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Making the most of the opportunity to change

SOME SEASONS ARE ONES OF SEISMIC CHANGE, SOME of stability. It's always the way in Formula 1 and, with the last major rule change in 2014 now an increasingly distant memory and the 2017 changes to look forward to, it's difficult to know what to expect from the coming season.

The odds are on status quo, with Mercedes still leading the way and Ferrari snapping at its heels. But while Ferrari won't make as substantial a step as it achieved from 2014 to '15, it can edge up on the Silver Arrows. It's what we need to happen to make a real fight of the season and, from what we've seen, when Mercedes is put under pressure strange things can happen!

Looking further ahead to the much-vaunted 2017 F1 rules, there is a lot to be concerned about. Promises have been made about faster, more spectacular cars and spectacular racing. They will certainly be quicker, and from the work being done inside teams it's clear that the magical six seconds laptime reduction is eminently possible. They will look maybe slightly cooler, certainly more swoopy. But better and more spectacular? There's a real danger that the assumptions made are wide of the mark.

This is something F1 needs to be very mindful of during the coming months. There is still time to take a serious look at the final form of the rules. For if the outcome resembles the emperor's new clothes, it won't be long before the fanbase sees that F1 is not, to extend the metaphor, wearing anything at all.



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COVER IMAGE
Alan Eldridge

COVER STORY - F1 2016

- 6 Introduction
- 8 The development war
- 10 A new American challenge from Haas
- 12 What's new for this season?

PIT+PADDOCK

- 16 Nissan's WEC pullout explained
- 18 Ford's World Endurance line-up revealed
- 19 Tough start for Dakar Rally
- 20 Feedback: your letters
- 21 Ben Anderson: in the paddock

FEATURES AND REPORTS

- 22 Porsche's year: World Endurance review
- 32 Interview: Williams new boy Lance Stroll

AUTOSPORT INTERNATIONAL PREVIEW

- 36 Ready for Birmingham
- 38 Solberg's stunt-driving masterclass
- 42 At home - in the Williams motorhome
- 44 Shedden's amazing BTCC season

CLUB AUTOSPORT

- 57 Triple Eight quits British GT
- 58 Phoenix Park resurrection planned
- 60 Mallory Park Plum Pudding meeting
- 61 Humble Pye

FINISHING STRAIGHT

- 62 What's on
- 64 From the archive
- 66 Bucket list: club racing's holy trinity

AUTOSPORT SUBSCRIPTION OFFER

- 35 Get a FREE Monster Powerbank

ALSO INSIDE

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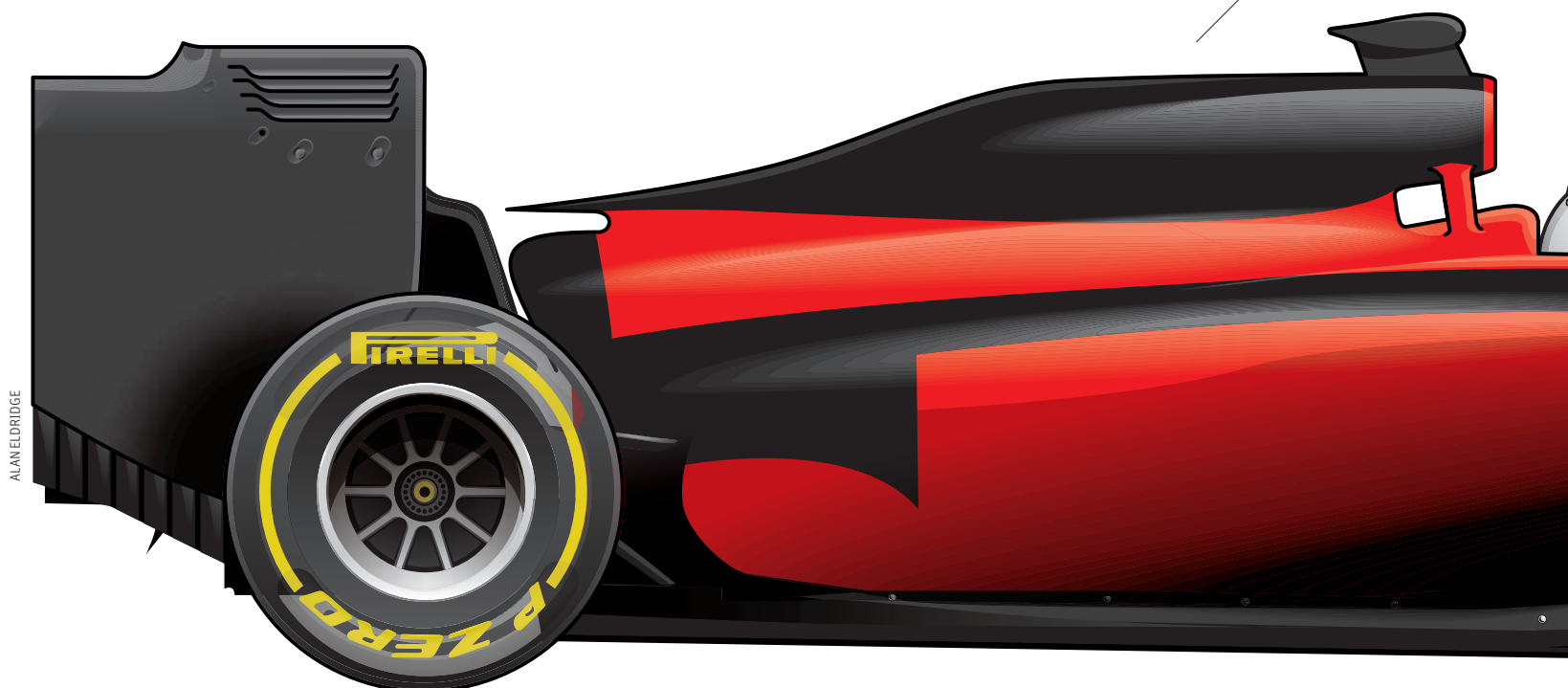
F1 2

...revealed!

A new team, a big push on engine development and a new British star driver are just a few of the elements that promise an exciting season ahead

By Ben Anderson, Grand Prix Editor

[@BenAndersonAuto](#)



ALAN ELDRIIDGE

2016

ENGINES

Development will now be allowed in-season rather than being reserved for the winter, and the number of development 'tokens' allowed will remain at 32 rather than falling to 25. This represents 50 per cent of the total token value of the engine, which in practice allows great scope for change and performance gains.

DRIVERS

While most teams field an unchanged driver line-up, there are some shifts. Jolyon Palmer makes his debut for the Lotus team, while Haas F1 has an exciting pairing for its debut season.

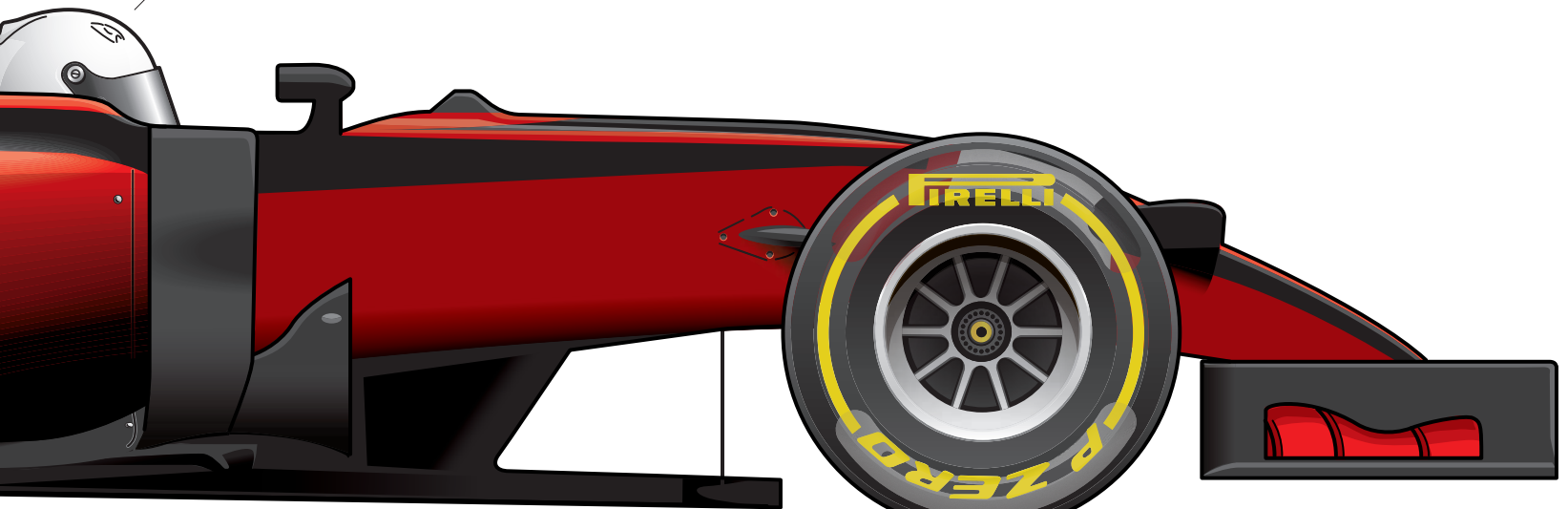
TEAMS

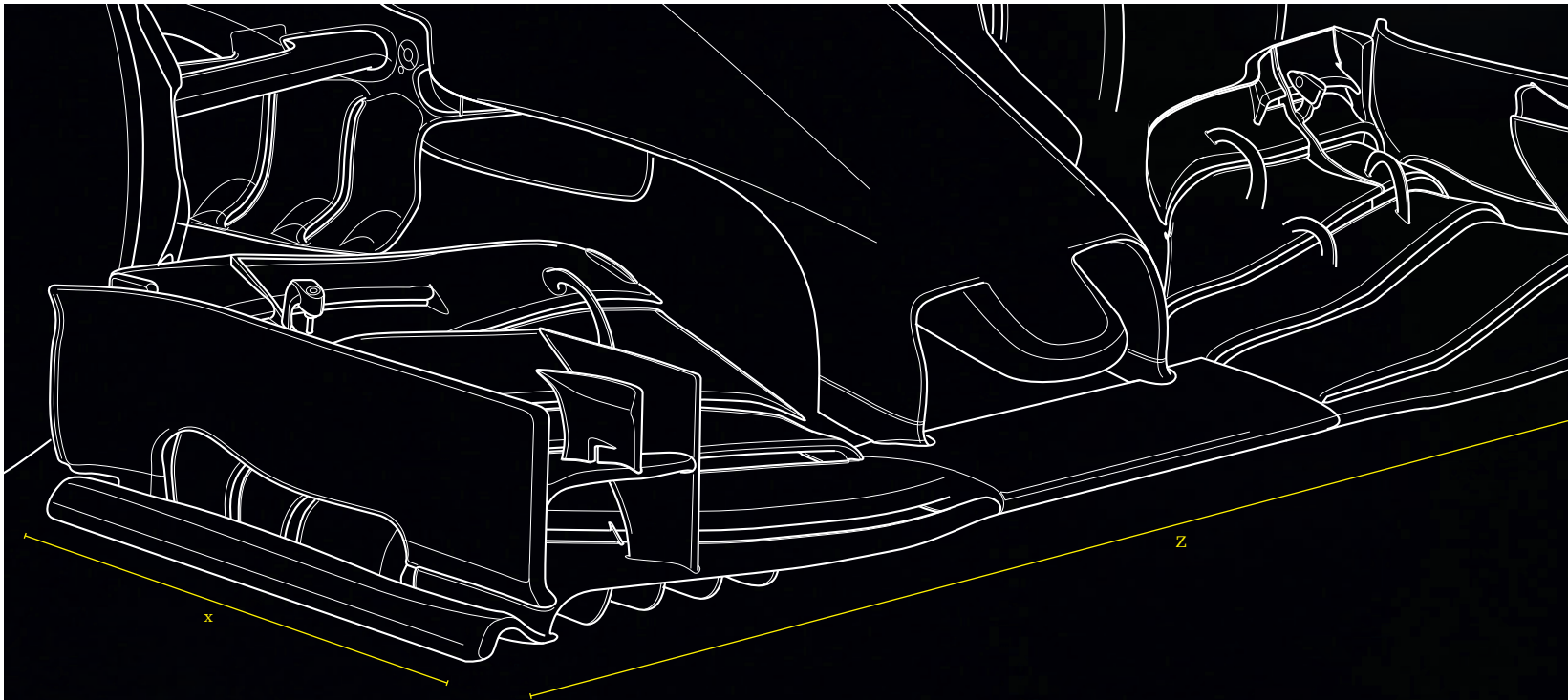
In March's Australian Grand Prix, Haas F1 will become the first new team to join the F1 grid since 2010. A partnership with Ferrari and a track record of success in NASCAR means expectations are high for the new season.

THE REGULATIONS ARE NOW IN THEIR THIRD season, and in normal circumstances would be edging into middle age. But with a new rulebook planned for 2017 – largely already defined but yet to be published – this will be the final year for the technical philosophy that was introduced in 2014.

It is a year of remarkable stability. There are no meaningful rule changes that will influence performance, save a little tinkering to improve the exhaust note, meaning that it will very much be what might be termed an iterative year.

But F1 never stands still. There will be new ideas, there will be innovations and there will be development. Granted, it might be of the subtle kind only detectable with precise instruments and understandable with vast computing power and specialist training, but this is F1. It never stands still, even when it might superficially appear to. Let battle commence.





The development war

The rules are largely stable for 2016, so what will be the key battlegrounds as teams fight to stay ahead of their rivals and close in on champion Mercedes? Ben Anderson reports

FORMULA 1 REGULATIONS CHANGED DRASTICALLY FOR 2014, AS A NEW engine formula arrived, exhaust-blown downforce was effectively banned, and the FIA sought to improve safety by mandating new crash structures at the front of the cars.

Car designs varied, particularly in the area of the nose but, as F1 enters the third season under these rules, we can expect far more convergence technically. Stability generally equals conformity, as everyone settles on similar solutions.

Bad news for variety. But hopefully good news for the quality and competitiveness of the racing, as the cars should inevitably close up on track.

"You'll see some of the detail areas change – front wings will be a bit different, the sidepod areas might be a bit different, the rear of the bodywork might be a bit different, but there are not going to be big changes because it's very much evolutionary," explains Williams technical chief Pat Symonds.

"There's no reason to suppose any of the changes will be any more [dramatic] than you've seen on any of the mid-season or race-to-race upgrades [in 2015]. Visibly, the only regulation that's changed is that the cockpit sides have increased in height a little bit. It does look a little bit different, but it's not earth-shattering.

"I rather suspect if you took a silhouette of a car from straight after the 2016 Australian Grand Prix and put it against the previous year, it would take quite a nerd to notice the differences!"

One significant area of variation under the V6 formula has been nose design. These rules were altered again for 2015, as F1's governing body tried to do away with the unsightly 'proboscis' appendages many cars sprouted in 2014. This forced teams to rethink their designs, to meet the regulations without compromising crash safety, while also attempting to recover lost downforce.

Most teams have followed the Williams trend of shortening the nose section as far as possible and leaving a 'thumb-tip' protrusion, but Ferrari stuck with a bulbous 'long-nose' design in 2015, while Mercedes went for a skinnier, sloping approach with no protruding element.

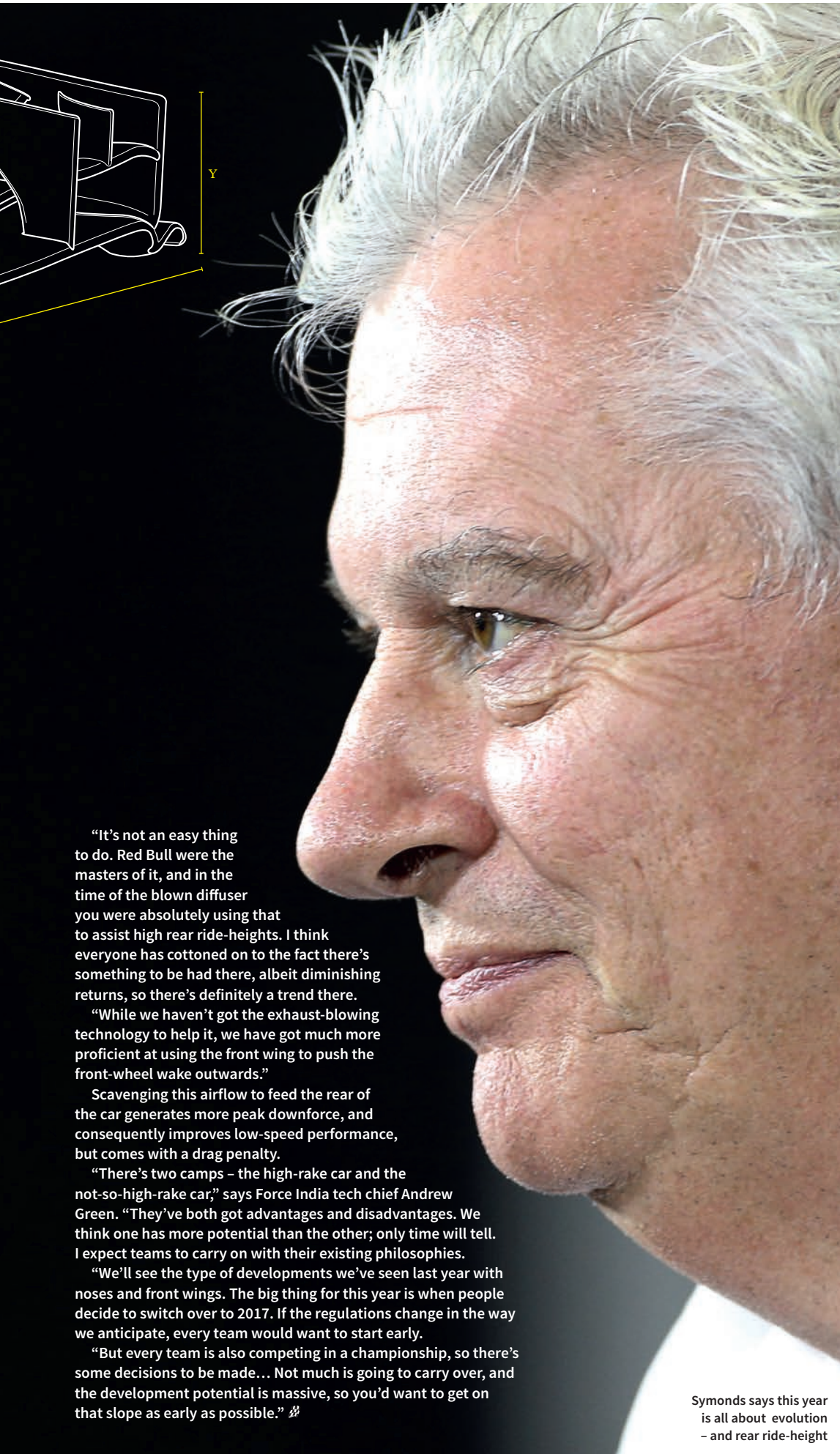
"It's bloody difficult to get that through the crash test, but it can be done, and we've seen those who have modified have gone shorter," adds Symonds. "I'm sure we'll see a trend towards the shorter nose, because it's demonstrably a bit better. To me it's the logical way of doing it, but if I were Mercedes I probably wouldn't mess around too much with it!"

One significant emerging trend during 2015 was a move among many teams towards raising the rear ride-height of the car. Red Bull, Ferrari, Williams, McLaren and Force India all ran noticeably more rake than rivals as the season wore on. This is something Symonds

"I suspect it would take quite a nerd to notice the differences from last year"

expects we'll see more of in 2016.

"Everything now is about rear ride-height," he explains. "It's about how high you can run your rear ride-height. The reason you chase the rear is that if you can get good rake on the car, and if you can stop your front-wheel wake from going under the car, there's more downforce to be had.



"It's not an easy thing to do. Red Bull were the masters of it, and in the time of the blown diffuser you were absolutely using that to assist high rear ride-heights. I think everyone has cottoned on to the fact there's something to be had there, albeit diminishing returns, so there's definitely a trend there.

"While we haven't got the exhaust-blowing technology to help it, we have got much more proficient at using the front wing to push the front-wheel wake outwards."

Scavenging this airflow to feed the rear of the car generates more peak downforce, and consequently improves low-speed performance, but comes with a drag penalty.

