *DAYTONA*

Toyota's GR Supra GT4 has more than 500 podiums to its credit and has won titles across the world, but the EVO 2 version that takes its bow in Florida next January will be a further improvement still. **Chris Pickering** finds out how

If you've ever dreamed of going GT racing, the chances are that you visualised something a lot like the Toyota GR Supra GT4. With classic front-engined GT proportions, muscular haunches and a big wing thrown in for good measure, it's the archetypal GT racer.

It's these dreams that Toyota is hoping to tap

into with the GT4. Conceived nearly 20 years ago as a feeder series to hone the talents of amateur drivers and aspiring pros, it's the first rung on the international GT racing ladder. But these days, with the meteoric rise of GT3, it's also the penultimate class before Le Mans or Daytona. GT4 itself brings access to blue riband events like the Nürburgring 24

BELOW With ABS increasingly the difference between success and failure in customer GT racing, special focus has been paid to this area with the new GR Supra GT4 EVO 2

“Thermal management is a recurring theme once you get into the 'cascade' effect of upgrading parts of the car**”**



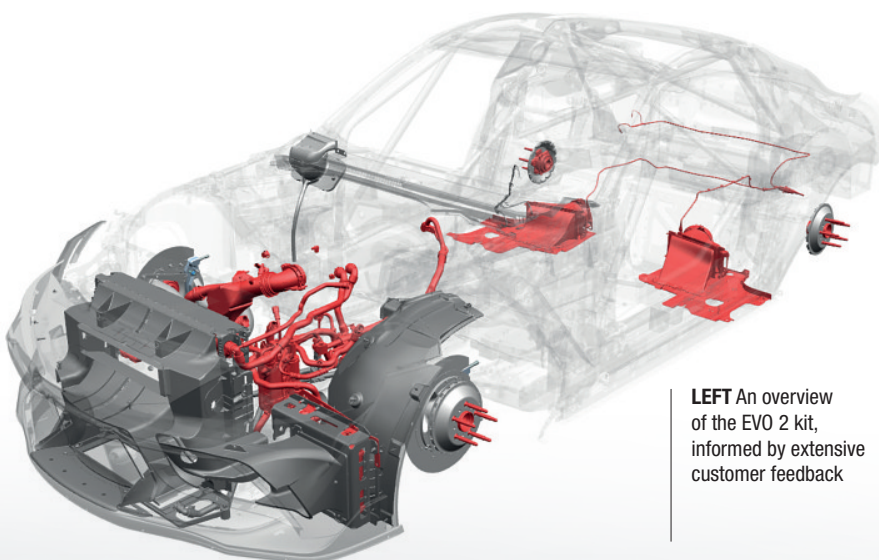
Hours and the Bathurst 12 Hour race.

GT4, then, is not to be underestimated. And neither is the Supra, with over 500 podium finishes in 11 different countries since its introduction in 2020.

Now, there's a new EVO 2 version of the Supra GT4, poised to make its race debut at the IMSA Michelin Pilot Challenge season-opener at Daytona in January – one of the support races for the hallowed 24 Hours.

"We had a big update for the start of last year with the GR Supra GT4 EVO. For that, we went round every series our customers are involved in, on every continent, collecting feedback. Understanding what we were missing and what our customers needed," explains Varun Srinivasan, GT4 technical project manager at Toyota GAZOO Racing Europe (TGR). "We've built on that with the EVO 2, which has a number of additional updates, mostly focusing on the brakes, the gearbox and the cooling."

The EVO 2 has been given a fresh homologation from the SRO, which



LEFT An overview of the EVO 2 kit, informed by extensive customer feedback

governs GT4. This means that teams can either purchase a complete car or an update kit, which includes a set of revised parts, plus details on how to modify some of the existing components.

The core of the Supra GT4 remains as it has been for the past four years. It's based on the six-cylinder variant of the Supra (a smaller four-cylinder engine is also available

in the road car) which uses the BMW B58 engine, found in everything from the Morgan Plus Six to the 7-Series limo.

Racecar needs

The chassis platform was also co-developed by Toyota and BMW, sharing some of its key elements with the G29-era BMW Z4. There are some notable ►



differences, however. Even on the road car, there is more chassis bracing on the Supra, the sills are significantly wider and stiffer and the engine is moved back (relative to the Z4) for better weight distribution.