"There's two camps - the high-rake car and the not-so-high-rake car," says Force India tech chief Andrew Green. "They've both got advantages and disadvantages. We think one has more potential than the other; only time will tell. I expect teams to carry on with their existing philosophies.

"We'll see the type of developments we've seen last year with noses and front wings. The big thing for this year is when people decide to switch over to 2017. If the regulations change in the way we anticipate, every team would want to start early.

"But every team is also competing in a championship, so there's some decisions to be made... Not much is going to carry over, and the development potential is massive, so you'd want to get on that slope as early as possible." ❧

Symonds says this year is all about evolution - and rear ride-height

Concessions on engines will help the teams

ENGINE-DEVELOPMENT RULES WERE DUE to be tightened for 2016, but Ferrari, Honda and Renault lobbied hard for more freedom in their bid to catch Mercedes - and they got their way.

Initially, manufacturers were going to have their development tokens reduced from 32 to 25, all of which had to be used before homologation of the power units at the end of February. But the FIA relented, keeping the original figure, and their usage is now extended to the end of the season.

But will that help Ferrari, Renault and Honda catch up? No cut in tokens and the relaxing of restrictions on when they are used allows more development freedom.

"With the previous system, if there was a gap to the others, there was no chance to change that gap," says Honda's Yasuhisa Arai. "In-season development is good for the manufacturers and the fans because the gap can change during the season."

Honda has the most work to do. Its chief weakness is a lack of efficiency with its ERS - particularly the turbine, compressor and MGU-H - which left Jenson Button and Fernando Alonso "sitting ducks", as the Briton put it, on the straights in 2015.

Arai is certain Honda can get on top of the problems over the winter with the tokens available. "We have redesigned everything with regards the compressor, the turbine and the MGU-H," he says. "We have learned our lessons."

If Honda can cure its deployment problems, that will significantly reduce the deficit, but questions remain over its capability to do so.

The new rules potentially allow Renault to gain on its rivals, especially considering that it's increasing its working relationship with Ilmor, but it needs to reduce the length of time taken to solve problems.

Ferrari is Mercedes' closest challenger in terms of engine performance and arguably made the biggest gains in that area in 2015. But Mercedes won't stand still and the rules could even help it extend its advantage.

LAWRENCE BARRETTO



America's new entry to F1's land of opportunity

New grand prix teams haven't thrived in recent times. But there are strong reasons to expect Haas F1 to enjoy credibility in 2016, says **Edd Straw**



TEE/LAT

YOU HAVE TO LOOK BACK A VERY LONG WAY FOR THE last time a genuine Formula 1 start-up team ran at anything approaching a competitive level on its debut. None of the last eight new squads to take to the grid – HRT, Virgin, Lotus Racing, BAR, Lola, Forti Corse, Simtek and Pacific – so much as scored a point in their debut campaigns.

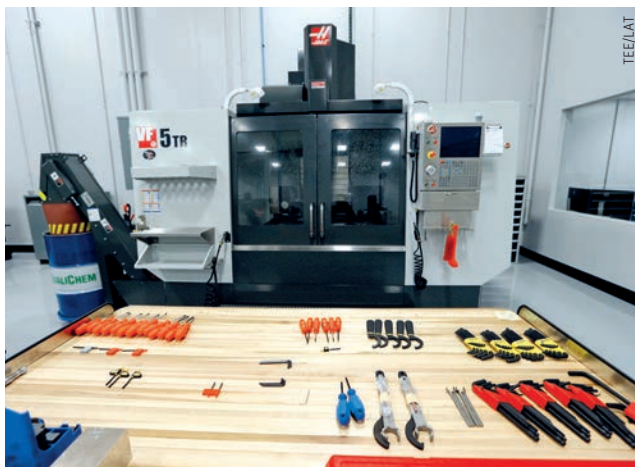
Only two of them still race in F1 (as Mercedes and Manor) and under very different ownership and identities. The last strong debut came in 1993, when Sauber remarkably finished its first lap in Formula 1 in the South African Grand Prix at Kyalami with JJ Lehto and Karl Wendlinger running fourth and fifth, and went on to finish seventh in the constructors' championship.

That is the tide of history against which the new-for-2016 Haas F1 team aspires to swim. While the success of Brawn/Mercedes, which emerged from what started as BAR, suggests all is not doom and gloom, that is an unusual set of circumstances and hardly a template for the American squad.

Team's base has cutting-edge engineering tools



TEE/LAT



TEE/LAT

But Haas is something different. Many will offhand dismiss it as another USF1, the much-vaunted all-American team that was supposed to race in 2010 but which never turned a wheel in anger (or, indeed, any other emotion). But it's more credible than that for several reasons.

For starters, the team is adamant that its Ferrari-engined machine will be ready for the first pre-season test on February 22-25. Then there is a deal with Ferrari that extends beyond that of a mere power-unit-supply agreement – it extends to other components. In order to qualify as a constructor, a team must simply own the intellectual property of all the designated listed parts. Beyond that limited list, it can use off-the-shelf technology. While that doesn't technically make it a B-team, it does in effect make it half a B-team; and by standing on the shoulders of one of F1's true giants, Haas can focus more of its budget of approximately £80 million on performance. Add to that the fact that Haas also has the assistance of Dallara – remember, a proven F1 constructor with a couple of podium finishes to its name that doesn't deserve to be tainted by its forcibly undercooked HRT design, and there is real promise.

It also has plenty of respected people behind it. The Stewart Haas team has enjoyed much success in NASCAR, and in Gene Haas it has a motivated team boss with a compelling reason for joining F1 – namely marketing his machine-tools business globally. Gunther Steiner is technical director and brings experience from Jaguar/Red Bull, with Rob Taylor and Ben Agathangelou also on the design strength.

The team's HQ is Kannapolis in North Carolina, but it has also established an operational outpost in Banbury, formerly inhabited by Marussia, to prevent it from having to ship the cars across the Atlantic too often.

So the team ticks a lot of the boxes, including a decent driver line-up (see panel). All of that means it should have a successful first year with the caveat that success for a start-up team with a modest budget is not to be measured in points.



Main: F1 team's base is in Banbury, UK

Below: Gene Haas (centre) has hired F1 veteran Gunther Steiner (left) and branding guru Adam Jacobs



Chances are, Haas will be at the back, but the real key is the gap to the front. While other recent newcomers never really latched onto the back of the midfield and were usually cast adrift at the back (the exception being Marussia during that brief golden period in early 2014), Haas has the chance to establish a solid baseline to build from.

For reference, when the last tranche of new teams appeared in 2010, the strongest qualified 4.932 per cent off pole position in Bahrain, the first GP of the year – a deficit of 5.6 seconds. If Haas can be in the neighbourhood of three per cent or better, that's a superb achievement.

Points may be hard to come by but, with a Ferrari tie-in and some realistic ambitions, Haas may prove to be the exception that proves the rule of the folly of establishing a start-up F1 team. Of course, whether it goes on to deliver on that potential is another matter, but at least it won't be a lame duck before it even turns a wheel. ❄



Romain Grosjean was the first driver announced by Haas

Driving force is one that could shine

IT'S NOT UNCOMMON FOR NEW TEAMS to come into Formula 1 with at least one experienced driver. But Haas has taken the step of employing two well-regarded drivers, one of whom you could argue is as quick as anyone else on the grid.

Romain Grosjean is the undoubted star, a driver with 10 podium finishes to his name for Lotus and now with the maturity and experience to deliver consistently. Provided the car is honest and true, the Franco-Swiss will be able to extract the maximum from it and be relied upon to seize on any chance for points. It's well-known that he is putting himself under the nose of Ferrari, which will surely have a

vacancy for 2017 if Kimi Raikkonen has another season like the last one, but Esteban Gutierrez is also an interesting case.

His two years with Sauber were a mixed bag. The first half of 2013 was poor, but he came on well in the second half of the year and deserved more than a sole points finish at Suzuka. The '14 Sauber was dire, and the Mexican was understandably erratic. While impressing Ferrari enough to come into contention for a race seat is a long shot, it will be interesting to see how he matches up against Grosjean.

"Ferrari is like a top-notch university, and if you go to that university then you have good credentials," says Haas of the decision to take Gutierrez. "If anything, most of it is the fact that Ferrari said, 'Here's a driver you should consider and we would like to have him in your car.' Ferrari was interested in Esteban driving. Part of it is they would like to try him out so that they can evaluate him for a Ferrari drive down the road."

With 121 grand prix starts between them, the drivers don't want for experience but they also still have something to prove. In that regard, it is a good line-up that is not threatened by the risks of employing old lags who have been there, done that and may not have the fight to battle away at the back.

"Ferrari is like a top-notch university"

Gene Haas



Gutierrez is Ferrari protege

What else is new in F1 2016

After an absence of 26 years there's a J Palmer on the grid again, and that isn't the only old name returning to the F1 line-up...



THIS IS JOLYON PALMER'S BIG CHANCE. HAVING become Britain's first GP2 champion since a certain Lewis Hamilton won the F1 feeder series in 2006, Palmer has had to be patient while he awaited an opportunity to progress.

He spent last season on the sidelines as reserve driver for the cash-strapped Lotus team, but that deal afforded



him 13 free practice appearances in Romain Grosjean's car, and Palmer used that opportunity to gain some valuable Formula 1 track experience.

He didn't always get a clean run at things, owing to some technical faults on his E23 (plus he was scuppered by Lotus's late payment of a tyre bill in Hungary), but he still racked up more than 250 laps, and come the back end of the season was lapping within two tenths of 2016 team-mate Pastor Maldonado.

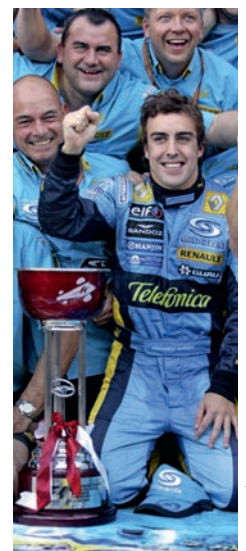
Many will be unsure what to make of Palmer, whose rise to the pinnacle of single-seater racing has been unconventional – starting in the short-lived T-Cars tin-top series (before the days of Ginetta Junior), then through the Formula Palmer Audi and FIA F2 championships run by his father, MotorSport Vision impresario Jonathan.

A close defeat to Red Bull affiliate Dean Stoneman in the 2010 F2 title race was Palmer's breakout year and, although it took him four seasons to crack GP2, he arguably improved most in that period – finally racing in a conventional team environment and developing to the point where he won his championship convincingly, against opposition including McLaren junior Stoffel Vandoorne and Sauber's Felipe Nasr.

"[He's] a very capable, very bright guy," reckons Lotus head of trackside operations Alan Permane. "I watched him through those years in GP2 and he's a fantastic racer. I'm sure he'll be great."

The 2016 season will be a transitional one for Palmer's team, as Renault returns Enstone to works status for the first time since 2011. It won't be easy, but this time of change also represents a great opportunity for Palmer to establish his credentials as Britain's next serious F1 prospect.

BEN ANDERSON



...AND FRANCE'S NEW TEAM

RENAULT'S re-acquisition of the Enstone-based Lotus team at the end of the year means that it will return to F1 as a full factory operation in 2016.

The personnel at Enstone – those who remain – are first rate and the facility is good, but it is going to take time for the former title-winning team to recapture past glories. Expect 2016 to be a year of rebuilding.

LAWRENCE BARRETTO

Biggest calendar ever

THE FORMULA 1 WORLD CHAMPIONSHIP will be contested over the highest number of races in the category's history this season.

The German Grand Prix, which fell off the calendar last year owing to the ongoing financial difficulties at the Nurburgring, returns to Hockenheim as part of the race-sharing arrangement between the two venues, and the calendar gains its record 21st grand prix thanks to the arrival of a new race on the streets of Azerbaijani capital Baku (pictured).

There is some doubt over the future of the US GP at Austin, owing to cuts in government funding of that race, but if that scenario is resolved then F1 will take in 21 races in a calendar year for the first time.

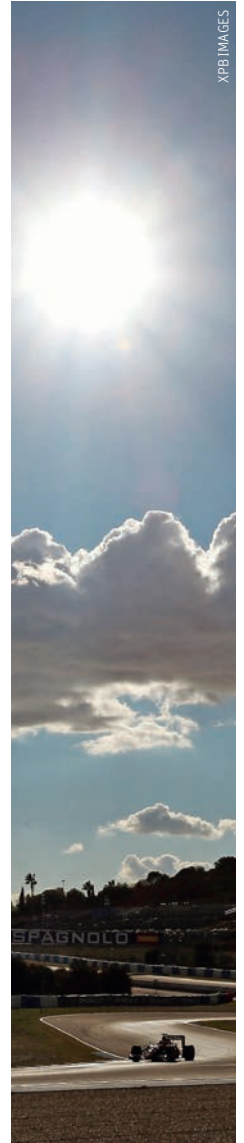
F1 bosses originally scheduled a later start to the season, with the Australian GP set to kick off the campaign in April, but concerns over the impact of a condensed calendar on team personnel (particularly the loss of the three-week summer shutdown) prompted a rethink.

The season will instead get under way on March 20, featuring six back-to-back events, before concluding on the last weekend of November in Abu Dhabi.

BEN ANDERSON

2016 FORMULA 1 CALENDAR

March 20	Australia
April 3	Bahrain
April 17	China
May 1	Russia
May 15	Spain
May 29	Monaco
June 12	Canada
June 19	Europe (Baku)
July 3	Austria
July 10	Britain
July 24	Hungary
July 31	Germany
August 28	Belgium
September 4	Italy
September 18	Singapore
October 2	Malaysia
October 9	Japan
October 23	USA
October 30	Mexico
November 13	Brazil
November 27	Abu Dhabi



PRE-SEASON TESTING CUT TO TWO

THE NUMBER OF pre-season tests has been cut from three to two, with each lasting four days and taking place at Barcelona's Circuit de Catalunya.

As was the case last season, there is provision for two in-season tests of no more than two consecutive days at a circuit where a grand prix has just taken place. Young drivers must be used on at least two of the four days. Dates and locations have yet to be decided.

In addition, there will be up to six two-day tests for the sole purpose of tyre testing.

LAWRENCE BARRETTO

PIRELLI TYRE CHANGES

For the 2016 Formula 1 season there is a new tyre compound – the ultra-soft – and new rules governing the use of manufacturer Pirelli’s rubber. Here are how the rules work.

Is the total number of sets of tyres available over a race weekend still the same?

Yes. There are still 13, but the number of compounds available per weekend has risen from two to three. Of the 13 sets, two are stipulated for the race by Pirelli, and could be of differing compounds. A set of the softest compound available on the weekend is mandated for Q3. Of the 10 remaining sets, teams/drivers have free choice.

Of those 10 sets, are the ratios for each team and driver pre-determined?

No. The ratio depends on a team’s strategy for the weekend. For example, if a team fails to send its choice to the FIA it receives a standard allocation of three sets of the harder compound, four of the middle, and three of the softer. It can play with any combination of the numbers dependent on set-up of the car, driver style etc.

Will teams still get an extra set of tyres for the first 30 minutes of first practice?

Previously one set of ‘prime’ tyres was used for the opening half-hour of FP1. Now, any one set of the 10 chosen by the team/driver can be used for the first 40 minutes.

Can teams still use the softest compound available in Q1 and Q2?

Yes, providing they have chosen enough sets of the softest among their pre-selected 10 sets for the weekend.

Does the stipulation that drivers have to start races on their Q2 tyres still apply?

Yes, as stated in the regulations, “at the start of the race each car which qualified for Q3 must be fitted with the tyres with which the driver set his fastest time during Q2”.

We now know that three tyre compounds will be made available for a race, but can all three be used in a race?

Yes.

Do the same rules apply for the minimum use of a compound in each race?

The rules simply state “each driver must use at least two different specifications of dry-weather tyres during the race”. So if it is one lap on a set of softs and 50-odd laps on a set of mediums, that is within the rules.

Does the ‘mandatory race tyre specification’ mean it’s not really a free tyre choice?

There is a free choice because while Pirelli is selecting two sets of tyres for a race, there are still another 10 available for a team/driver to go as aggressive or as conservative as they wish.

Even if Pirelli nominates two different compounds for its mandatory race sets, the teams still have a completely free choice from the three nominated compounds for their other tyres during the weekend.

Do the early deadlines mean drivers are committing to tyre strategies months ahead of a race?

In effect, yes they are, because with the new rules, teams and drivers must inform the FIA eight weeks before the start of a European event, and 14 weeks before a non-European race, the ratios of the three compounds they wish to use at that event, after being supplied with the options a week before the deadline.

This will add another layer of uncertainty, although in practice there will be some convergence on strategies.

Will the super-soft, let’s say, be the same compound everywhere, or are those names now generic to cover a range of options?

Pirelli has decided to retain the current names. They will always be associated with that particular compound.

In short, how will tyre strategy in an average 2016 grand prix be different to tyre strategy in an average 2015 grand prix?

It is hoped that with the introduction of a new compound, to make five in total, and with teams able to use all three compounds available for a race, the possibility of different strategies will increase in an exponential way with two or three pitstops.

IAN PARKES

ETHERINGTON/LAT



MANOR AND MERCEDES: A MATCH MADE IN HEAVEN?

MANOR JUST ABOUT made it onto the grid last season, after a last-minute rescue package saved it from closure. It adapted its 2014 chassis to comply with the regulations and ran a year-old spec Ferrari engine. As a result, it spent the year running around at the back.

This season, things look brighter with a new chassis planned, a latest-spec Mercedes power unit in the back and a technical partnership with Williams Advanced Engineering.

But it takes time to adapt to change, not least when there are personnel moves to consider too. Team principal John Booth, sporting director Graeme Lowdon and technical chief Bob Bell have departed.

Coming the other way is former McLaren team manager Dave Ryan in the role of racing director, as owner Stephen Fitzpatrick pursues his plan to improve the team’s future prospects.

There is an expectation that the team will be in touch with the pack and put itself in a position to seize opportunities when they present themselves. If Manor is able to complete a smooth testing programme and score points at any point during the season, it would represent a good step for the team.

LAWRENCE BARRETTO

XPB IMAGES



XPBIMAGES

BACK TO FERRARI FOR TORO ROSSO After months of uncertainty, Toro Rosso completed a deal in which it will use a 2015-spec Ferrari engine this term. Both Red Bull-owned teams were without a power supply for 2016 after requesting to end their deals with Renault at the end of the season. Toro Rosso opened talks with Ferrari over the possibility of a supply to reignite a partnership that previously ran between 2007 and 2013. After Red Bull agreed its deal with Renault and the rules were tweaked to allow old-spec engines to be used, the Toro Rosso deal was announced. Though rivals Sauber and Haas as well as the works Ferrari team will have the latest-specification engine, it is understood that team principal Franz Tost is privately happy with his team's terms, especially given the lack of power and poor reliability of the Renault unit it used in 2015. **LAWRENCE BARRETT**

Come feel the noise

NOISE HAS BEEN A BIG ISSUE IN F1 since the V6 hybrid turbos were first introduced. Bernie Ecclestone droned on about how the lack of it was turning punters away, while Sebastian Vettel even went so far as to suggest that the latest generation of engines sound "shit".

Turbo engines will always sound quieter than V8s, by their very nature. They are capped to lower revs, and more noise is anathema to hybrid systems that are designed to recycle energy into horsepower, not let it go to waste...

Nevertheless, work has been ongoing in the interim, to find a way of enhancing the sound without ditching the hybrid technology altogether.

Mercedes tried a much-ridiculed trumpet solution on the exhaust in 2014, which was ultimately rejected. Now the technical regulations have been amended

to mandate an alternative exhaust profile on all the cars.

"I think that will enhance the sound; it will tidy it up," reckons Mercedes engine chief Andy Cowell. "At the moment we've got the main tailpipe coming out of the rear of the turbine, and the wastegate tees into that, so there's just one pipe coming out the back.

"That tee piece acts as a dead-end on the main tailpipes, which will affect the frequency of the sound. Taking that out will clean up the quality of the sound, and improve the volume of the main tailpipe."

Not everyone is convinced, though, principally because the constant drive for efficiency minimises time spent with the wastegate open.

We'll hear for ourselves when the 2016 cars start testing next month.

BEN ANDERSON



XPBIMAGES

Changes at the back should produce a different tailpipe note



WORLD ENDURANCE CHAMPIONSHIP

Why Nissan's radical

THE AXE HAS FALLEN ON NISSAN'S FRONT-wheel-drive GT-R LM NISMO without the car ever running in the form intended by creator Ben Bowlby. The inability to restore the radical concept behind the LMP1 design was a key reason behind the cancellation of this year's World Endurance Championship assault.

The official line from Nissan Motorsports team principal Mike Carcamo was that it was faced with developing a new version of the front-engined car at the same time as going racing. But sources close to the US-based operation masterminding the programme suggest that equally significant were doubts about the potential car competitiveness in the revised configuration planned for 2016.

Taking energy from the heavily loaded front axle and sending it to the skinny rear wheels courtesy of an efficient, fully mechanical hybrid system was one of the foundation stones upon which the concept of the GT-R LM was built. That building block was central to unlocking the potential in this avant-garde design, according to Bowlby. But instead of restoring a concept that was shelved for year one early in the programme, Nissan was planning something different – and more expedient – for the coming season.

Putting the engine in the front to provide aerodynamic freedoms not available to the manufacturers running conventional rear-engined cars was one of the fundamentals of the concept. The other was shifting the weight

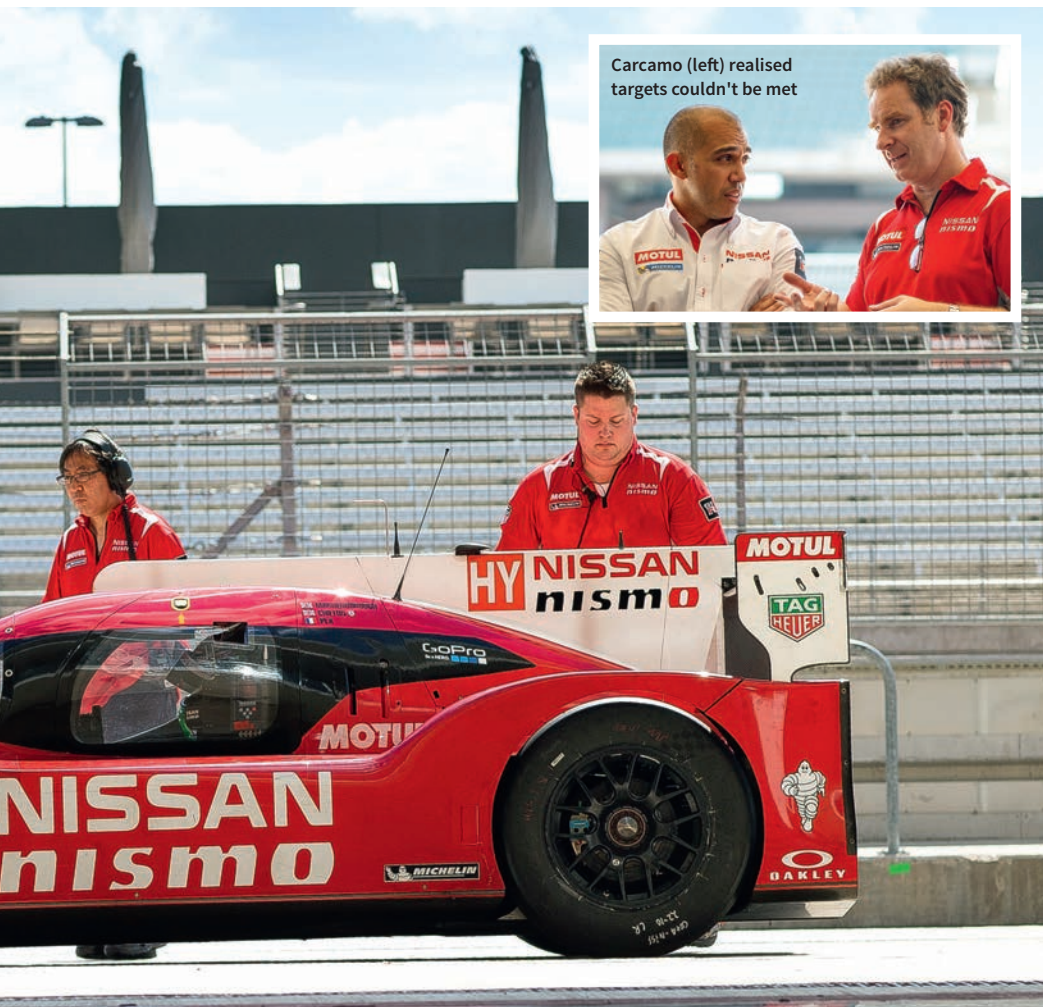
and aero loads forward to allow it to regenerate big megajoule numbers through a single front-axle energy-retrieval system.

Bowlby, technical director of the LMP1 programme, explained his philosophy shortly after the launch of the car at the start of 2015: "You want to recover from the front where you have a lot of downforce, and you want to put the weight up there [part of the front-engine concept] because you will then have a better chance of recovering a lot of energy."

The idea of recovering energy from the lightly loaded rear axle – lighter than in a conventional rear-engined car – appeared to undermine everything Bowlby had been trying to achieve when he conceived the GT-R LM. Rival engineers suggested that there was little chance of Nissan being able to get to one of the higher megajoule hybrid classes regenerating only at the rear.

Carcamo, placed by Nissan at the helm of the project at the end of the summer, confirmed on the cancellation of the project just before Christmas that the plan was to regenerate at the rear with what he described as "a traditional electrical energy-retrieval system".

This was forced upon Nissan by ongoing problems with the mechanical system developed in the UK by Torotrak and its ability to find a like-for-like replacement. It had no option for an electrical system, and mounting a motor-generator unit in the front was not possible for reasons of weight and, possibly, packaging.



Carcamo (left) realised targets couldn't be met

GT-R LM was axed

Carcamo has insisted that this didn't "undermine the concept", but he has admitted to what he calls "a lack of visibility" as to the potential competitiveness of the revised GT-R LM.

"At this time we don't have the visibility to meet our own performance targets in line with what we think our competitors will be doing," he explained.

That conclusion followed a redesign of the car over the final two months of 2016.

"We had learned a lot, knew some of the deficiencies and were attacking them with new designs," he continued.

"There was a redesign in two months: manufacturing, build and testing of a vehicle takes much longer, so rather than putting ourselves at risk in the development process by trying to race at the same time, the decision was made not to race."

That brings to an end the GT-R LM programme. The official line is that decisions about the future beyond 2016 have yet to be taken, but the gates of the Nissan LMP1 workshops in Indianapolis are locked and its staff laid off.

The GT-R LM was never going to achieve much in 2015 once it became clear that the

car could not race as intended. The Torotrak system was overweight and ran only sporadically – and unreliably – in testing. The complicated rear-drive system never made it onto the car, which meant that Nissan was forced to regenerate and deploy at the front end.

Nissan had to revise its plan to homologate the car in the highest 8MJ hybrid sub-division. It eventually opted for the lowest 2MJ system, though as we know the hybrid system was never functional when the three cars raced at Le Mans in June.

With that decision, the concept of the GT-R started to unravel. Less recuperation at the front meant bigger conventional brakes were required, which in turn forced the introduction of larger-diameter wheels and tyres. And that decision meant there was no time for Michelin to develop the bespoke tyres for the car. There was a domino effect.

The radical concept behind the Nissan GT-R LM NISMO needed to be pieced back together, not altered to incorporate more-conventional technology. That was why the plans for 2016 were always doomed.

GARY WATKINS

"The rear-drive hybrid system never made it onto the car"

IN THE HEADLINES

WOLFF TO LAUNCH FEMALE SCHEME

Ex-Williams Formula 1 test driver and DTM racer Susie Wolff will launch an initiative to boost female participation in motorsport at the Autosport International Show. Wolff will reveal details of the programme, put together in conjunction with the Motor Sports Association, during the January 14-17 event at the Birmingham NEC.

KUBICA SET FOR MONTE CARLO RALLY

Robert Kubica will drive one of six M-Sport-built Ford Fiesta RS WRCs on this month's opening round of the World Rally Championship, the Monte Carlo Rally. Elfyn Evans, who has been dropped from M-Sport's WRC line-up, will contest the WRC2 class in the first competition outing for the Cumbria firm's upgraded Ford Fiesta RS.

LOEB EXPANDS TEAM INTO RALLYING

The eponymous team of rally legend Sebastien Loeb is to expand into the WRC. Sebastien Loeb Racing, which also competes in the World Touring Car Championship and the French GT series, has announced Alsace-born 25-year-old Terry Folb as its first driver.

GUNTHER GETS SEAT WITH PREMA

German teenager Maximilian Gunther has been confirmed as part of top Formula 3 European Championship squad Prema Powerteam's line-up for 2016. Gunther, who won at the Norisring with Mucke Motorsport last season, joins Lance Stroll and Ralf Aron at the Italian squad.

BRIT ILOTT JOINS VAN AMERSFOORT

British 17-year old Callum Iloft is to contest a second European F3 season, but has switched from Carlin to Van Amersfoort Racing. Iloft, a podium finisher in 2015, is no longer part of the Red Bull junior programme. He will partner Pedro Piquet, while Harrison Newey – son of Red Bull tech chief Adrian – is also strongly tipped for a seat.

WEBB JOINS ASIAN LE MANS FRAY

Former European Le Mans Series champion Oliver Webb is to contest the final two rounds of the Asian Le Mans Series, starting this weekend at Buriram in Thailand, with the LMP2 ORECA-Judd of the Race Performance team. Briton Webb replaces Shinji Nakano, who won the opening two rounds alongside regular driver Niki Leutwiler.

SURTEES IN NEW YEAR HONOURS LIST

John Surtees has been made a Commander of the British Empire in the New Year's Honours list. The CBE is a more senior rank than his OBE from 2008, and comes in recognition not only of his world titles on four and two wheels, but also his charity work with the Henry Surtees Foundation. Meanwhile, former Monte Carlo Rally winner Paddy Hopkirk was made a Member of the British Empire (MBE) for services to motoring and young people.





GP2

ROWLAND KEY TO DRIVER MARKET

FORMULA RENAULT 3.5 champion Oliver Rowland's likely graduation is at the heart of the 2016 GP2 driver market, with the Briton targeting a Formula 1 affiliation should he move into the support series.

Rowland tested with powerhouses ART and DAMS in the post-season Abu Dhabi tests, as well as the incoming Prema Powerteam. He and his backer the Racing Steps Foundation are in negotiations over a 2016 drive, though the DAMS door closed in December when Alex Lynn was retained and Nicholas Latifi signed.

With Honda protege Nobuharu Matsushita believed to be sticking with ART, Russian driver Sergey Sirotkin linked to the French team too and Prema, and DAMS refugee Pierre Gasly tipped for Prema, Rowland's decision is key.

It is understood progress will be made soon, and Rowland dropped a firm hint of his destination should he go to GP2. "It will be one out of the three teams I tested with," he said. "Next year if I do GP2 it will be with a link to a Formula 1 team – it's something we have pretty much agreed. The number-one priority would be to win GP2. It's not done yet but it's looking quite good."

Another driver move is set to be Mitch Evans to the Campos Racing team. The New Zealander finished fifth in 2015 with Russian Time, winning twice.

SCOTT MITCHELL



WORLD ENDURANCE CHAMPIONSHIP

Priaulx and Franchitti take roles as Ford unveils line-up

FORD HAS REVEALED THE DRIVERS WHO WILL LEAD its assault on the 2016 World Endurance Championship with its new GTE contender.

The two Ford GTs fielded in the full WEC will be raced by Andy Priaulx, Olivier Pla, Stefan Mucke and Marino Franchitti. The pairings for the two cars entered in the GTE Pro class under the Ford Chip Ganassi Racing banner have yet to be confirmed, nor has the identity of who will join them for the Le Mans 24 Hours in June.

Ford Performance global director Dave Pericak said: "To compete at this level you need the best car, the best team and the best drivers. We have selected Stefan, Olivier, Andy and Marino to drive the Ford GT to take on the best in the world."

The four drivers have "heart, speed and proven endurance

racing credentials", according to team boss Chip Ganassi.

Priaulx, who has left BMW after 13 years, added: "A new project is always exciting but for me to be driving for Ford in the WEC is just on another level."

It has also been announced that Mucke will contest this month's Daytona 24 Hours in one of the two Ganassi Fords entered in the GT Le Mans class of the IMSA SportsCar Championship.

Priaulx will also make his Ganassi debut at Daytona aboard one of its Riley-Ford EcoBoost DPs. He will share the car with Alex Wurz, who is deferring his retirement to fulfil an ambition to contest the race, World Endurance champion Brendon Hartley and Formula 3 racer Lance Stroll.

GARY WATKINS



FORMULAE

Aguri wants rival motor

TEAM AGURI IS SET TO COMMIT to using a rival Formula E powertrain next season.

Championship regulations stipulate that a powertrain manufacturer must be prepared to sell its motor, gearbox and inverter package to a rival team for a maximum €120,000, or lease it for €72,000 per season.

Team Aguri, which is running in season-one Spark SRT_01E

specification for season two, has until the end of March to choose the direction it will take for the next campaign but is likely to make the decision sooner.

Meanwhile, NEXTEV TCR may drop its twin-motor powertrain for season three, which begins this autumn. The team wanted to make the decision by the end of 2015 so that it could test its new powertrain on track as soon as possible. In

addition, current Venturi customer Dragon Racing is developing its own powertrain for the first time.

Manufacturers are allowed 15 test days in addition to the official pre-season running. The final homologation of season-three powertrains is not due until July 1, but crash testing must be completed by April 1, after which any changes will be limited to fine-tuning.

SCOTT MITCHELL



DAKAR RALLY UPDATE

Loeb after the drama

LAST YEAR'S DAKAR RALLY TURNED into a fairly straightforward dash across South America, raising concerns that the adventure might have gone from the world's toughest rally. Last weekend's start to the 2016 edition set the record straight in emphatic fashion.

In September, Peru withdrew its roads from the Dakar route, fearing the impact of the El Niño weather pattern. At the time, plenty were quick to mock such conservatism. Those same folk were forced to think again when torrential rain washed Sunday away and left Monday so muddy that Nani Roma lost 40 minutes hauling his Mini out.

In Saturday's prologue – the six-mile stage which would decide the running order for the main event – there was worse news. Chinese driver Guo Meiling crashed off the road and hit spectators. The 47-year-old X-Raid Mini driver was making her Dakar debut when she lost control mid-way through the short stage. Ten fans were injured, three of whom remained in hospital in serious condition when *Autosport* closed for press.

With safety at the forefront of everybody's minds, the organisers were quick to cancel the first day proper when heavy rain and low cloud meant the safety helicopter couldn't track crews along the 150-mile competitive section from Rosario to Villa Carlos Paz.

Despite everybody being keen to go racing, last year's winner Nasser Al-Attiyah praised the move. "It was a good decision from the organisers – we don't need to take any risk on the safety side," said Al-Attiyah. "The

[cancelled] section was a little bit in the mountains, so it would be too much risk if something happens and the helicopter cannot reach the point. Safety must always come first."

Event director Etienne Lavigne admitted the weather was causing significant problems. "We were troubled," he said. "Weather conditions were very bad. Honestly, it's preferable to cancel."

Sitting watching the clouds gather lakeside in Carlos Paz, there were concerns about Monday and the 323-mile competitive section out west to Termas Rio Hondo. In the end, the rain stopped and the stage was shortened. But a shocking stretch around halfway through what became a 240-mile section still brought much of the field to a standstill.

It was here where Roma was forced to dig, urging understandably reluctant locals to join in the mudbath and get themselves painted by any one of the spinning wheels beneath his ALL4 Racing.

Just when the tale couldn't get any taller, Sebastien Loeb stepped forward. If ever there was a part of this route that would suit the Peugeot driver, it was here, and he went fastest to lead as *Autosport* closed for press. "I was really surprised," he smiled. "I was caught in the mud and stopped. I thought I wouldn't get out..."

Loeb's Peugeot team-mate Stephane Peterhansel was second, 2m23s behind, with Russian Vladimir Vasilyev third in a Toyota. Loeb's fellow ex-WRC star Mikko Hirvonen was a frustrated fifth in a Mini.

DAVID EVANS

IN THE HEADLINES

FORMULA E CALENDAR BY MARCH

Formula E wants a final season-three schedule by this March, with Beijing in contention to host the curtain-raiser for a third year. Series CEO Alejandro Agag told *Autosport*: "We're going to try to do October to July. In principle [it will be] the same." Races in Canada and Australia have been mooted to join fellow newcomer Hong Kong. "We're discussing with a couple of venues in the Middle East, some in Asia and some new venues in Europe," added Agag.

AGURI SEEKS DA COSTA UNDERSTUDY

Team Aguri is likely to replace Antonio Felix da Costa with someone who has experience in a Formula E car when the BMW DTM driver is forced to miss the Berlin and Moscow rounds. Past Aguri drivers Sakon Yamamoto and Salvador Duran have been linked with the seat.

SERRALLES JOINS CARLIN FOR LIGHTS

Carlin will run Felix Serralles in Indy Lights this season after the Puerto Rican switched from Belardi Auto Racing for his second season in the category. Serralles joins fellow 2015 Lights race winner Ed Jones, who remains with Carlin.

VAXIVIERE LEADS SPIRIT OF RACE

Matthieu Vaxiviere will stay in the renamed Formula 3.5 V8 series this season after finishing second in the 2015 points. The Frenchman will lead the attack of the new Spirit of Race squad. His team-mate will be Russian Vladimir Atoev, who makes a big step up from finishing runner-up in the SMP Formula 4 Championship last season.

ORUDZHEV RETURNS WITH ARDEN

Another F3.5 V8 race winner, Egor Orudzhev, will stay in the series this season. The Russian remains with Arden Motorsport, with which he finished fifth in the 2015 points.

VW SET FOR JAPAN F3 ATTACK

Volkswagen looks set to take on indigenous engine suppliers TOM'S Toyota, Mugen Honda and Toda in Japanese Formula 3 this year. Leading team B-Max ran the Spiess-built powerplant in the pre-Christmas Suzuka test, with Blancpain Endurance Series champion Katsumasa Chiyo and 2015 frontrunner Mitsunori Takaboshi driving.

MACLEOD JOINS SUZUKA TEST

Macau GP star Sam MacLeod also took part in the Suzuka test, the Scot driving a KCMG Dallara-Toyota. So too did GP3 racer Mitch Gilbert, with a Toyota-powered B-Max car.

PETROV SWITCHES TO WEC

Ex-Formula 1 and DTM racer Vitaly Petrov will join the Russian-backed SMP Racing squad for his maiden season in the World Endurance Championship in 2016. SMP moves up to the WEC after campaigning its new BR01s in the European Le Mans Series last year.



FEEDBACK

More the merrier for F1's future

Formula 1 in crisis? Let's be positive for 2016: there looms the possibility of titanic battles between four drivers at the front in Mercedes and Ferrari equipment, not to mention they could be joined on occasion by Red Bull, Renault or McLaren, dare we hope.

My overriding wish would be, however, that at least two or three teams apply for 2017 entries this year – come on ART (Renault-powered second team?) and Dome (Honda?) – and that whoever applies gets accepted. We definitely need new teams and bigger grids, and new regulations might just be the 'carrot'.

Can't wait for the new season to begin.

Dave Flitton
Hungerford, Berkshire

Make more of Jr's choice

The Top 50 Drivers of 2015 (December 17-24) left me frustrated with *Autosport*, and not for the first time. For #29, Nelson Piquet Jr, there was virtually no mention of his strong Global Rallycross



Championship campaign (where he won a race in Washington DC) and the fact that he's finished in the top four two seasons in a row.

Considering GRC is actually his primary campaign, I'd figure it was worth talking about. Why leave it out? In fact, why barely any GRC coverage at all? You cover every other major US series, so why not the fastest growing one?

Dominik Wilde
By email

How can Alonso beat Button?

As a self-confessed septuagenarian petrolhead and Button fan, how could they put Alonso at 13 and JB at 35 (Top 50 Drivers)?

Were they watching the same races as I was, or do I need to revisit both the opticians and the hearing-aid shop?!

I'm sure it's me, or could it just be that everyone keeps saying that the 'Spanish flyer' is the most complete driver on the grid and

Piquet Jr is enjoying an eclectic career, of which GRC plays a spectacular part

everyone now believes it?
Happy New Year.

John Reekie
By email

BBC's fault it can't afford F1

I've just seen the news that the BBC has given up the F1 programming/live feed to save money.

If they hadn't wasted money transferring half the staff and opening a new television centre in Salford, then wasting more money building a new television centre in London, we all would have had F1 without an interruption every five minutes for stupid adverts.