“Whenever you’re working from a road car base, the first thing you do is to ensure that it’s safe in a motorsport environment,” comments Srinivasan. “The details can be quite complex, but the basic thought process is straightforward: You introduce all the safety features first – and generally most of those are mandated in the technical regulations, so you start with those features that you have to include. Then you move on to the reliability and the performance aspects.”

“The details can be quite complex, but the basic thought process is straightforward”

The road car’s steel and aluminium body structure is retained, with the addition of a high-strength roll cage, built to the GT4 regulations. There’s also an OMP race seat with a six-point FIA harness and a 120-litre ATL FT5 safety cell, along with a factory-fitted fire suppression system.

“When you convert a road car to race car you need to understand what the racecar needs,” notes Srinivasan. “Does it require more power? Does it require better handling? Does it require better aerodynamics? You start to peel the layers to understand what’s missing, and then you fill in the gaps.”

The suspension layout is carried over from the road car, with MacPherson struts at the front and a multi-link setup at the rear, combined with adjustable dampers from KW. Another departure from the road car is the use of specially fabricated suspension arms – but not for the reason that you might expect.

“We’ve tried to carry over as many parts as possible, but one of the key differences in a racing environment is the durability requirements,” explains Srinivasan. “There are close to 50 cars running in some of these events, so contact is sometimes inevitable. The lower suspension arm is a good example. We’ve modified it to ensure that it’s safe and durable when there’s contact or when the drivers ride the sausage kerbs. Adjustability is another thing that we bring to the racecars, in terms of track width, cambers and ride heights.”

Powertrain changes

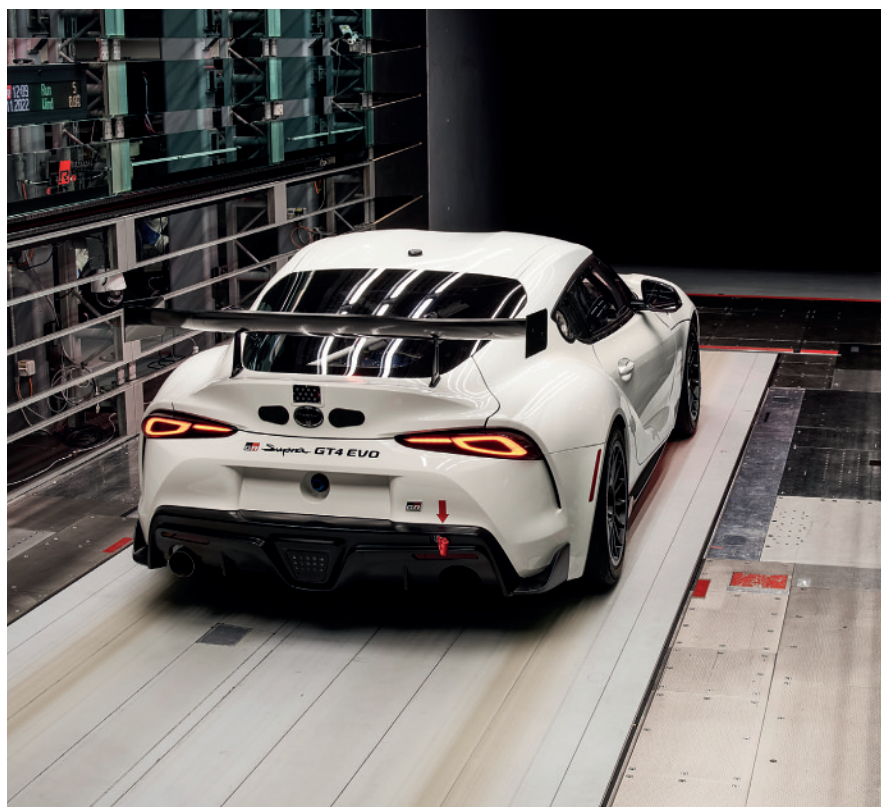
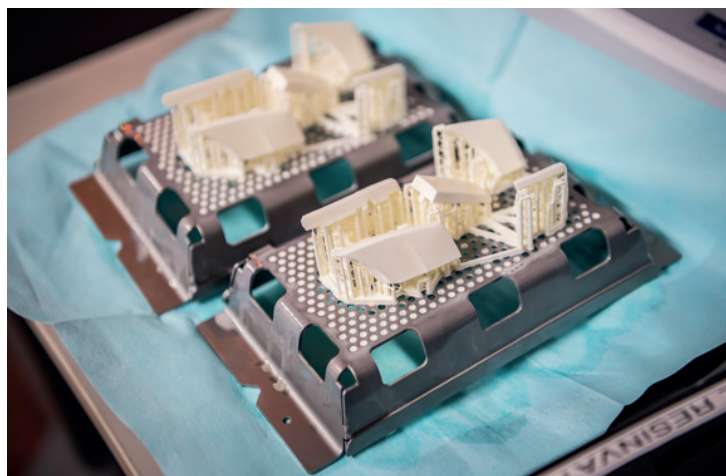
With relatively minor modifications permitted to the road cars and a comprehensive performance balancing (BoP) system in place, GT4 attracts a diverse crowd of machinery. The Supra’s opposition on-track includes V8-powered GT cars such as the Aston Martin Vantage and mid-engined supercars like