I shall not be watching any live feed of F1 in 2016, and do as I already do and record Sky F1, but now record every race as well on Channel 4. I can at least then cut out the adverts and see as much of the racing as possible!

Patrick Wickham
Buckingham

Channel 4 plans to show races ad-free – ed

Channel 4 to the fore

It's to the BBC's shame that it's dropped its F1 coverage, and entirely to Channel 4's credit that it's taken over. The fact that "viewing figures have remained solid" (December 31, p29) is proof that free-to-view F1 coverage is as relevant as ever.

But the crucial question is what will Channel 4 choose to replace *The Chain*?

Frances Stewart
By email

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Accentuate the positive

Those who compare Formula 1's present state unfavourably with MotoGP should look again at history – because change could be in the offing

By Ben Anderson, Grand Prix Editor

[@BenAndersonAuto](#)

SPEAK TO MANY OF THOSE WHO FOLLOWED LAST year's MotoGP title fight closely and they'll inevitably tell you it was a classic, even if the ending was not to everyone's taste.

It's the sort of contest Formula 1 has missed for the past few seasons, and the chief reason, of course, is the dominance of one particular car over the rest.

MotoGP enjoyed a standout season because of a rare chemistry that doesn't come along too often. Firstly, it got back into a position where its top two teams were evenly matched, so whether you were riding the factory Yamaha or the factory Honda you generally had a shot at winning races wherever you went. On top of that, you had the fastest rider of recent seasons (Marc Marquez) enduring a bit of a rocky spell, which forced him into the role of rank outsider against the metronomic warhorse Valentino Rossi – who's probably not quite as fast as he used to be, but raced cannily and scored points everywhere – and the rapid but erratic Jorge Lorenzo.

All three were already multiple champions of their chosen discipline, all had different strengths and weaknesses last year, and that all boiled up into an epic title fight that had audiences gripped.

Meanwhile, Lewis Hamilton romped to his third world championship in F1 – and his second in a row – with three races to run, as Mercedes'

dominance of the current technical regulations continued.

If you asked people to pick one to watch, and they had to choose, most wouldn't plump for the latter, and no one could blame them. Dominance is boring. But it is also an intrinsic part of sport, which comes and goes in cycles. In actual fact, Marquez did to MotoGP in 2014 exactly what Hamilton did to F1 last year, wrapping up his second title with three races to spare. A dominant display if ever there was one.

But just look how quickly it turned around again.

One man walking off with the glory in any sport doesn't make for spectacular viewing, except for the hardcore of those fans that just appreciate a certain craft executed brilliantly. But the magnitude and difficulty of the achievement should never be underestimated, and in fact it's almost impossible for anyone to win a world championship in a car that isn't the best – or one of the best at the least.

You could perhaps argue that Alain Prost stole the 1986 crown in a McLaren that was inferior to the Williams; Keke Rosberg's '82 success came in a season where he won just once (and six different makes of car won races); and John Surtees

just about won the '64 crown in a Ferrari that arguably wasn't a match for the BRM of Graham Hill or Lotus of Jim Clark.

Memorable seasons all. All unpredictable, with a good smattering of underdog success, which is what makes for captivating sport. You only have to go back as far as 2012 to find the last classic title battle in F1. Yes, Sebastian Vettel ultimately won his third of four titles that year, but eight different drivers won races, and Red Bull's Vettel's only triumphed by three points over Ferrari's Fernando Alonso...

Of course we all want the top drivers battling it out in the top machinery for the ultimate prize. That's why MotoGP was so good last season. But I'd tentatively suggest we're not too far away from another classic F1 season either.

We've now got all of the current world champion drivers placed at three of the biggest teams on the grid, and the only problem is that those teams are not evenly matched technically. But it wouldn't take much for that to change. Under relatively stable regulations the technical packages always converge, and Ferrari is arguably not too far away from matching Mercedes, which would immediately provide a fresh dynamic.

Yes McLaren-Honda was a disaster in 2015, but the budget is there, and so are two former world champions. The chassis looked strong come the final races of the year, and it would arguably take only a Ferrari-like step in ERS efficiency from Honda (plus some niftier suspension on the MP4-31) to put Alonso and Jenson Button back in the mix at – or at least near – the front.

And that's without even mentioning the young pretenders driving for former champion team Red Bull. If their TAG-badged Renault engine is at least decent this year, Daniel Ricciardo and Daniil Kvyat will be in contention too. Things can change so quickly in F1, even without the sort of major new technical regulations that usually shake things up. Ferrari dominated F1 in 2002, winning all but two races. There were no major technical changes for '03, yet that season featured eight different race winners and a title fight that went to the wire.

It could be wishful thinking, of course, but you never know – the next epic title battle could be just around the corner. If not, there are major regulation changes coming for 2017 that could transform the competitive order regardless, which has been a consistent pattern down the years.

Either way, F1 probably isn't far away from becoming unmissable once again. ✨

“Marquez did to MotoGP in 2014 what Hamilton did to F1 last year”



How Porsche won the battle of the German giants

The 2015 World Endurance Championship came to a nailbiting conclusion after a fierce fight on and off track

By Gary Watkins, Special Contributor

[@gazzasportscars](#)





The balance in the battle for the 2015 World Endurance Championship swung dramatically in favour of Porsche at the Nurburgring in August.

It was plain to see in the final result, the lap times and on the faces of everyone in the Audi camp. It collectively knew that its back was against the wall.

Audi's performances – and victories – in the opening two rounds of the WEC at Silverstone in April and Spa in May with two different configurations of its latest R18 e-tron quattro had indicated that it was sitting pretty in the battle for the drivers' and manufacturers' titles, even if it had lost out at the Le Mans 24 Hours. The pace of the high-downforce version of the second Porsche LMP1 car to carry the 919 Hybrid monicker in Germany suggested otherwise.

Porsche won by over a lap at the Nurburgring and would remain unbeaten over the remainder of the five-race, post-Le Mans leg of the WEC. The manufacturers' crown was sealed with a round to spare at Shanghai in early November, and then Mark Webber, Timo Bernhard and Brendon Hartley sneaked home in the race to the drivers' title



after a troubled run in the Bahrain finale later in the month.

The massive aerodynamic upgrade that the Audi had undergone over the winter had given it the upper hand at Silverstone, and it had taken another step for Spa with the arrival of what it termed its low-drag package. Describing it as low-downforce was both frowned upon and incorrect given that this car was faster than the Silverstone-spec third entry through the second sector at Spa that includes the Pouhon double-left.

Porsche, on the other hand, had compromised the first two races – the Silverstone opener in particular – by

opting against developing high-downforce aerodynamics for the beginning of the season. Adding to its tally of victories at Le Mans was the priority in 2015 and it didn't want to detract from that effort. Development of aerodynamics suitable for the Formula 1 tracks that made up the bulk of the WEC calendar would have to wait until everything was set for the 24 Hours and the unique demands of the 8.47-mile Circuit de la Sarthe.

"If you do high-downforce development at the beginning of the year, it has to take away from Le Mans aero development," said Porsche LMP1

Porsche locked out every front row (above) but Audi ran it close in the races



EBREV/LAT

technical director Alex Hitzinger. "It was purely down to avoiding any compromise on the aero kit for Le Mans."

Porsche effectively sacrificed Silverstone and to a lesser extent Spa in the name of Le Mans glory. It was a policy that was rewarded with a 17th victory in sportscar racing's jewel in the crown for the Stuttgart marque. The petrol-powered 919 Hybrid had the edge on the R18 turbodiesel on the racetrack, in the pits and in the reliability stakes.

The extra 919 Hybrid fielded for Formula 1 driver Nico Hulkenberg and GT racers Nick Tandy and Earl Bamber led home a Porsche one-two, 17 years on from its previous victory at Le Mans. They had the edge on the second-placed sister car of the eventual champions during the night. It was that which ultimately proved decisive in the battle between the two 919s, rather than a one-minute stop-go penalty incurred by Hartley for a yellow-flag infringement.

Audi took the challenge to Porsche until night fell. The R18, however, wasn't a match for the 919 under the cover of darkness. Exactly why hasn't been fully explained yet, but it had something to do with tyres and engine performance. It was academic, though. Audi's two regular WEC entries >>

ROUND BY ROUND



Silverstone

**Overall Lotterer/Fassler/Treluyer LMP2 Bird/Canal/Rusinov
GTE Pro Bruni/Vilander GTE Am Dalla Lana/Lamy/Lauda**

The Audi trio comes back from an early delay to claim a victory after a spectacular and prolonged battle with the Jani/Dumas/Lieb Porsche. The R18 has the upper hand, but a late stop-go means its winning margin is just 4s. The Webber Porsche leads from pole, but retires with gearbox problems.

Spa

**Overall Lotterer/Fassler/Treluyer LMP2 Dolan/Evans/Tincknell
GTE Pro MacDowall/Rees/Stanaway GTE Am Dalla Lana/Lamy/Lauda**

Superior tyre wear gives Audi another victory – Treluyer completes two and a half stints on a set of Michelins at the end. Jani/Dumas/Lieb are again second for Porsche, this time finishing 13s down. Webber/Bernhard/Hartley take third after an off, a stop-go and a damper problem.



EBREV/LAT



Le Mans 24 Hours

**Overall Hulkenberg/Tandy/Bamber LMP2 Howson/Bradley/Lapierre
GTE Pro Gavin/Milner/Taylor GTE Am Shaitar/Bertolini/Basov**

Porsche reclaims its Le Mans crown in only the second year of its comeback to the top flight of sportscar racing. The third car, driven by a trio of P1 irregulars in the forms of Tandy, Bamber and Hulkenberg, has the edge over the sister 919 Hybrids and the Audis and pulls clear during a purple patch during the night.

Nurburgring

**Overall Webber/Bernhard/Hartley LMP2 Howson/Bradley/Tandy
GTE Pro Lietz/Christensen GTE Am Shaitar/Bertolini/Basov**

Porsche's new high-downforce car blitzes Audi. Webber and his co-drivers take a first WEC win after their team-mates are hit with a series of penalties for exceeding their fuel allocation, resulting from a problem with a boost-pressure sensor. Audi team orders give the Lotterer car third, albeit one lap down.



EBREV/LAT



Austin

**Overall Webber/Bernhard/Hartley LMP2 Bird/Canal/Rusinov
GTE Pro Lietz/Christensen GTE Am Shaitar/Bertolini/Basov**

The eventual champions are on top in the US and outpace their team-mates, only to lose the lead with a penalty for a pitlane infringement. They still win after a late battery problem leaves Jani/Dumas/Lieb down in 12th. The Lotterer Audi maintains its run of podiums with second.



Fuji

**Overall Webber/Bernhard/Hartley LMP2 Bird/Canal/Rusinov
GTE Pro Bruni/Vilander GTE Am Dempsey/Long/Seefried**

The Jani car is on top in a wet-dry race, but Porsche invokes team orders to allow Bernhard to pass the leader at the end. Fassler stars in the updated Audi in the wet, but a gamble on tyre strategy doesn't pay off for the best of the R18s.



EBREV/LAT

Shanghai

**Overall Webber/Bernhard/Hartley LMP2 Panciatici/Chatin/Dillmann
GTE Pro Lietz/Christensen GTE Am Perrodo/Collard/Aguas**

Audi again challenges in a race held in mixed conditions, but Porsche gains the upper hand by double-stinting on wets in the third hour. Dumas spins in the penultimate hour but recovers to take second.

Bahrain

**Overall Jani/Dumas/Lieb LMP2 Bird/Canal/Rusinov
GTE Pro Pilet/Makowiecki GTE Am Dalla Lana/Lamy/Lauda**

The second Porsche takes an important victory on a day when Audi is back in the mix in full-dry conditions. Jani/Dumas/Lieb need to win to prevent Lotterer/Fassler/Treluyer from taking the title after throttle problems delay the Webber car and leave it fifth at the finish.



EBREV/LAT

Spa win made it two consecutive victories for Audi



XPB IMAGES

LMP2

G-Drive defeats KCMG in spicy class title fight

THE KCMG ORECA SQUAD WAS STILL in confident mood even after arch-rival G-Drive Racing had claimed victory in Austin courtesy of an opportunistic strategy. The Chinese entrant had followed up its class victory at Le Mans with another win at the Nurburgring, proving that its ORECA coupe could be competitive on all types of circuits, and looked on course for the title. That was until a controversial incident next time out at Fuji resulted in a non-score.

The battle for the championship turned on a series of unnecessary incidents in Japan when the KCMG ORECA-Nissan 05 with Richard Bradley at the wheel came together with both of the similarly-powered Ligier JSP2s fielded under the G-Drive banner by OAK Racing. Bradley, who was leading the championship at this point together with Matt Howson, was first tagged by Roman Rusinov as they squabbled over the lead and, after rejoining, he became embroiled in a battle for third with Gustavo Yacaman in the sister G-Drive Ligier.

One final clash left the ORECA too severely damaged to continue and handed a clear advantage in the points to the G-Drive Ligier that Rusinov shared with Sam Bird and Julien Canal. KCMG's title hopes then all but evaporated at

Shanghai when on-loan Porsche driver Nick Tandy, who joined Bradley and Howson for five of the eight races, spun in the rain and beached the car.

G-Drive started the year on top with victory for Bird and his team-mates at Silverstone and was heading for maximum points at Spa when engine problems intervened. KCMG wasn't in the mix at either of the first two races with a car it had barely run after missing one of the two official WEC test days at Paul Ricard with gearbox problems.

That changed at Le Mans, a circuit on which a car built to the narrower dimensions that will come into force in P2 in 2017 was always likely to shine. Former Toyota driver Nicolas Lapierre (who subbed for Tandy on three occasions through the season), Bradley and Howson dominated from pole.

KCMG was equally dominant at the Nurburgring, at least over the second half of the race, but failed to win after Germany. It lost out to the G-Drive crew in Bahrain, thanks to a creative tyre strategy from the OAK squad, but Bradley's and Howson's final deficit in the point was 23 points. Or two fewer than it thought it lost with the Fuji clash.

The lead G-Drive entry and KCMG were only beaten twice over the course of

the season, which was probably the correct state of affairs given the quality of their driver line-ups and the fact that they had two of the best mandatory silver-rated drivers in Canal and Howson. The second G-Drive Ligier, which Yacaman shared with Luis Felipe 'Pipo' Derani and Ricardo Gonzalez, notched up seven podiums over the course of the season on the way to third in the points.

The other winner was the Signatech Alpine ORECA-Nissan, a previous-generation open-top 03R. It triumphed at Shanghai when spurious silver Tom Dillmann – a GP2 race winner, no less – joined Nelson Panciatici and Paul-Loup Chatin. They had notched up their first podium the race before at Fuji together with Vincent Capillaire and ultimately finished a distant fourth in the final championship table.

The only other team to make it onto the podium was the Swiss Morand squad with its updated Morgan EVO. Morand was forced to withdraw from the opening round of the championship after a projected takeover fell through, but bounced back with third place – and second in the points – at Spa for Oliver Webb, Pierre Ragues and Zoel Amberg, who then dropped out of the campaign as the result of injuries sustained in GP2.



Toyota (top right) struggled in 2015, but nowhere near as much as Nissan (left)

>> both hit problems – an identical issue with the rear bodywork – on the way to third and fourth.

Andre Lotterer, Marcel Fassler and Benoit Treliuyer led Audi's challenge at Le Mans and took the final podium spot ahead of the sister car of Lucas di Grassi, Loic Duval and Oliver Jarvis. That meant the former champions headed into the long summer recess with a handy points lead, even if Porsche had taken over at the front of the manufacturers' standings. On the evidence of these first two races that had to make Lotterer and co favourites.

Not in the minds of Porsche, it must be said. Hitzinger has revealed that at

a team meeting two days after Le Mans, he suggested that the high-downforce 919 – with so-called 'kit 5' bodywork – could win every race. It turned out to be a prescient prediction.

Porsche should always have dominated over the final races with its revised car because the fuel-flow regulations are framed that way. A complete redesign of the 919 concept for 2015 – which included a new monocoque and an engine slightly increased in capacity – allowed it to move up to the highest hybrid sub-class that allows for eight megajoules of retrieved energy to be deployed at Le Mans (and a percentage thereof at other tracks).

Audi's 2015 challenger was more or less all-new apart from the monocoque and had moved up a hybrid division. It went to town in aero development, but was racing against 8MJ with a 4MJ car.

"Our strength was that we had good aero, but now they have that too," explained Lotterer after the Nurburgring. "That's the big difference between now and the first two races. We are racing against an 8MJ car and we can't compensate for that."

Audi promised not to give up and really did make a fight of it. It continued to develop the 2015 R18, at the same time as it was working on an all-new 2016 car. An overheating issue that held the >>



G-Drive (left) bested KCMG in LMP2

LMP2 CHAMPIONSHIP

POS	DRIVER	TEAM	1	2	3	4	5	6	7	8	PTS
1	Julien Canal (F)/ Roman Rusinov (RUS)/ Sam Bird (GB)	G-Drive Racing (OAK) Ligier JSP2	1	10	3	2	1	1	2	1	178
2	Matt Howson (GB)/ Richard Bradley (GB)	KCMG ORECA 05	4	4	1	1	2	DNF	3	2	155
3	Gustavo Yacamán (CO)/ Pipo Derani (BR)/ Ricardo Gonzalez (MEX)	G-Drive Racing (OAK) Ligier JSP2	2	2	4	3	3	3	DNF	3	134
4	Nelson Panciatici (F)/ Paul-Loup Chatin (F)	Signatech Alpine ORECA 03R	DNF	5	DNF	5	6	2	1	4	86
5	Nicolas Lapierre (F)	KCMG ORECA 05	-	4	1	-	2	-	-	-	84
6	Nick Tandy (GB)	KCMG ORECA 05	4	-	-	1	-	DNF	3	2	71
7	Oliver Webb (GB)/ Pierre Ragues (F)	Team SARD Morand Morgan EVO	-	3	DNF	4	5	5	4	7	70
8	Danny Watts (GB)/ Jonny Kane (GB)/ Nick Leventis (GB)	Strakka Racing Dome S103/Gibson 015S	3	6	DNF	7	7	6	7	6	63
9	David Hansson (DK)/ Ryan Dalziel (GB)/ Scott Sharp (USA)	Extreme Speed Motorsports HPD/Ligier	EX	9	10	6	4	4	DNF	8	62
10	Ed Brown (USA)/ Jon Fogarty (USA)	Extreme Speed Motorsports HPD/Ligier	6	8	7	8	DNF	7	6	9	62

11 Johannes van Overbeek (Extreme Speed Motorsports Ligier JSP2), 54; 12 Vincent Capillaire (Signatech ORECA 03R), 48; 13 Tom Dillmann (Signatech ORECA 03R), 38; 14 Erik Maris/ Jacques Nicolet/ Jean-Marc Merlin (OAK Racing Ligier JSP2), 34; 15 Chris Cumming (Team SARD Morand Morgan EVO), 30; 16 Archie Hamilton (Team SARD Morand Morgan EVO), 22; 17 Zoel Amberg (Team SARD Morand Morgan EVO), 18; 18 David Brabham (Extreme Speed Motorsports HPD ARX-03b), 8; 19 Kevin Estre/ Laurens Vanthoor (OAK Racing Ligier JSP2), 0.

GT

Lietz leads Porsche to another double triumph

A revised version of the 991-shape 911 RSR, a favourable Balance of Performance for the second half of the season and an intensive tyre-development programme after the Le Mans 24 Hours allowed Porsche to take the World Endurance Cups for GT manufacturers and drivers, and its factory Manthey squad to take the GTE Pro teams' crown. A bit of bad luck for Ferrari played a part in the German marque's run to a clean sweep of the end-of-season silverware too.

The updated 911 RSR gave the Porsche drivers a more-stable aerodynamic platform, but it was post-Le Mans when the car came into its own thanks to the tyre development undertaken together with Michelin. Lietz, Manthey's chosen championship challenger, had taken the runner-up spot at both Silverstone and Spa, but he and Michael Christensen (who was racing in the US on the weekend of the Belgian race) went on

a run on the resumption of the WEC at the Nurburgring in August that yielded three victories in four races – and made the destination of the drivers' title more or less a foregone conclusion.

Ferrari might have beaten Porsche to both titles but for misfortune at the 'Ring and at Austin. An engine-control-unit failure in Germany and a problem with the illuminated door panel in the Austin night race for Gianmaria Bruni and Toni Vilander derailed their title defence aboard the lead AF Corse 458.

They had claimed victory from the back at the Silverstone opener, probably should have won at Spa, and could have triumphed over the winning Chevrolet Corvette C7.R at Le Mans together with Giancarlo Fisichella but for late gearbox problems. Bruni and Vilander bounced back from the disappointments at the 'Ring and Austin with a second victory of the season at Fuji, but they had no answer for Lietz and Christensen in the wet-dry race at Shanghai nor for the sister car of Frederic Makowiecki and Patrick Pilet in Bahrain.

The second factory AF car shared by James Calado and Davide Rigon took a step forward in 2015 and they were on the podium five times without registering a win. Their results helped keep Ferrari's nose in front in the battle for the makes' crown, but a first victory of the season for Makowiecki and Pilet gave Porsche the title by just four points.



The Nurburgring round (above) kickstarted a title-winning run for the #91 Porsche, here chasing the sister car

Aston Martin Racing claimed a solitary win over the course of a disappointing season. Fernando Rees, Richie Stanaway and Alex MacDowall claimed the lone Pro class victory for the Vantage GTE at Spa. Whether they would have done so without a late penalty for the Bruni/Vilander Ferrari will never be known.

What was clear was that the Aston wasn't a competitive proposition after the pre-Nurburgring BoP changes that robbed the car of 20bhp and remained so even after its air-restrictor reduction was halved for the Fuji round. Only when the early-season BoP was restored for Bahrain was one of the British cars able to make it back onto the podium.

The GTE Am title was effectively decided at Le Mans. The Aston Martin Racing trio of Pedro Lamy, Mathias Lauda



Lietz (right) picked up drivers' title

GT CHAMPIONSHIP

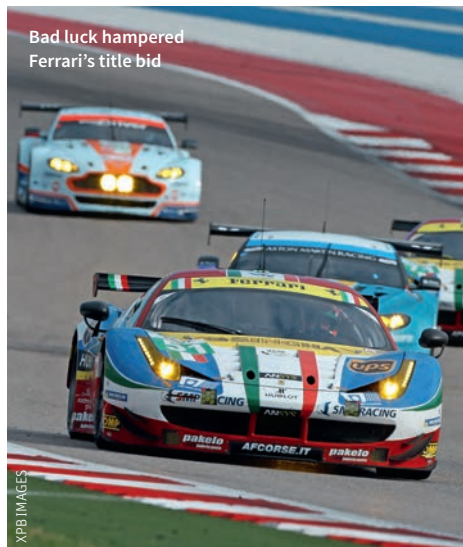
POS	DRIVER	TEAM	1	2	3	4	5	6	7	8	PTS
1	Richard Lietz (A)	Porsche Team Manthey Porsche 911 RSR	2	2	9	1	1	4	1	5	145
2	Gianmaria Bruni (I)/ Toni Vilander (FIN)	AF Corse Ferrari 458 Italia	1	4	6	14	7	1	2	2	131.5
3	Michael Christensen (DK)	Porsche Team Manthey Porsche 911 RSR	2	-	9	1	1	4	1	5	127
4	Davide Rigon (I)/ James Calado (GB)	AF Corse Ferrari 458 Italia	3	7	3	3	3	3	4	6	123
5	Frederic Makowiecki (F)	Porsche Team Manthey Porsche 911 RSR	7	2	DNF	2	2	2	3	1	118
6	Patrick Pilet (F)	Porsche Team Manthey Porsche 911 RSR	7	-	DNF	2	2	2	3	1	100
7	Alex MacDowall (GB)/ Fernando Rees (BR)	Aston Martin Racing Aston Martin Vantage V8	6	1	11	5	4	7	5	7	84
8	Christoffer Nygaard (DK)/ Marco Sorensen (DK)	Aston Martin Racing Aston Martin Vantage V8	4	6	8	4	5	5	-	4	81
9	Richie Stanaway (NZ)	Aston Martin Racing Aston Martin Vantage V8	6	1	11	5	4	-	5	7	78
10	Darren Turner (GB)	Aston Martin Racing Aston Martin Vantage V8	5	5	DNF	6	6	6	6	3	67

11 Aleksey Basov/ Andrea Bertolini/ Viktor Shaitar (SMP Racing (AF) Ferrari 458 Italia), 65; 12 Jonny Adam (Aston Martin Racing Aston Martin Vantage V8), 47; 13 Nicki Thiim (Aston Martin Racing Aston Martin Vantage V8), 41; 14 Marco Seefried/ Patrick Long (Dempsey Racing-Proton Porsche 911 RSR), 38.5; 15 Patrick Dempsey (Dempsey Racing-Proton Porsche 911 RSR), 37.5; 16 Olivier Beretta (AF Corse Ferrari 458 Italia), 36; 17 Emmanuel Collard/ Francois Perrodo (AF Corse Ferrari 458 Italia), 34.5; 18 Stefan Mucke (Aston Martin Racing Aston Martin Vantage V8), 34; 19 Rui Aguas (AF Corse Ferrari 458 Italia), 34; 20 Giancarlo Fisichella (AF Corse Ferrari 458 Italia), 24; 21 Mathias Lauda/ Paul Dalla Lana/ Pedro Lamy (Aston Martin Racing Aston Martin Vantage V8), 22.5; 22 Kevin Estre/ Sven Muller (Porsche Team Manthey Porsche 911 RSR), 15; 23 Jorg Bergmeister (Porsche Team Manthey Porsche 911 RSR), 12; 24 Rob Bell (Aston Martin Racing Aston Martin Vantage V8), 10; 25 Matteo Cressoni (AF Corse Ferrari 458 Italia), 8.5; 26 Peter Mann/ Raffaele Giammaria (AF Corse Ferrari 458 Italia), 8; 27 Khaled Al Qubaisi (Abu Dhabi-Proton Racing Porsche 911 RSR), 6.5; 28 Christian Ried (Dempsey Racing-Proton Porsche 911 RSR), 5.5; 29 Klaus Bachler (Abu Dhabi-Proton Racing Porsche 911 RSR), 3.5; 30 Francesco Castellacci/ Stuart Hall (Aston Martin Racing Aston Martin Vantage V8), 3.5; 31 Earl Bamber (Abu Dhabi-Proton Racing Porsche 911 RSR), 3; 32 Gianluca Roda/ Paolo Ruberti (Larbre Competition Chevrolet Corvette C7.R), 3; 33 Marco Mapelli (Abu Dhabi-Proton Racing Porsche 911 RSR), 2; 34 Roald Goethe (Aston Martin Racing Aston Martin Vantage V8), 2; 35 Kristian Poulsen (Larbre Competition Chevrolet Corvette C7.R), 2; 36 Nicolai Sylvest (Larbre Competition Chevrolet Corvette C7.R), 1; 37 Liam Griffin (Aston Martin Racing Aston Martin Vantage V8), 1; 38 Benny Simonsen (Aston Martin Racing Aston Martin Vantage V8), 0.5; 39 Alex Mortimer/ Duncan Cameron/ Matt Griffin (AF Corse Ferrari 458 Italia), 0; 39 Wolf Henzler (Porsche Team Manthey Porsche 911 RSR), 0.



and Paul Dalla Lana were on course for a third consecutive victory until the final hour. Amateur driver – and car owner – Dalla Lana opted to drive the final stint even though there were no new tyres left in the entry’s allocation and contrived to write off the Aston at the end of his out-lap.

That allowed the SMP Racing entry of Andrea Bertolini, Viktor Shaitar and Aleksey Basov to claim the 50 points on offer and move into a lead they would never lose courtesy of further wins aboard their AF Corse-run Ferrari at the Nurburgring and Austin. The attempts of the Aston drivers to make up the lost ground weren’t helped by the BoP changes, but a run of two seconds and then a victory in Bahrain brought them to within 50 points of the title winners.



Bad luck hampered Ferrari’s title bid

XPB IMAGES



AF-run SMP team clinched Am crown

SBLOXHAM/LAT

GTAM

- | | | | |
|---|---|---|--|
| <p>1 Aleksey Basov/ Andrea Bertolini/Viktor Shaitar (SMP Racing (AF) Ferrari 458 Italia), 165;</p> <p>2 Emmanuel Collard/ Francois Perrodo (AF Corse Ferrari 458 Italia), 148;</p> <p>3 Mathias Lauda/ Paul Dalla Lana/ Pedro Lamy (Aston Martin Racing Aston Martin Vantage V8), 144;</p> <p>4 Rui Aguas (AF Corse Ferrari 458 Italia), 136;</p> <p>5 Marco Seefried/ Patrick Long (Dempsey Racing-</p> | <p>Proton Porsche 911 RSR), 131;</p> <p>6 Patrick Dempsey (Dempsey Racing-Proton Porsche 911 RSR), 116;</p> <p>7 Khaled Al Qubaisi (Abu Dhabi-Proton Racing Porsche 911 RSR), 82;</p> <p>8 Christian Ried (Dempsey Racing-Proton Porsche 911 RSR), 79;</p> <p>9 Francesco Castellacci/ Stuart Hall (Aston Martin Racing Aston Martin Vantage V8), 54;</p> <p>10 Gianluca Roda/ Paolo Ruberti (Larbre Competition</p> | <p>Chevrolet Corvette C7.R), 52;</p> <p>11 Klaus Bachler (Abu Dhabi-Proton Racing Porsche 911 RSR), 46;</p> <p>12 Matteo Cressoni (AF Corse Ferrari 458 Italia), 36;</p> <p>13 Earl Bamber (Abu Dhabi-Proton Racing Porsche 911 RSR), 36;</p> <p>14 Roald Goethe (Aston Martin Racing Aston Martin Vantage V8), 32;</p> <p>15 Kristian Poulsen (Larbre Competition Chevrolet Corvette C7.R), 30;</p> | <p>16 Peter Mann/ Raffaele Giammaria (AF Corse Ferrari 458 Italia), 24;</p> <p>17 Nicolai Sylvest (Larbre Competition Chevrolet Corvette C7.R), 22;</p> <p>18 Marco Mapelli (Abu Dhabi-Proton Racing Porsche 911 RSR), 18;</p> <p>19 Liam Griffin (Aston Martin Racing Aston Martin Vantage V8), 14;</p> <p>20 Benny Simonsen (Aston Martin Racing Aston Martin Vantage V8), 8.</p> |
|---|---|---|--|

» cars back in Germany was solved in time for Austin and an update, which incorporated a higher-downforce aero spec and a new refuelling system to match the gains Porsche had made at Le Mans, arrived at Fuji.

Audi’s efforts were very nearly rewarded with a third WEC drivers’ title. The amazing finishing record of Lotterer, Fassler and Treluyer – aided by a spot of team orders – allowed them to make it home on the podium in each of the eight races in 2015 and gave them a mathematical chance going into Bahrain.

The calculators were doing overtime in the Porsche pits when the 919 of the champions-elect ran into problems early in the race. A Heath Robinson fix of a rod that actuated one of the throttle bodies got the car back on track, though made the car difficult to drive. That problem was exacerbated when the second rod failed and needed a similar quick fix. The car repeatedly cut out on Webber over the final laps and he had to enter and leave the pits slowly on electrical hybrid power at its final stop.

It was nailbiting stuff. But fifth place and a victory for the sister car of Neel Jani, Romain Dumas and Marc Lieb was enough for Webber, Bernhard and Hartley to become Porsche’s first world champions since Derek Bell in 1986.

Webber and his team-mates became Porsche’s chosen crew after the Austin race in which the Jani car lost what would have been an admittedly inherited victory. Battery failure – the regular 12-volt unit, not the sophisticated hybrid item – with 30 minutes to go left its drivers with half a point for 12th.

Things might have been different but for a run of bad luck for Jani and his co-drivers. They had braking issues – not for the first or last time in the season – at Le Mans that left them fifth after two offs, a series of penalties for exceeding their fuel allocation when they would probably have won at the ‘Ring, and then the Austin disaster. Another set of circumstances could have resulted in Porsche putting its efforts behind them rather than the drivers of the sister car, though it should be pointed out that it was the Webber car that had the misfortune in the opening two races: a gearbox failure at Silverstone and a damper issue at Spa. »



Fassler, Lotterer and Treluyer fought Porsche hard, notably at Fuji where they led early on

» The second R18 finished a long way behind the third-placed Porsche in the points. Di Grassi, Duval and Jarvis had the lion's share of Audi's problems and only in Austin did they make the podium, though di Grassi had to yield third to Lotterer in Germany.

The 2015 WEC was fought out between Porsche and Audi only. Reigning champion Toyota was nowhere, even though it produced a significant update of the TSO40 HYBRID that had claimed the drivers' titles in 2014. That yielded an equally significant improvement in laptime, but it wasn't enough in the face of an all-new Porsche and an Audi that was as good as all-new. What's more, the Japanese manufacturer remained in the 6MJ class in which it had raced in its championship year.

Silverstone produced third place for Sebastien Buemi, Anthony Davidson and Kazuki Nakajima, who joined the reigning champs for a first full assault on the WEC, and the hope that the revised car wasn't totally uncompetitive. The events of Spa two weeks later removed that and set in course a decision-making process that brought forward plans for a new turbocharged engine from 2017 to '16. That told you everything about where the TSO40 lost out to its rivals last season.

A new manufacturer joined the LMP1 ranks in 2015 – belatedly and, it turned out, all too briefly. Nissan's short-lived return to the top flight of sportscar racing with the GT-R LM NISMO began and ended at Le Mans. The race debut of the radical front-wheel-drive contender was delayed, and when it did race it wasn't in the form intended by creator Ben Bowlby.



The car was neither fast – the best of the three GT-R LMs qualified nearly 20 seconds off the pace – nor reliable. One car made it home to an unclassified finish after spending a third of the race in the pits, which made a mockery of Nissan's “mission accomplished” claims.

The GT-R LM would not be seen again in 2015 after the US-based Nissan Motorsports squad withdrew from the remainder of the series. The project was finally canned before Christmas and brought a sorry end to the latest chapter in Nissan's unsuccessful history in world championship endurance racing.

The heritage-livered #17 Porsche lost out at Le Mans

The privateer participants in LMP1 slipped further behind the factories in 2015. Rebellion Racing predictably won both the teams' crown and the drivers' title with Nicolas Prost and Mathias Beche, despite its eponymous R-Ones missing the first two races after a late decision to swap to the turbocharged AER V6 powerplant.

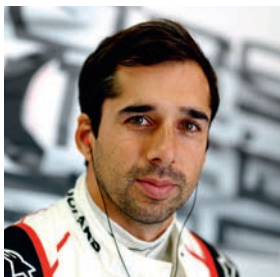
The renamed ByKolles squad made big strides with a significant update of its CLM-AER P1/01, a car that continued to evolve through the season. It took class honours on two occasions, but was never a match for a healthy Rebellion. ❄

PROTOTYPE CHAMPIONSHIP

POS	DRIVER	TEAM	1	2	3	4	5	6	7	8	PTS
1	Timo Bernhard (D)/Mark Webber (AUS)/Brendon Hartley (NZ)	Porsche Team Porsche 919 Hybrid	DNF	3	2	1	1	1	1	5	166
2	Marcel Fassler (CH)/Andre Lotterer (D)/Benoit Treluyer (F)	Audi Sport Team Joest Audi R18 e-tron quattro	1	1	3	3	2	3	3	2	161
3	Marc Lieb (D)/Neel Jani (CH)/Romain Dumas (F)	Porsche Team Porsche 919 Hybrid	2	2	5	2	12	2	2	1	138.5
4	Lucas di Grassi (BR)/Oliver Jarvis (GB)/Loic Duval (F)	Audi Sport Team Joest Audi R18 e-tron quattro	5	7	4	4	3	4	4	6	99
5	Sebastien Buemi (CH)/Anthony Davidson (GB)	Toyota Racing Toyota TS040 HYBRID	3	8	8	5	4	5	6	4	79
6	Stephane Sarrazin (F)/Alexander Wurz (A)/Mike Conway (GB)	Toyota Racing Toyota TS040 HYBRID	4	5	6	6	DNF	6	5	3	79
7	Kazuki Nakajima (J)	Toyota Racing Toyota TS040 HYBRID	3	DNF	8	5	4	5	6	4	75
8	Nick Tandy (GB)	KCMG ORECA05/Porsche 919 Hybrid	19	6	1	7	-	DNF	11	8	70.5
9	Nico Hulkenberg (D)/Earl Bamber (NZ)	Porsche Team Porsche 919 Hybrid	-	6	1	-	-	-	-	-	58
10	Sam Bird (GB)/Roman Rusinov (RUS)/Julien Canal (F)	G-Drive Racing (OAK) Ligier JSP2	6	31	11	8	5	9	10	7	33.5

11 Richard Bradley/Matt Howson (KCMG ORECA05), 25; 12 Marco Bonanomi/Filipe Albuquerque/Rene Rast (Audi Sport Team Joest Audi R18 e-tron quattro), 24; 13 Ricardo Gonzalez/Pipo Derani/Gustavo Yacaman (G-Drive Racing (OAK) Ligier JSP2), 19.5; 14 Nicolas Prost/Mathias Beche (Rebellion Racing Rebellion R-One), 14.5; 15 Simon Trummer/Pierre Kaffer (Team ByKolles CLM P1/01), 13; 16 Nicolas Lapierre (KCMG ORECA05), 12.5; 17 Jonny Kane/Danny Watts/Nick Leventis (Strakka Racing Dome S103/Gibson 015S), 7; 18 Paul-Loup Chatin/Nelson Panciatichi (Signatech ORECA03R), 5.5; 19 Ryan Dalziel/Scott Sharp/David Heinemeier Hansson (Extreme Speed Motorsports HPD ARX-03b/Ligier JSP2), 5; 20 Oliver Webb/Pierre Ragues (Team SARD Morand Morgan EVO), 4.5; 21 Ed Brown/Jon Fogarty (Extreme Speed Motorsports HPD ARX-03b/Ligier JSP2), 4; 22 Johannes van Overbeek (Extreme Speed Motorsports Ligier JSP2), 3.5; 23 Tom Dillmann (Signatech ORECA03R), 3; 24 Jacques Nicolet/Jean-Marc Merlin/Erik Maris (OAK Racing Ligier JSP2), 2.5; 25 Dominik Kraihamer/Alexandre Imperatori (Rebellion Racing Rebellion R-One), 2.5; 26 Vincent Capillaire (Signatech ORECA03R), 2.5; 27 Archie Hamilton (Team SARD Morand Morgan EVO), 2; 28 Daniel Abt (Rebellion Racing Rebellion R-One), 2; 29 Nick Heidfeld (Rebellion Racing Rebellion R-One), 2; 30 Chris Cumming (Team SARD Morand Morgan EVO), 1.5; 31 Zoel Amberg (Team SARD Morand Morgan EVO), 1; 32 Matheo Tuscher (Rebellion Racing Rebellion R-One), 0.5; 33 David Brabham (Extreme Speed Motorsports HPD ARX-03b), 0.5; 34 Lucas Ordóñez/Tsugio Matsuda/Mark Shulzhitskiy (Nissan Motorsports Nissan GT-R LM NISMO), 0; 34 Harry Tincknell/Michael Krumm/Alex Buncombe (Nissan Motorsports Nissan GT-R LM NISMO), 0; 34 Olivier Pla/Jann Mardenborough/Max Chilton (Nissan Motorsports Nissan GT-R LM NISMO), 0; 34 Laurens Vanthoor/Kevin Estre (OAK Racing Ligier JSP2), 0; 34 Christian Klien/Vitantonio Liuzzi (Team ByKolles CLM P1/01), 0; 34 Tiago Monteiro (Team ByKolles CLM P1/01), 0.

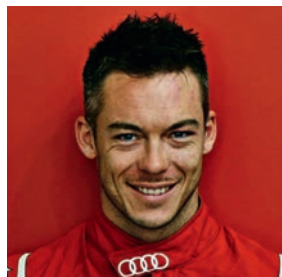
AUTOSPORT'S TOP 10 LMP1 DRIVERS



1 NEEL JANI

There's strong evidence that Jani was the quickest

Porsche driver both over one lap and a stint, at least when the whole season is taken into account. If any evidence of the former was required, it was the decision of the Porsche hierarchy to leave him on the bench when it came to qualifying at the final three races. There's a point for pole in the WEC, and the drivers of the sister car needed every one they could get in pursuit of the title. And you don't have to look too far back to find some great race performances: he was superlative in both Shanghai and Bahrain.