the McLaren Artura. As such, one of the first priorities was to increase the power output from the road car’s comparatively modest 335 bhp.

A single twin-scroll turbocharger is used on the 3-litre straight six, as per the road car, but uprated for the EVO 2. Revised pistons, an Akrapovič racing exhaust system and a bespoke calibration running on a motorsport-spec Marelli ECU boost the power output by nearly 100 bhp to a nominal 430 bhp (subject to performance balancing regulations).

Straight six engines are making something of a comeback in road car applications, but they remain relatively rare in motorsport. While they have the benefit of perfect primary balance and typically lower mass than a vee engine, they also come with the disadvantages of a longer packaging footprint, ►

BELOW Design, development and testing of each GT4 iteration has been conducted at TGE’s Cologne facility, with support from Japan, harnessing considerable expertise in everything from additive manufacturing (dash buttons below) to aerodynamics (bottom)



Driving Technology Into Pole Position

INTERNATIONAL

RACE TECH

Motorsport Engineering

SPECIAL OFFER SUBSCRIPTIONS

Starting from €62, £54, \$66



racetechmag.com

as well as longer crankshafts and camshafts that are more prone to flex. Neither are a problem at the engine speeds and loads encountered in a GT4 car, however, and Srinivasan points out that the straight six also has some key advantages.

"The smoothness and balance of an inline six are fantastic," he comments. "You've also got the benefit that there are fewer moving parts than you'd have in a vee engine [with two separate banks of cylinders]. Inevitably, a V6 or a V8 would mean more maintenance and more complexity, which is not what you want on a customer car. You also get more issues with heat management. What we're trying to do is give our teams a good power unit that's reliable and simple with low maintenance costs."

As with a lot of GT4 cars, the Supra retains the road car's torque converter automatic, albeit with significant software changes. This has been the subject of some of the EVO 2 revisions, with a new software update to fine-tune the rev matching, providing faster downshifts and improved engine braking for the latest version.

The powertrain changes at the start of the GT4 project set off a cascade of other modifications, Srinivasan explains: "It's a fine balancing act. For instance, once you increase the power, you need to start thinking more about cooling the engine. And when you get into that cooling work, you find that you need to look at the aerodynamics around additional air inlets. On top of all of that, you need to look at costs. You can keep adding performance improvements everywhere, but will your customer be able to maintain the programme with those costs?"

Keeping cool

Cooling, of course, can have a direct impact on reliability, and hence the running costs associated with the car. Thermal management is a recurring theme once you get into the 'cascade' effect of upgrading parts of the car. It was a key topic in the original design, and one that has been revisited in the latest EVO 2 developments.

"Cooling has been an important aspect in the evolution – not just in the powertrain, but in the cockpit, the brakes, the gearbox and the differential," explains Srinivasan. "With the technical regulations we have, it's not as simple as just adding vents everywhere or installing bigger heat exchangers. It's making proper use of the vents we have and coming up with some ideas of how you can improve that."