2 ANDRE LOTTERER

Things happened when Lotterer

climbed aboard the lead Audi in 2015, no matter what the circumstances. He made it past the leading Porsche at Silverstone when team-mate Fassler couldn't, and he seemed to carry Audi's championship hopes alone at the Bahrain finale – he drove only a few laps less than the combined total of his team-mates. The never-say-die attitude that underpins his driving was always there to see. His charge at Le Mans was impressive and yielded yet another fastest lap, his third in a row at the 24 Hours.



3 NICK TANDY

Does Tandy qualify for this list when he was 'only' a

part-timer in the P1 category? There's a strong argument that he shouldn't be considered on the grounds that a true judgement can't be made on the basis of just two races. But so special was his drive at Le Mans that he cannot be left out. Great racing drivers turn motor races, and that's what Tandy did over the course of the quadruple stint that began just after midnight. That stint put the winning Porsche out of reach of both Audi and the second-placed sister car. Enough said.



4 SEBASTIEN BUEMI

Judging Buemi or any of the Toyota drivers

is difficult given the TS040's lack of competitiveness. What we can say is that the combination of the Swiss and team-mates Davidson and Nakajima were the most equally-matched P1 line-up on the grid. They were separated in the averages at Le Mans by little more than a couple of tenths. Buemi was the quickest of the trio and made few if any mistakes, which is why he gets such an elevated position in this ranking even though he has but one podium to his name in the 2015 WEC.



5 TIMO BERNHARD

The stand-out driver in the championship-winning Porsche over

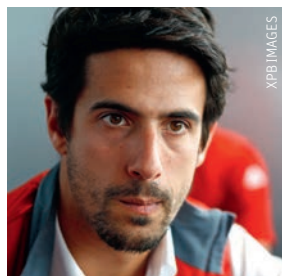
the eight rounds of the WEC impressed again at Le Mans, though his team-mates were probably his equal by the close of the season. A stint near Sunday lunchtime as he strove to make up ground to the leader would be talked about in the same breath as Tandy's night-time quadruple if Bernhard and his team-mates had won. What shouldn't be underestimated was his role in elevating the performances of Webber and Hartley over the course of 2015. Bernhard was a true team leader and central to their championship success.



6 BRENDON HARTLEY

If this list was compiled on the basis

of performances over the second half of the season, Hartley would be higher than sixth. Much higher. The Kiwi continued to improve as a driver through the season and posted some impressive drives over the final five races. His double stint with a car that was far from in perfect shape (and hard to drive because of the throttle problem) in Bahrain was amazing. Perhaps most importantly, however, he eradicated the mistakes that had previously been part of his game and were still there at Spa and Le Mans.



7 LUCAS DI GRASSI

The Brazilian impressed again in his second full season in

the WEC with Audi, and almost certainly drove better than in his previous campaign. He was impressive at Le Mans, which probably counts as his drive of the year (at least at the wheel of an R18 e-tron quattro). Team-mate Lotterer ended up with fastest race lap, but di Grassi was quicker on the averages than his illustrious team-mate. He also starred for Audi at the 'Ring and was impressive in Bahrain too. There should be more to come from him in the future as he strives to break his WEC victory duck.



8 NICO HULKENBERG

The same arguments apply to Hulkenberg

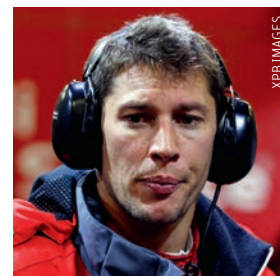
as they do to Tandy. He deserves his place here for the pace he showed at Le Mans. He was the fastest man on the track for much of his first quadruple before handing over to Tandy, and again during a double on Sunday morning. It was all the more impressive given that this was his first experience of the Circuit de la Sarthe. What can't be ignored is the clash that put Roald Goethe's Aston Martin into the barriers. It was unnecessary and on another occasion might have cost the winning Porsche the victory.



9 MARK WEBBER

Webber took another step forward as a sportscar driver at the

start of 2015 and continued his improvement over the five-race championship run-in starting at the 'Ring. He came alive on the arrival of the high-downforce version of the latest 919 in Germany. By his own admission, he'd struggled to adapt to its understeering predecessors, cars that were anathema to what he knew from his previous racing exploits. He can't be rated higher, however, because he wasn't on the pace of his team-mates – either in his car or the winning Porsche – at Le Mans.



10 LOIC DUVAL

Duval both reaffirmed and left niggling

doubts that he is the same driver as before the monster shunt in practice that ruled him out of Le Mans in 2014. And that's not a contradiction. Just as he had done in the second half of '14, the Frenchman proved there was no hangover from the accident. Except, that is, when he returned to the 24 Hours. Duval wasn't on the pace of his team-mates. Perhaps that was understandable, but this mental barrier is one that will have to be cleared if he is to be rated again as one of the world's top sportscar drivers.

Can't buy me love

Williams protege Lance Stroll has been under fire for his accidents and his wealth. But he has deeper qualities – above all, levels of driving talent and resilience that can't be bought

By Marcus Simmons, Deputy Editor

[@MarcusSimmons54](#)

All we need is a fight atop a cable car and it'd be like a James Bond film. It's Saturday evening of the Formula 3 European Championship finale, and *Autosport* meets Lance Stroll's PR man outside the Prema Powerteam awning, before we're whisked away in an electric golf cart to a deserted – and distant – part of the Hockenheim infield.

Stroll awaits us inside a luxury motorhome, inside which we're beckoned to sit down. *Autosport* taps the table. "Carbonfibre?" "Yeah," comes the reply with a grin.

Half an hour later, interview over, we'll be returned straight to the door of the media centre by a charming chauffeur in a comfy car. In between, we get to know Stroll much better than various quick chats around the Prema tent have allowed during the season. This is something that's been on the wishlist for a while – make no mistake, the Swiss-based Canadian *will* one day be racing in Formula 1, and he has already landed a Williams development-driver role for 2016, at the age of just 17.

The enthusiasm of Stroll's multi-billionaire father Lawrence has helped fast-track his son's progress, creating a lot of green-eyed envy. But here's a thing about young Lance: he's smart, funny, articulate, polite. A really pleasant kid. And actually, he's fast too.

That was evident from his graduation, under the wing of the Ferrari Driver Academy (which supported him from age 11 until his recent Williams deal), from karts into cars in 2014, aged 15. Stroll is down in history as the winner of the inaugural FIA Formula 4 race, and went on to win the Italian championship.

The only close rival on track was Brandon Maisano, the Frenchman brought in to help Stroll progress by the Prema team, in which Stroll Sr has an investment. "It was definitely a push, you know?" he acknowledges. "That team-mate competitiveness was great for building me as a driver."

Crucially, Stroll believes that helped him prepare for F3: "Absolutely. I don't think I would have known to that extent how much competition can be a big thing, because he was always right there. As soon as I made a mistake he would get me – it was really, really close."

That carried on into F3, with Prema drafting in Felix Rosenqvist to help a squad comprising Stroll and Maisano together with Racing Steps-backed Jake Dennis. Early runs went well but, as Stroll admits, "you know, winter testing is one thing and racing is another. I really tried to keep my expectations away from my head and tried working and preparing as hard as I could." That included a foray to New Zealand, with Maisano, for the Toyota Racing Series. Tick – another title won.

Come April, and the start of the F3 season, the rookie steps were encouraging: "The beginning of the season was fantastic. We were all very pleased. Top five, top six, and even Pau I finished fourth. And then we had that little bump in the road and from there it was 'what just happened?'"

Ah, that little bump in the road. Here is where Stroll hit the headlines – for the wrong reasons. His massive crash at Monza as a result of contact with Antonio Giovinazzi earned him huge criticism. Ditto his clash with Mikkel Jensen next time out at Spa that resulted in Rosenqvist slamming into the barriers.

So, Lance... you said at the time that the Giovinazzi crash was partly caused by him being in a blindspot behind your car's >>



Stroll started season well, here heading for fourth in Pau GP



airbox. But, looking back, do you think you didn't leave him enough room? "I think definitely I could have avoided it, but racing is... if I wouldn't have rolled in the air and had such a huge crash I don't think it would have been such a big deal; it would have been a racing incident – two drivers fighting side by side, it gets close, we touch, and that would be the end of it. But since it was so big, so dramatic, everybody went deep into detail about it. I could have moved just a little less, which looking back I believe I should have done, and nothing would have happened.

"For sure I put the blame on myself. I could have avoided it. 'Patience' I think is the right word. Even if he would have taken the position I would have had the rest of the race to fight back."

And Spa? It looked, with you on the inside and Jensen slightly behind to your left, that you wouldn't have known Rosenqvist was to his left... "Exactly. That's exactly what happened! Again, silly mistake and definitely my fault. I could have just stayed where I was instead of moving over. Again, like Monza, I learned from that. Those were some of my darkest moments of the year, so... but I came back strong."

After these shunts, there was a noticeable reset in Stroll's racing brain. Maybe he became a little cautious, but it netted a run of late-season podiums, including a win at Hockenheim. "I changed my mindset, just cooled down a little bit and said, 'Just come back to racing like you enjoy racing,'" he says. "Not really thinking more, but just realising the consequence of what I could do a little bit more. Before I'd make that young-kid divebomb or whatever, and now I just realise, 'I'll finish one position behind in this race'. Just experience basically."

One theory is that, conscious of the envy around his support, both financial and from Ferrari, Stroll was overreaching in a bid to prove that he deserves to get to the top on merit. Ask him about any pressures upon him and he says: "I think I have the least pressure of all the grid to be honest. I have good financial backing, which is important – not that it's right that it's important, but clearly if you want to compete in the sport that's the only way it's going to work. And I have people around me that love being with me, that want the best for me. They don't want me to prove anything to them; they just want to help me and support me with the mistakes I made."

But ask him if that pressure is self-imposed, and he admits: "Well yeah, there always is. As a competitor and racer you want to do well. There's no driver in the world – well maybe there is, but I haven't met him – that goes on the grid being super-relaxed. There's always those butterflies, that personal grunt you need to race and strive to do the best."

The good thing is that Stroll is now channelling that in the right direction. Being a pariah, as he was for a few weeks in the summer, must hurt, especially someone so young. But

he's got that loyal support network around him – including the Prema team, which prides itself not only on its technical skills but also on the way it looks after every one of its drivers, from the moment they land at the airport on their way to the track until they're on the plane home.

With Prema, he'll attack the 2016 F3 title: "Looking back at the beginning of the 2015 season, if I could have signed to finish fifth [as he did] we would definitely be happy with that. The championship is definitely our goal, just building on what we learned [last] year."

Which was an awful lot. Like Bond, Stroll might have been shaken, but he's definitely not stirred. ✽

"I changed my mindset, just cooled down a little bit to enjoy my racing"



EIJAN CAMERON

Stroll won the Toyota Racing Series in New Zealand in early 2015

From Ferrari to Williams – at 17



Baldisserrri (standing) remains as Stroll's guiding hand

SURELY LANCE STROLL'S fellow Quebecers will make something of this. He's gone from being a protege of Ferrari, the team with which the great Gilles Villeneuve was synonymous, to being on the books at Williams, whose last world champion was... Jacques Villeneuve.

And, just to make you feel old, he wasn't even born when JV survived his clash with Michael Schumacher at Jerez to claim the 1997 title.

Formula 1 has moved on a lot since those halcyon days 18 years ago, but at the heart of

Williams is still the family whose name it bears – and that appeals to Stroll. "We'd been speaking to Williams for the last few months, since the middle of summer," he says. "They offered me a position to be part of the F1 team in a development role. In Ferrari I was in the junior programme, but now I get to do a lot more work on the simulator, and hopefully a couple of days in an older F1 car.

"They came to us and immediately made us understand I'd have a good role. They were super-

welcoming when we came to see them – they seem super-interested and believe in me. They've got a great history, they're a great team and a great racing family."

Stroll has brought with him Luca Baldisserrri, the guiding light behind the Ferrari Driver Academy who has now been replaced by Massimo Rivola. While very supportive of his drivers, Baldisserrri is renowned for being a straight-talker too. "I like that," grins Stroll. "I don't want to hear the fake truth. I want to hear the real stuff. We don't bullshit each other!"



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THERE'S NO BUSINESS LIKE SHOW BUSINESS

Autosport International kicks off the 2016 motorsport season in mid-January. Find out why it's a must-see event for any fan



THE AUTOSPORT International show will again signal the start of the new season from January 14-17, when the motorsport community en

masse descends on Birmingham's NEC. Every level of the sport will be represented through star guests and displays, from karting to Formula 1,

and including touring cars, sportscars and historic and club motorsport. Europe's biggest motorsport show starts with two days dedicated

to the industry, with professionals and exhibitors from around the world viewing the very latest technology. Doors open to the public

on the Saturday and Sunday, with these tickets starting at £33 from www.autosportinternational.com. Here is just a taste of what you can expect.

MAUGER/LAT

STARS

Hill, Massa, Solberg, McNish, Gardner and much more



EBREY/LAT; COATES/LAT; FERRARO/LAT

THE SHOW WILL LAUNCH 20TH anniversary celebrations of Damon Hill's 1996 F1 world title. Hill will be reunited with the Williams FW18 in which he became the only son of a world champion to also win a title. One of Williams's current F1 drivers, Felipe Massa, will join

Hill in Birmingham, leading a line-up of top personnel to share insight about both the team and Formula 1 in general. Deputy team principal Claire Williams will be accompanied by chief technical officer Pat Symonds, chief performance engineer Jakob Andreasen and

head of performance engineering Rob Smedley. Two-time World Rallycross champion Petter Solberg is returning to the show's Live Action Arena, having wowed crowds with his performances in 2015. Included with each ticket, these shows are hosted

by Sky F1's David Croft, and feature stunts from Guy Martin and plenty of racing. Three-time Le Mans 24 Hours winner Allan McNish will dissect a big year in sportscar racing in which Porsche emerged as top dog, while motorcycle world champions Wayne Gardner and

Phil Read will cover the big MotoGP topics. Among the other guests, Gordon Shedden will celebrate his 2015 British Touring Car Championship title, and will be joined by fellow BTCC champs Matt Neal, Andrew Jordan and Colin Turkington.

TICKETS AUTOSPORTINTERNATIONAL.COM OR PHONE 0844 581 1420



CENTREPIECE ATTRACTIONS

Revamped ASI puts Williams in spotlight

YOU WILL SEE A REVAMPED AUTOSPORT STAGE within the NEC this year, to welcome a major showcase from the Williams Formula 1 team.

The Grove squad is constructing its motorhome outside of an F1 paddock for the first time (see more on page 42), and is bringing some of the most successful and iconic cars from its history.

Eight grand prix racers will be on display, including title winning machinery driven by Keke Rosberg in 1982, Nigel Mansell in 1992 and Damon Hill in '96, along with the team's first F1 car, the FW06, and its 2015 FW37.

"We get such brilliant support from the fans and we can't wait to be able to give something back at Autosport International," said deputy team principal Claire Williams.

"We've got some incredible features lined up, and it is a great opportunity to get this close to some of our most famous racing cars – including the 2015 one."

Another car from the Williams Heritage collection, a Williams FW08C, will also be demonstrated within the Live Action Arena



WILLIAMS'S AUTOSPORT INTERNATIONAL LINE-UP

1978 Williams-Ford FW06

The team's first F1 car

1982 Williams-Ford FW08

Won drivers' title with Keke Rosberg

1983 Williams Ford FW08C

Race winner with Keke Rosberg

1986 Williams-Honda FW11

Won constructors' title with Nigel Mansell and Nelson Piquet

1992 Williams-Renault FW14B

Won drivers' title with Nigel Mansell and constructors' title

1996 Williams-Renault FW18

Won drivers' title with Damon Hill and constructors' title

2003 Williams-BMW FW25

Race winner with Juan Pablo Montoya and Ralf Schumacher

2012 Williams-Renault FW34

Spanish Grand Prix winner with Pastor Maldonado

2015 Williams-Mercedes FW37

Driven by Valtteri Bottas and Felipe Massa

THE STAR CARS



CARS FROM THE BRITISH TOURING CAR CHAMPIONSHIP will be on display in a special feature, with the area hosting BTCC driver interviews and autograph sessions.

An array of Formula 1 machinery will star, while Wales Rally GB will again curate the dedicated rally collection.

In association with Silverstone Classic, the best of motorsport from the 1970s and 80s will be in the spotlight. The diverse four-wheel offering spans Formula 1, Le Mans and Can-Am cars, alongside grand prix racing motorcycles.

Other areas are dedicated to grassroots motorsport, karting, oval racing, industry careers, while interactive elements include simulators and an indoor karting track.

Supercars and road-going classics will also be on display under the same roof, within the Performance Car Show, which celebrates the best of the motoring world.



PETTER SOLBERG'S STUNT DRIVING MASTERCLASS

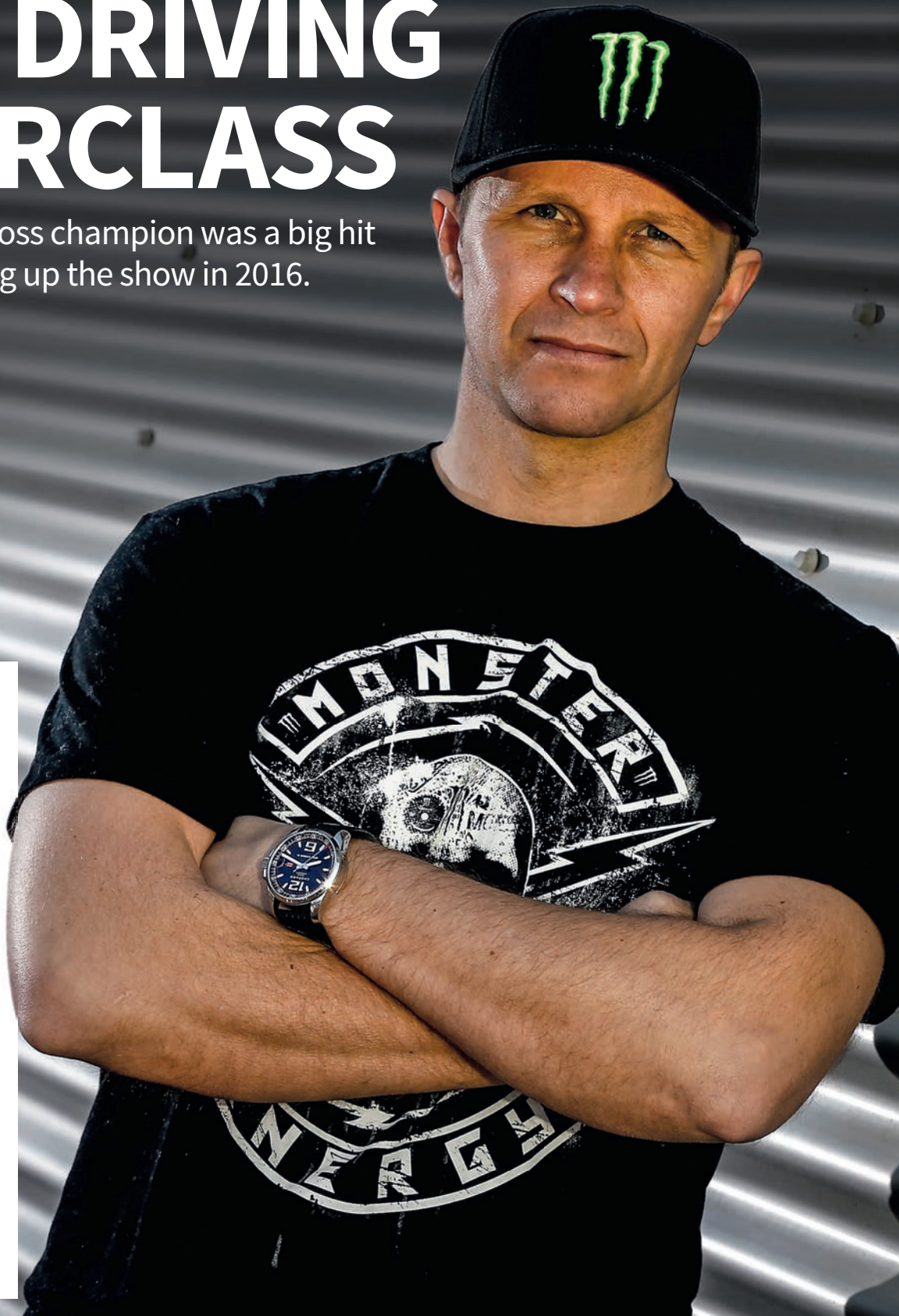
The double World Rallycross champion was a big hit last year, but he's ramping up the show in 2016. Here's how he does it

I love Birmingham and am so glad to be going back again. This is the biggest and the best show in the world. I came a few years ago for the first time just to talk on the *Autosport Stage* and I saw a little bit of what was going on in the Live Action Arena. Straight away, I knew I wanted to do more. Last year was unbelievable what we did with so many fans – I want to do that again this week.

Honestly, it's hard to explain what I do because so much of it comes naturally to me and I do it on instinct.

I can do these kinds of things with any kind of car as long as it's got some power and it's rear-wheel drive or four-wheel drive. I enjoy doing these things as long as the people outside of the car are enjoying themselves as well. You get a good kick from the fans and they make a real connection with the person inside the car.

"I'm so glad to be back. It's the best show in the world"



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THE JUMP

Depending on the size of the jump we have in Birmingham, we might have to run the car in asphalt or gravel specification. If it's just a small jump, we'll be fine to run the car low without much suspension travel. If it's a bigger jump, we really need to get more travel from the dampers and less chance for the bottom of the car to be crashing out when we land. When I land the car, obviously I need to be able to put the steering input there immediately,

so we can make the turn and carry on with the next trick in the show.

When you're coming up the ramp to the jump, the speed has to be exactly right, and as you take off it's really important to be on the throttle to keep the car straight. If you lift off at the wrong moment, you'll land the car on the nose.

Normally, if it's a big jump with quite a lot of time in the

air then I'll change down a gear while I'm in the air – this gives you the acceleration on landing, which you need because you've slowed down so much while you're flying.



“That mistake cost me €30,000. But you know me – when I do a show I do it properly!”

**THE POWERSLIDE**

The first trick that most people are going to see from me is the powerslide. When you have a car with good power like ours, it's normally not so difficult. I say normally not so difficult... last year some of you might have been there when I discovered it's not always so easy! I hit the wall!

I was coming in very fast, everything was perfect and I was drifting really nicely. I had done this just before and just touched the wall with the rear – it was fantastic, I honestly just kissed the wall and went away. The next time I was a tiny, tiny bit faster and I got to the dirt – the bits of rubber and marbles which are left outside of the line the guys are normally driving on. I hit that and the car just took off. Bang, straight into the wall. The impact smashed a corner of the car – that meant a new upright, driveshaft, brake disc and caliper. That mistake cost me €30,000. But, you know me, when I do the show I like to do it properly!

**THE SURFACE**

In Birmingham, the surface we drive on is really slippery; more like ice, except probably even more slippery – you can actually get some grip on some kinds of ice. But there's no grip in the NEC. Some people think that makes it easier to spin the car and, I guess, it does make it easier to just do a straightforward handbrake turn. But when you have so little grip, you really have to work the car and yourself much, much harder.

All the time you're on a very fine line, right at the edge of the friction circle. If you push too hard, this place will bite you in the ass. But there's sometimes a little more grip as the show goes on. When we go into the hall for the first time the floor is clean, but we get some rubber down and it gets a bit more grip. Not much more though...

**THE DOUGHNUT**

Depending on how much space we have and how much speed the car is carrying, you may or may not use the handbrake. When I'm coming off the startline and carrying some good speed into the arena, I can just throw the car into a slide and then control it on the throttle – but you do need some speed to do this. It's like in rallying – if you have an open corner which is tightening then it's easy to control the slide and keep the nose in at the apex, even when the rear of the car is sliding very wide.

For a tighter doughnut, it's a quick grab of the handbrake to lock the rear wheels, immediately lots of throttle and steering input – quite violent – but after that you don't need the steering. You keep the car spinning in the perfect circle with the throttle. Once the wheels are spinning and smoking, then it's easier to work with the car.



GETTING OUT OF THE CAR

You know that I like to put on a show for everybody – I always want to make sure everybody is having a good time. A good way for me to do this is to get out of the car to wave to people as I'm driving along. I've done this for a long time now – but since I've been doing more of these demonstration-type events and rallycross, I've been doing it a bit more. And now I've started doing doughnuts while sitting out of the car. This is really fun!

It's not easy though. I have to start spinning the car while I'm in the seat like normal. Then it's really carefully onto the side of the seat and finally out onto the rollcage. At the same time, I have to open the door with the left hand, steer with the right; get my left leg on the door bar and my right leg

stretched across on the throttle – it's not easy!

You have to be careful. Some of you might remember the Bologna Motor Show a few years ago, when things didn't go exactly to plan... I'd done this a few times, getting out of the car and onto the roof. I did it this time, but didn't realise that when I was getting out of the car my knee had hit the paddle-shift and I took second gear. Then, when I got onto the roof the speed increased and the door shut! I had to jump down from the roof, but the speed was something like 45km/h and I fell. I broke my hand and really hurt my ass. That was a big fuck-up, but I think some people thought it was part of the show!

Even with a broken hand, I continued to drive for 10 minutes after that – but it hurt a lot!

THE 360

This is a tricky one in the arena in Birmingham, as usually it requires much more space. I normally like to take more speed, because it makes the spin a bit more dramatic. I'll go flat-out through the gears going forward, then pull the handbrake at around 120 or 130km/h (75mph). This spins the car through 180 degrees and then we're doing that speed backwards. While I'm going backwards, I change down the gears and drop the clutch to spin the wheels and pull forwards out of the spin.



THE SET-UP

Normally I'll take the asphalt tyre for Birmingham. There's not much grip here, but once you get some heat into the softest compound then you do get something. The choice of tyre for this year does depend a little bit on the jump. Maybe we'll need the gravel suspension on the car; if we do, then we'll take the gravel tyre. If we're on the gravel tyre, everything is just that little bit slower, the reaction from the tyres not quite the same and there's more movement

from the car. Everything is a little bit less precise.

For the rest of the car, it's the same. The differentials are all like we'd use on a rally and the engine's the same – except it has a bit more power. What we need from the engine at an event like this is immediate response, so the anti-lag system is turned to the most aggressive. This is good, though – this means there's lots of noise, lots of popping and banging, which all adds to the action.



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STANDING ON THE SIDE OF THE CAR

I only did this once with Terry Grant and I have to say it was a bit stupid! It was so risky – even I say this was a bit too crazy. I really don't think I'll be doing this one again, it was a bit too much on the limit. But, you know, Terry is a good guy and a really good driver – we work very well together and I trust him. But it only needed the car to move a little and it would have gone wrong quite badly.



GRIFFITHS/LAT

GOING BACKWARDS

This is actually one of the most difficult things to do. As you can imagine I'm strapped into the car as usual, and with the HANS device on you can't turn your head at all. The rear-view mirror and the wing mirrors are really useless because it's so dark in the arena. When I've done a 180 and I'm sliding backwards – usually with the wheels spinning forwards – I can't see anything at all. It's really important to have some reference points in the arena so I know when I really have to stop going backwards!

WHAT TO EXPECT

We have some new stuff this year, but a lot of what I'm going to do depends on what space we have and what comes into the mind straight away. We make a plan with Malcolm [Forbes, Live Action manager], so I know what time I'm coming in and what I'm going to be doing, but there's always the chance for something a little bit different.



INSIDE THE WILLIAMS F1 HOME FROM HOME

The Williams Martini Racing motorhome will appear outside of the F1 paddock for the first time at *Autosport International*. Here's what you'll see on your tour of it

As part of the Williams F1 team's new look for the start of 2014, it created a motorhome that is the most popular in the Formula 1 paddock. "We made the decision that, while we loved our old motorhome and lots of people enjoyed the

experience it delivered, it wasn't fit for what we wanted," says Williams head of marketing Chris Murray. "As part of the programme we have been on for the past three years, where we started our march back towards the front of the grid, the hospitality experience needed to evolve."

The resulting three-story edifice is spirited from grand prix to grand prix by 14 trucks, with the team's build record, set last year, just 12 hours. "There was a time when ego played a part in the design of motorhomes but this isn't ostentatious or overblown," says Murphy. "We wanted to retain the

character of the old motorhome. So when you walk in, you are welcomed. We also needed to improve the catering, so the back of the ground floor is the kitchen. That's connected to the second-floor kitchen, which delivers our fine dining." And fine dining in F1 terms means Michelin

two-star chef Michael Caines offering a six-course tasting menu. And then there's the Martini Terrazza, at the top of the motorhome. "The Terrazza is a big part of Martini's heritage, so to create that in the paddock was brilliant. The number of people we have up there is huge!"



DUNBAR/LAT

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Q&A

CLAIRE WILLIAMS
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Why is it so important to have a facility like your motorhome at a grand prix?

The motorhome is our home away from home. This isn't just some place for people to come and eat; this is a place to meet, it represents who we are. Our motorhome cost a huge amount of money. It was quite a big decision to take to make that investment, but it's important to us because when we go racing we like to share what we do and we love welcoming people. To be able to take that to the fans at Autosport International is great.

Is that why maybe fans also like Williams, because you're trying to let them in?

We appreciate the goodwill of the fans. A lot of fans have stuck by us and still believed in us even when we weren't having any success on the racetrack. We never take it for granted. If it wasn't for the number of fans that we have we couldn't go out and talk to sponsors and say this is the greatest sport in the world because it has a cumulative audience of two billion people. If those fans didn't keep tuning in then we wouldn't have sponsorship and then we wouldn't exist as a race team.

Is the motorhome important for sponsors?

Yes. That's why we're very competitive about our motorhome. I want to make sure that whenever someone comes in here they go out into that paddock and go, 'Williams serves the best food and they have the best hospitality people in the whole of this paddock.'

FROM LATE STARTER TO CHAMPION

Gordon Shedden didn't know which car he was going to be driving when he appeared at *Autosport International* in 2015. Now, he knows all the answers



ALL PICS: EBREY/LAT

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What a difference a year makes. At *Autosport International* 12 months ago, Gordon Shedden was answering questions about the type of car Honda would be using in the British Touring Car Championship. The Civic Tourer was a one-year project and the rumour mill had the Civic Type-R as the nailed-on replacement, but Shedden said the decision hadn't even been made – and that the Civic Sport was a serious option.

That was little over three months before the start of the season. When the curtain went up at Brands Hatch and the 2015 challenger was readied for its debut, Shedden jokes was that “the paint was still wet when it arrived”.

Honda's decision to go ahead with the Type-R played up to the British arm of the Japanese manufacturer's marketing strategy, but it made life very difficult for Team Dynamics because the road car didn't even exist in road form at that point. Matt Neal gave the Type-R its maiden run at a test at Brands Hatch just a week before the championship's official media day. Conversely, the emerging BMR superteam had been developing its Volkswagen CCs from the end of 2014 and MG's Andrew Jordan was already well into his testing programme by the time Shedden took to the ASI stage to admit there was uncertainty over which direction Honda was going to take.

Shedden didn't get his own car until the media day test at Donington Park, and electrical issues limited his running. Hence the earlier joke about the car barely being finished in time for the opening round.

“We've got a history at Dynamics of building cars that are late to debut,” reflects Shedden. “This one was incredibly late – mine hadn't turned a wheel before the media day and we didn't really run then either.”

With the Tourer being an estate, Shedden claims there were limited lessons to apply to the Type-R before

running could begin in earnest. Honda would have to learn on the fly – far from ideal in a series as tough as the BTCC.

“You try and use what you've learned on the previous cars and it drummed it home that we worked so hard on the Tourer last year but it was different,” admits Shedden.

“When we tried to use what did on the estate it just wasn't working. There were late nights and stressful times to try to decide where we were going with the car.”

Incredibly, Shedden and Neal both won at Brands to put Honda top of the tree with its new car, but the BMR VWs were the cream of the crop in the hands of Jason Plato and Colin Turkington, so Dynamics needed to learn quickly. Turkington and Plato won at Donington Park and although Neal snuck another reversed-grid win, progress had to be made.

“Team and engineering wise, we've been together for a long time and that is one of our strengths,” says Shedden, who was qualifying strongly and picking up points, before making a major breakthrough at Thruxton. Not only was the raw speed there, but the Honda caught and surpassed the VW as the most potent machine with weight in the car.

“That was the thing we worked on – I don't think I carried less than 57kg in qualifying all season,” he recalls. “Most of the time I've had 66kg or 75kg.”

The performance Dynamics, and in particular Shedden, unlocked with this much weight was pivotal. BTCC bosses tweaked the regulations so that the championship leader started each weekend with 75kg instead of 45kg. The sliding scale was increased to the top 10 drivers and bumped up across the board, while another rule change was to make the race two grid decided by race one fastest laps – success was punished more than ever, but the ability to tailor a car to run heavy carried a greater reward.

“Colin said something last year with the BMW, it almost settled the car down

and it kind of did that for us as well,” says Shedden. “Sometimes, it helped the balance; it wasn't all negative.”

At Oulton he was fifth in qualifying and sixth in race one. At Croft, third and fourth. “The only one that was a disaster was Snetterton,” he says on reflection. There, Shedden qualified in the midfield with 75kg of ballast. Unlike Plato at Croft, he started in the pack – made no progress in race one, started mid-pack again in race two and got caught in first-lap carnage, getting fired off by Matt Neal of all people. He left Norfolk with three points in his pocket.

That was a lesson learned. Thereafter, his qualifying only got better. “In the second half of the year qualifying was the critical thing,” he maintains. “After Snetterton, the qualifying laps were four pretty mental laps.”

They were: fifth at Knockhill; third at Rockingham at the last minute (only to get demoted to seventh for a pitlane infringement); second with maximum ballast at Silverstone, a track an NGTC Honda had never qualified higher than ninth at; then fifth for the finale.

Of course, that all counted for little when Shedden qualified poorly for race two by virtue of being passed and tactically baulked by Plato in the opener. Contact left Shedden with a broken exhaust and starting the finale 20th.

Having come so far from the first round, let alone the *Autosport* show, Shedden wasn't about to lie down.

“You never know what's going to happen, I just had to try and keep going,” he admits. “It was the first time the car had been on base weight all year. So I knew it would be quick. It was worth giving it a go, throwing everything at it and not leaving anything on the table.”

“I would rather have not finished than coasted round and not tried and finished second in the championship.”

He did finish though, and not second in the points either. What seemed a tall order at the start of the year had come to pass: Shedden was a two-time champion.

Dynamics, yet again, has its work cut out over the winter. The works Honda team will field a third car in 2016 and supply a quartet of customer entries as well – Eurotech's older Civics are being upgraded and it has bought another car as well, while Speedworks Motorsport will run one with Dynamics support.

Shedden will go into the new season with much greater certainty than he did in 2015 – but that doesn't mean the 2016 ASI guest will be taking the challenge lightly.

“I'm sure the competition will be even tougher in 2016,” he reckons. “We know that we're going to have to improve because if we don't we'll end up going backwards at 100mph.” ❄

“If we don't improve, we'll go backwards at 100mph”

Even with ballast, Shedden's Civic was capable of “mental” qualifying laps



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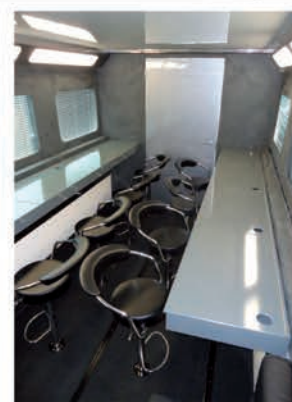
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This incredible photo was taken on May 1st, moments before the start of the 1994 San Marino Grand Prix. Nowhere recorded is there a photograph taken at such close proximity, leaving the question - what must have been going through his mind on that fatal day? A fabulous investment for any collector, the print is printed onto toughened glass to give an unrivalled finish and produced as a limited edition of 1000. The overall size is 950mm x 550mm and comes ready to hang with a certificate of authenticity and plaque.

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Triple Eight withdraws from British GT

TRIPLE EIGHT HAS WITHDRAWN from the British GT Championship this year, but its BMW Z4s will remain on the grid with the AmD Tuning team.

AmD has already taken delivery of the two former Triple Eight BMW Z4 GT3s, and has confirmed that frontrunners Joe Osborne and Lee Mowle will return in the first car.

The deal marks the end of leading British Touring Car Championship team Triple Eight's sportscar programme after three winless seasons in British GT.

Team head Ian Harrison said: "We won't be doing GTs this year since we intend to focus solely on our BTCC commitments with MG."

Triple Eight has secured a fresh three-year deal with MG for the BTCC.

Osborne and Mowle finished third in the GT3 division points last year and will embark on their fourth British GT campaign together. The drivers for the second car have yet to be announced.

AmD Tuning, which plans to run a brace of Audi S3s in the BTCC this term, joined British GT in 2015 with Graham Coomes and Jake Hill contesting a GT4 campaign in a Porsche 911.

Team principal Shaun Hollamby said: "Having had the chance to experience British GT for the first time last season it became clear that we wanted to be part of the series for the long term. We're delighted to move into GT3 with a two-car team.

"The BMW has proven itself to be a strong package in recent years and in

Lee and Joe we have an established pairing who have shown that they are capable of challenging for the title."

Former Triple Eight and Trackspeed chief engineer Keith Cheetham will also move across to AmD to bring GT3 experience to the team.

"I've known Shaun for a few years now through the BTCC and his team fits the bill," said Mowle. "AmD is run as a tight ship and we are bringing a lot of engineering experience with us.

"Keith will continue, having engineered the cars last year, and we also have a wealth of data."

Osborne added: "The championship will be very tight and the driver pairing that makes the fewest mistakes will come out on top – hopefully that will be us."

Top BTCC squad Triple Eight has been a British GT frontrunner but will not return

GT4 CUP OPENED UP TO NON-ASTON MARTINS FOR THE FIRST TIME IN 2016

The Aston Martin GT4 Cup will be opened up to other marques this year as series bosses aim to make it a feeder for British GT.

The series will return to the British GT support bill this year, appearing alongside it at the Brands Hatch, Oulton Park and

Silverstone rounds. It will now operate for any model of homologated GT4 car, having only been open to the AMR Vantage GT4 and N24 models.

ACR race director Roger Bennington said: "We are looking to increase the grid of

the GT4 Cup because at the moment we are short on cars. The only way of doing this is to open it to other cars.

"We would like it to become a stepping-stone to British GT as it is on the support bill and would be cheaper to contest."



Aston Martin series will no longer be just for Astons



PHOENIX PARK

Plot for rise of Phoenix Park

THE PHOENIX PARK MOTOR RACES COULD RETURN this year with plans for a revamped event on the August Bank Holiday weekend.

The historic meeting in the Dublin park has not been held since 2012, but organisers are hoping for a return to the event's 1990s glory days, when Williams F1 champions Jacques Villeneuve and Damon Hill were guests.

Organiser Trevor Kinsella said that the plans are progressing well, but are still at an early stage.

"We have secured a date," he said. "We have looked at changing a few things to make it better for the public and one of those is to move it to a Bank Holiday weekend."

"Now we are in talks with a couple of potential big-name sponsors, since race-entry fees aren't enough alone to cover the costs as we have to build a complete circuit."

"We're looking to bring the event back to championship status – there are still one or two classes who we may be able to get in, but we would have to upgrade the safety of the circuit to do that."

Park resident Kinsella added that he would like to see some UK series also take part.

"We've been working on it since last February but it's the nature of the beast – it takes time," he said. "We have a great team behind us. It's still at a very early stage but it's looking very good."

Racing first took place at the Phoenix Park venue in 1903, while the area played host to three Irish Grands Prix between 1929 and 1931.

Governing body Motorsport Ireland has pronounced itself pleased with Kinsella's efforts.

"It all depends on budget because it's a road course and you can't charge an admission fee, but we have been very impressed by the plan," said chief executive Alex Sinclair. "We have to be sure all the necessary funding is in place."

"It would be fantastic to have the event back. I've been in this job a little while and the one regret is that Phoenix Motor Races is not an annual event. Nobody would like it back more than me."

MINI SE7ENS

MINIS GET GT SUPPORT ON BRANDS GRAND PRIX CIRCUIT

THE MINI SE7EN RACING Club will compete on the Brands Hatch Grand Prix circuit for the first time in 13 years this season after securing a slot on the undercard of the British GT Championship.

The Mini Se7en and Miglia grids will be combined for two races in support of the British GT season opener on the Kent venue's 2.4-mile layout on April 17.

The classes haven't raced on the full GP configuration since September 2003, on that occasion attracting a 52-car entry.

"The addition of Brands Hatch GP to the calendar really adds something special," said commercial manager Colin Peacock. "We had a large gap between round one in March and round three in May, and Kane Astin [Miglia regular] spotted this event and we managed to get on it."