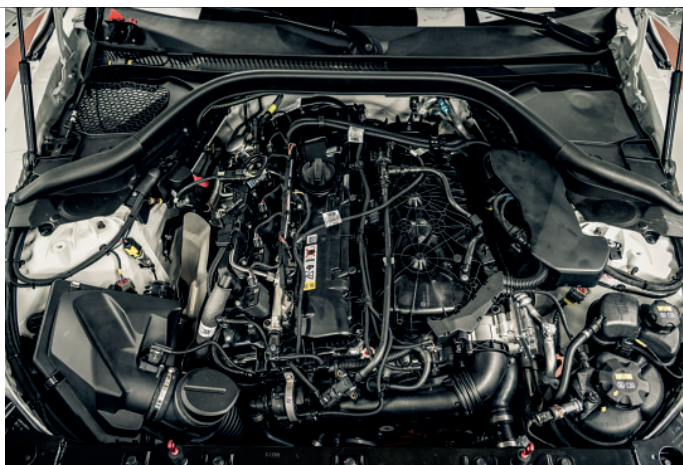
"For example, the previous car had the gearbox cooler facing the front of the car, perpendicular to the airflow. Behind that we have two more coolers stacked up. What we've done now is to re-position the gearbox cooler in front of this pack, parallel to the ground. So, that improves the cooling to all three coolers. We've also added fans to give us a bit more control over the temperature, without being quite so dependent on the air intakes."

While cooling is the primary function of the aerodynamic features on the GT4, there is also a prominent front splitter and rear wing – both made from natural fibres instead of the usual carbon weave.

RIGHT Every aspect of the GT4 (seen here in the workshop) received attention for the EVO and EVO 2 upgrades

BELOW Beneath the muscular lines of the EVO 2 the focus has been mostly on the brakes, the gearbox and the cooling





“There’s a lot less downforce than you’d get in, say, a GT3 car, but the splitter and the rear wing do provide an appreciable amount of downforce,” comments Srinivasan. “GT4 is an entry-level category, so you want your drivers to get a feel for downforce. It offers a great stepping stone to climb the GT racing ladder and it’s important for drivers to learn their race craft.”

A similar principle applies to electronic aids. The Supra GT4 comes with traction control and ABS – not just to make it more approachable for less experienced drivers, but also so they can get used to the level of intervention and learn to lean on these systems that now feature heavily in categories such as GT3. To that end, the EVO 2 updates include meticulously retuned ABS maps, designed to offer optimal braking for a range of circuit conditions and tyre wear levels.

Although it’s important to give the teams and drivers access to these functions, Srinivasan notes that the level of adjustability in GT4 cars is deliberately limited when it comes to things like aero settings to avoid them getting lost in complexity. “GT4 is very much focused on drivers rather than teams coming up with hours of simulation work on the setup,” he notes.

Stepping stones

The GR Supra GT4 is built on a dedicated production line at WRT Manufacturing in Belgium, but it was developed at TGR’s headquarters near Cologne, with access to the organisation’s prodigious R&D capabilities.

“We’re very lucky with the facilities that we’ve got here. We rely a lot on our expertise in the wind tunnel, with CFD and with FEA,” comments Srinivasan. “And we’re constantly looking at things to improve. For

instance, we’ve got a great engineering and production team working on natural fibres [for the aero components].”

TGR also has considerable expertise in additive manufacturing. This has been used over the course of the GT4 project to produce miscellaneous items like buttons for the controls on the centre console.

“It’s always a question of looking at the best way to produce a part. Sometimes it’s better or more cost effective to use traditional methods, but sometimes there’s an advantage to going with additive manufacturing,” comments Srinivasan. “It often comes down to the size and shape of the component.”

More than 120 cars have been built since the Supra GT4 was first introduced in 2020. During that time, it has proved itself to be a capable racecar, and perhaps just as importantly, a viable route onto the GT racing ladder. Germany’s Tim Heinemann, for instance, won the DTM Trophy championship in a Supra GT4 in 2022, before graduating to GT3 in 2023. He’s since gone on to race for Herberth Motorsport in the Asian Le Mans Series and Falken Motorsport at the Nürburgring 24 Hours. For aspiring drivers, this is the dream. And it’s one that TGR would no doubt be very happy to fulfil. 



ABOVE Varun Srinivasan is GT4 technical project manager at Toyota GAZOO Racing Europe



THE COLAPINTO PHENOMENON

Sergio Rinland is buzzing with excitement about F1 and it's not too hard to guess why!



ARGENTINA is a country where motorsport competes with football for popularity.

It enjoyed its peak during the Fangio years in the 1950s and with Carlos

Reutemann in the 1970s. Since then, its representation in F1 has been sporadic and not very successful. Yes, there have been flashes in Sports Prototypes on both sides of the Atlantic, with Oscar Larrauri, Juan Manuel Fangio Jr and Jose Maria Lopez, but beyond that – mainly through lack of finance due to the roller-coaster Argentina economy and, in a couple of cases, lack of talent – there was little to celebrate.

Many talented young drivers tried to make the breakthrough, but never progressed beyond karting, F4 or F3.

My own love of the sport stems from Fangio's legacy. When I was a kid in southern Argentina, his exploits ignited that passion. I followed his races from the radio and some magazines, but there was not much racing in our part of the world until I reached my teens. That's when we got to follow Reutemann in our Touring Cars and F2 before the ACA (Automovil Club Argentino) chose him and his team-mate, Benedicto Caldarella, in 1970 to drive for its own Formula 2 team, based in England.

Reutemann made an immediate impression in his first race at the old Hockenheim, battling for the lead with none other than the king of F2 at the time, Jochen Rindt. So meteoric was his rise that by 1971 he was fighting for the championship. He lost it by a few points to Ronnie Peterson due to his team manager refusing to allow him to use the newest slick tyres for the last race. March did, and Ronnie became F2 European Champion.

Finishing runner-up still opened many doors for Reutemann. Vital financial support from state-owned corporations got Carlos started in F1 with Brabham in 1972; he was also selected as a Sports Car driver for

ABOVE Colapinto is the first Argentine to score F1 points since Carlos Reutemann in 1982

Alfa Romeo and Ferrari. He had talent *and* financial support, the two main ingredients to succeed.

Now, decades on, a new talent has ignited the imagination of the whole country. Argentina hasn't witnessed anything like The Colapinto Phenomenon since Reutemann.

Franco Colapinto has what no other driver from Argentina could put together in more than 40 years. First and foremost, talent. But he also has a very professional management team behind him and, crucially, financial support, mainly from Argentine companies. And, why not, a degree of good luck (even though I don't believe in luck). The whole package!

Colapinto's first three races in F1 reminded me of that 1970 Hockenheim Formula 2 race: here is a driver with the talent, personality and determination not to be intimidated by what F1 is today.

In Reutemann's time, if you had the budget you could test day-in, day-out, which he did. Today that is not possible so Colapinto had to drive thousands of laps in the DiL simulator to compensate for the lack of testing in F3, F2 and F1.

Williams took note of his talents and kept quiet, until it had off-loaded Logan Sargeant, for his poor results. Team Principal James Vowles had to withstand a lot of criticism for bringing Franco in rather than opting for a more experienced driver. Obviously now, we know he knew something we did not.

Why do I say 'good luck'? Colapinto's debut coincided with a huge rise in performance from the Williams team, long overdue.

“The talent, personality and determination not to be intimidated”

Monza's debut defied even the most sceptical; it was fantastic, despite a small error in qualifying. Then, many people thought (me included): 'Monza is not very physically demanding, so he could do his fastest lap in the last lap with old hard tyres, but will he have the necessary stamina to cope with Baku?' The answer could not have been more emphatic. He not only qualified in front of his experienced team-mate, but he also finished in the points!

By the time we got to Malaysia, there were no doubts, he was ready. His start belied his inexperience and his race was impeccable. Only Red Bull's more savvy strategy denied him more points.

It says it all of his phenomenal start in F1 that the only criticism we have heard from his race engineer was: "Watch your language"!

Will he still be in F1 next season? This late in the year, it is like a game of Musical Chairs without enough seats. But he will be back because one thing is clear: here is a star in the making. 🏁

COME ON DOWN TO INDIANAPOLIS, THE RACING CAPITAL OF THE WORLD!



IF YOU ARE A MOTORSPORTS PROFESSIONAL,
RACER, OR PART OF A RACING TEAM, YOU NEED
TO BE AT THE PRI SHOW"

DISCOVER CUTTING-EDGE TECHNOLOGY FROM TOP INDUSTRY
LEADERS, CONNECT WITH KEY PLAYERS, AND ACCELERATE YOUR
BUSINESS GROWTH. DON'T MISS OUT ON THIS OPPORTUNITY TO PUSH
YOUR LIMITS AND REACH THE WINNER'S CIRCLE.

PRI SHOW

DECEMBER 12-14, 2024 | INDIANAPOLIS

REGISTER TODAY!
VISIT [PRISHOW.COM](https://prishow.com) TO SECURE YOUR SHOW BADGE NOW



MORE SINGLE SEATERS
THAN ANY OTHERS...

NO COMPROMISES™



PROUD BRAKE SUPPLIER OF



PROUDLY MADE IN THE USA
CLOVER, SOUTH CAROLINA

www.pfcbrakes.com

800.521.8874