"The track will work brilliantly for Minis as it's fast and flowing, so we should have some good slipstreaming racing. We averaged 39 cars across 2015; we're hoping to get that up to 45 this year."

The Brands outing will be the club's second meeting of its eight-event 2016 calendar, which will once again include a trip to Zandvoort in October as part of the British Race Festival event.

PICKUP TRUCKS

Sidelined BTCC racer Wood heads into Pickups



FORMER BRITISH TOURING Car driver Lea Wood will make a full-time switch to the Pickup Truck Racing series.

The 31-year-old impressed during a one-off outing at Thruxton last year, taking a win and a second place, and will contest a full campaign in 2016. He will team up with Dave Longhurst, who was his engineer in the BTCC.

"I'm really looking forward to this new challenge," said Wood. "When I knew that the

opportunities in the BTCC weren't there for me, this was always a strong option and it made sense to embark on this journey with Dave."

"I'm quite confident going into the circuit rounds as they are tracks I have competed at before, but I am even more excited to be racing around the Rockingham oval. We've got four events on that layout so it will be important to gain an understanding quickly and get on top of the car."



Vaulkhard set for return to roots

FORMER WORLD TOURING CAR DRIVER Harry Vaulkhard plans to return to his roots in 2016 and compete in the Ford Escort Mk2 in which he made his racing debut.

The 30-year-old first raced the naturally aspirated two-litre car in 2004 and may return to the Northern Sports and Saloons series where he began his career.

He tested the car at Donington Park recently, its first mileage in half a decade.

"It was an 18th birthday present from my

late dad Nigel," he said. "I last raced the car in 2010 at Spa, sharing with John Smirthwaite, but since then it's sat in a corner and not moved. It was great to get the car back out and give it a spring clean. We essentially put a new seat in it and changed the belts and it ran like clockwork."

Vaulkhard raced in the Mini Challenge during 2015, finishing ninth in the Gen 3 F56 standings, but has ruled out a return to that series, instead focusing on club outings.



EBREY

IN BRIEF



PIDGLEY IN TOCA SUPPORT SWITCH

MSA Formula driver Ollie Pidgley will move to the Renault UK Clio Cup for 2016 with Ciceley Motorsport.

"There will be an expectation because it's Ciceley, but that will come from outside," he said. "It's very exciting to be part of Ciceley's first season in the Clio Cup and they are making sure it is linked very strongly with their BTCC operation at race events."

SPANISH F4 OPENED UP TO TEAMS

Spain's new FIA Formula 4 championship has been opened up to teams. The series was initially launched as a contest centrally run by Koiranen GP, which also runs the SMP-backed NEZ series in Finland, Russia and Estonia. Spanish F4 – which Koiranen still promotes – uses the same Tatuus-Abarth combo as Italy and Germany.

LOCKIE AND MASON TO DEFEND TITLE

Reigning Britcar Endurance champions Calum Lockie and David Mason will return to the revamped series this year. Former British GT title winner Lockie has won the Britcar category four times and will again enter an FF Corse Ferrari alongside Mason.

NEW LOTUS FOR STRONG GT CUP GRID

The GT Cup Championship has received a strong number of entries already for the 2016 season. So far 15 teams have signed up for the multi-class championship, the grid for which will also include the new Lotus Evora 400 cars, which will run in either the GTA or GTB group on their racing debut, depending on the final engine specification for the new machines.

SCOTSMAN DAILY WANTS GINETTA MOVE

Reigning Scottish BMW Compact Cup champion Steven Dailly is eyeing a move to the Ginetta GT5 Challenge.

The 23-year-old, who won all 16 races and was crowned SMRC Champion of Champions in only his second full year of car racing, is now targeting a move to the category with his family-run KC Motorsport squad.

"I tested the car at Silverstone and loved it," said Dailly. "The plan is to get to Le Mans level and this is the starting point."



MOIR

BRDC F4

Indian makes step to top team Lanan

LEADING BRDC FORMULA 4 team Lanan Racing has announced Akhil Rabinra as its first driver for this season.

The 19-year-old Indian competed in the series with Douglas Motorsport last season and finished 13th in his maiden year of European racing.

Lanan took Jake Hughes and George Russell to the 2013 and 2014 drivers' titles respectively.

"Lanan Racing has been the most successful team in F4 so I am really happy to be joining them," said Rabinra. "Last year gave me the experience of racing in the UK that I needed and I am looking forward to fighting at the front this year."

Lanan Racing team principal Graham Johnson added: "We saw how Akhil improved as last year progressed, so it's great to

have signed him. His record is strong and we are looking forward to working with him to push him forward and on to race wins."

Elsewhere, South African karting champion Eugene Denyssen will join the championship this season with SWR, having previously tested the first-generation car with the team in 2013.



JONES

FORMULA FORD

Cowley eyeing Indy with switch

MATTHEW COWLEY WILL STEP UP TO THE POST-89 category in the British Racing and Sports Car Club Formula Ford 1600 Championship in Graham Carroll's 2015 Walter Hayes Trophy-winning Van Diemen.

Having won the National and Northern FF1600 Pre-90 championships last year in a Reynard 88FF, the

18-year old feels this is the perfect time to step up to a newer car, with the championship a qualifying round for the Mazda Road to Indy series this year.

"We had a great season in the Pre-90s and it's all looking strong for 2016 now," said Cowley, who will pilot the JL13 with the aid of new team B-M Racing.



Spencer stayed clear of Porter in the first Sports Car encounter

MALLORY PARK
CLUB MALLORY DECEMBER 26

JONES

Spencer fights to Boxing Day victory

LEICESTERSHIRE DRIVERS JOE SPENCER AND David Porter shared the wins at their home track in the Club Mallory **Sports Car** races on Boxing Day.

After Andrew Barrett spun his MX-5 at Gerard's Bend, Brian Dean (Westfield SEi) made the early running in the opener, before Porter dived ahead at Lake Esses on lap three. The Radical SR3 driver was soon reeled in by Spencer (RSM200), who charged through from the penultimate row of the grid to be in Porter's wheeltracks by the end of lap four.

Spencer's more wieldy Stuart Taylor Locosaki-derived car took the lead at Shaw's hairpin on lap five and he kept the former Road Saloons champion at bay, although the gap varied according to the traffic. The second RSM200 of Dave Harvey took third from Dean on lap seven, while the remainder of the field were at least one lap down. Andy Grimm (BDN S2) and Philip Hart (Mallock Mk16) completed the top six.

BARC (NW) Sports/Saloon champion Spencer looked set to complete a double later, but it was his team-mate Harvey who made an astonishing start, climbing from 16th to lead into Lake Esses on the first lap. By the end of the third tour Harvey's advantage amounted to 12s, but by that point the 20-year-old Spencer had made his way ahead of Ian Smythe's Fisher Fury, into second.

Harvey's advantage diminished at the rate of 2s per lap and eventually Spencer was able to go around the outside of him at Gerard's. Harvey fought back at the hairpin but Spencer went ahead into the first turn of what many thought was the last lap.

But the race ran to its scheduled 15 minutes, rather than the 10 mooted as darkness descended, leaving the RSM rivals to slug it out. Disaster struck

a minute from the end when they went either side of backmarkers approaching the hairpin and Harvey locked up on the grass. As he rejoined the circuit, he T-boned Spencer, eliminating both.

Porter was on hand to pick up the pieces, taking his first Mallory win since a 1998 Proton Coupe Cup round, by more than a lap over Dean. Grimm was the final Christmas pudding recipient in third.

The **Saloon Car** races were also divided two ways, with Andy Thompson completing a Boxing Day hat-trick in the opener in his SEAT Toledo before BTCC driver Stewart Lines warmed up for his 2016 campaign with a race-two win in his Scirocco.

Rich Hockley – running in a new engine and gearbox in his Honda Civic – led initially before Mike Webb went ahead at the Esses in his Focus. Former Road Saloon champion Brian Sale gave chase in the second race of his comeback after a two-decade lay-off, but he clonked into the back of Webb under braking for Shaw's on lap seven, then retired when the bumper wedged underneath his Rover SD1. Webb lasted just a few more yards before suffering driveshaft failure.

Thompson, who had a double Mallory win in 2014, took over the lead. He fended off Lines for the final eight laps, while Peter Felix (Renault Clio) could not find a way past Hockley for third.

Hockley led for more than half of race two but Lines sealed the win with a decisive move at Shaw's hairpin with four laps to go.

Thompson retired, having briefly made it a three-way fight, promoting the scrap between Felix and Sale. The extra grunt of the Rover told, before Felix too headed back to the paddock.

IAN SOWMAN



BTCC man Lines claimed a win and a second in Saloons

JONES

SPORTS CARS (18 laps) 1 Joe Spencer (RSM200) 15m24.2s (94.6mph); 2 David Porter (Radical SR3) +0.7s; 3 Dave Harvey (RSM200); 4 Brian Dean (Westfield SEi); 5 Andy Grimm (BDN S2); 6 Philip Hart (Mallock Mk16). **Fastest lap** Spencer 50.9s (95.5mph). **Pole** Tim Heron (Toyota MR2). **Starters** 22. **RACE TWO (18 laps) 1 Porter 15m18.9s (95.2mph);** 2 Dean -1 lap; 3 Grimm; 4 Hart; 5 Ian Fletcher (Fletcher Hornet); 6 Peter Marsh (Caterham 7). **FL** Harvey 49.1s (99.0mph). **P** Jake Bailey (Mazda MX5). **S** 21. **SALOON CARS (17 laps) 1 Andy Thompson (SEAT Toledo) 15m45.7s (87.4mph);** 2 Stewart Lines (VW Scirocco) +0.4s; 3 Rich Hockley (Honda Civic); 4 Peter Felix (Renault Clio); 5 Dave Baseley (Vauxhall Nova); 6 Michael Ritchie (Honda Integra). **FL** Lines 52.2s (93.1mph). **P** Tony Hart (Renault SGT Turbo). **S** 12. **RACE TWO (12 laps) 1 Lines 10m43.2s (90.7mph);** 2 Hockley +2.9s; 3 Brian Sale (Rover Vitesse S700); 4 Ritchie; 5 Baseley; 6 Luke Harvey (Honda Civic VTi). **FL** Lines 51.8s (93.8mph). **P** Mark Harris (Honda Civic Type R). **S** 9.



Dogie Lawrence: 100 not out in NZ

By Marcus Pye, the voice of club racing

TOMORROW (FRIDAY, JANUARY 8) NEW ZEALAND motorsport celebrates a very special landmark as top patriarch Dougie Lawrence celebrates his 100th birthday. Bruce McLaren, Chris Amon and Denny Hulme might be the country's most famous racing sons – compatriots Tony Shelly, Howden Ganley, Graham McRae, John Nicholson and Mike Thackwell also raced in Formula 1 World Championship events – but without Dougie and his racing-mad boys Graeme, Tony, Brian ('BL') and spannerman Wayne, its influence over more than 60 years would not have been as far-reaching.

I first met Dougie over the winter of 1990-91 when, at the invitation of Global's promoter BL, I covered the Peter Jackson International Series for Formula Atlantic cars, period forerunner of FToyota, for *Autosport*. At 75 Dougie and his late wife June (whose birthday I shared) proved genial hosts at their lovely home in Hamilton and on a memorable tour of the Waikato region. He was wonderful company and, when next we caught up in a monsoon at Pukekohe in 2010, was still holding court in the bar – at 94 – with 1970 Tasman champion son Graeme.

Bike convert Dougie raced a Citroen Light 15-based special in the 1950s, followed by a Mistral-bodied Triumph TR2 and an ex-McLaren Cooper T39 Bobtail, but in December '61 had been sufficiently successful selling cars to 'invest' approximately £1250 in a new Lola sports-racer rolling chassis, built by Eric Broadley's fledgling company in Bromley, UK. BR-29 was the second Mark 1 in NZ (Barry Cottle had BR-28) and was "awesome to us as it was the first 'new' race car we welcomed to the family", recalls BL. Fellow Hamiltonian Ganley, then a young journalist racing a Lotus Eleven, remembers Dougie fondly as a "tough old charger".

With its yellow tubular chassis and red gelcoat-impregnated

body, the pretty Lola always turned heads. Although Lawrence Sr's love of revs claimed early Ford engines, it brought him results – none finer than a victory at Christchurch's super-fast Wigram airfield circuit in a rainstorm – once a Coventry-Climax unit was installed. Runner-up in the '62 championship, Dougie lost his appetite for competing having witnessed Rod Coppins's Tec-Mec Chevrolet accident at Pukekohe in '63, in which a marshal and an ambulance man lost their lives.

Nonetheless, the Lola gave Graeme his grounding in racing. His superb career led not only to Tasman and NZ Gold Star titles in the ex-Amon Ferrari 246T, but also on throughout Asia to Can-Am and F5000 – either side of his monumental Lola T300 shunt at Pukekohe in '72, which he was lucky to survive, albeit after six months in hospital. Poor Bryan Faloon, whose Stanton-Porsche was being lapped on the railway straight, was less fortunate. Ironically, this terrifyingly violent crash coloured Dougie's 66th birthday. Yet neither parent told Graeme to quit.

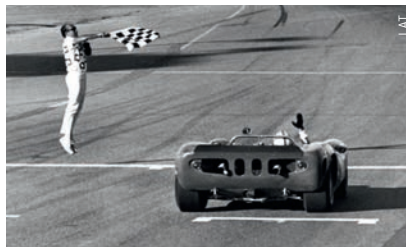
Although the Lola Mk1 is now 'back home' with Robin Longdon, it remained in New Zealand for decades. Dougie swapped it with Johnny Riley (father of sometime British F3 racer Brett) for "several cars, including an Austin A40. Originally Johnny wanted to trade seven tons of aircraft nuts and bolts, but Dougie, as any used-car dealer would, chose a product he could sell for a profit, within a reasonable timeframe," says BL.

The Lawrence brothers regularly get together and recall the "incredible times" they have had through their father and "best mate" Dougie's love of the sport, in which each evolved his own path. On Saturday the clan will be reunited in Hamilton for a luncheon in his honour. As I raise a glass to Dougie's centenary I'll wish all readers a belated Happy New Year. ❖



MOTORS TV FOR OSS RACERS

The Excool OSS Championship has attracted Motors TV coverage for 2016's five-event, 15-round schedule. The programme will be announced at *Autosport* International next week. The series will also reward competitors who contest three of the previous four rounds with free entry to the finale.



HALF-CENTENARY CAN-AM RACES

A race for Historic Can-Am cars at July's Silverstone Classic is among three in Britain this season, celebrating the 50th anniversary of the inaugural Canadian-American Challenge Cup series of 1966 (won by John Surtees). Masters Historic Racing will also run races at Brands Hatch (May 29-30) and Donington (July 2-3).



NEW MITTELL MC-53 ON TRACK SOON

The first of two Mittell MC-53 RGB racers under construction, destined for Vincent Randall's VR Motorsport team, is due to test at the end of this month. Scott Mittell will defend his 750MC title in the second. "This is the car we wanted to build two years ago, but were not confident enough to be so bold," said designer Ian Mittell, Scott's father.

WHAT'S ON



Putting motorsport centre stage

WHEN BT ANNOUNCED ITS arrival in the sports television market by snatching a bunch of Premier League football rights, it was clear it meant serious business. And while less heralded than its football efforts, its motorsport landgrab has been so effective that the most common answer to the question ‘which channel is [insert sub-Formula 1 international racing series] on?’ is now ‘BT’. In both schedule hours and viewership terms, motorsport (with MotoGP included) outstrips rugby to become its “second-tier” sport behind football, says channel head Simon Green.

“Once we acquired the Premier League rights, we were looking at motorsport and rugby on the basis that there was huge audience potential if they were presented in the right way. We had a strong set of motorsports rights and to go off and secure some more and build lots of cross-promotion was a pretty obvious thing to do. We believe we now have a pretty compelling

line-up for the serious motorsport fan.”

The timing of BT’s MotoGP arrival was sublime, coinciding with the Valentino Rossi resurgence that led into 2015’s extraordinary events. The season finale was heavily flagged around BT’s football/rugby broadcasts and reached a peak audience of 433,000 – down on the million-plus viewership MotoGP had earned in its BBC days, but a figure Green is very proud of for a specialist channel in its early days.

“We’d like to think that a lot of new people are able to access and enjoy

MotoGP is BT’s current flagship – but could F1 be one day?



MotoGP. I’m a football person deep down, but I’ve come to realise how brilliant motorcycle racing in particular is. MotoGP has all the glamour and colour Formula 1 has but it’s actually better racing and there are more personalities in it.”

MotoGP has clear motorsport flagship status at BT, though it still has to skip around the station’s channels, with Green admitting “clash management is a difficult thing, and that sometimes has knock-on effects on other content”. Though he reckons the flexibility and capacity offered by BT’s array of channels and red-button strands was key to it securing so many motorsport series, anyone trying to be a regular DTM viewer, for instance, will have spent a lot of time schedule-prowling to see exactly where in the BT portfolio a given race ended up.

For the majority of its car- racing series, BT takes ‘world-feed’ programmes rather than creating its own production. Green’s contention

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HOT ON THE WEB THIS WEEK

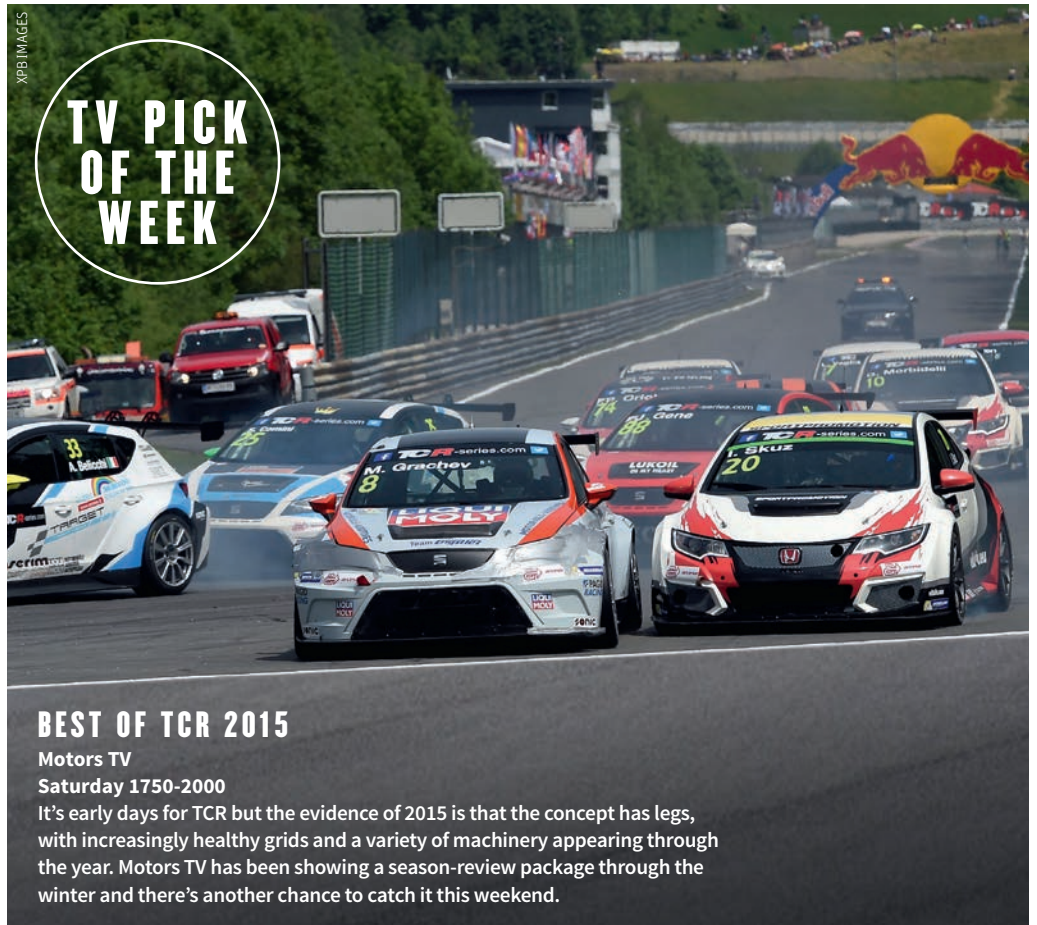
YouTube DAKAR OFF TO A STICKY START

Search for: Stage / Etapa / Etape 2 - Top moment - (Villa Carlos Paz / Termas de Rio Hondo)

The classic Dakar image is of dust clouds rising in the wake of the intrepid competitors, but this year it was all about mud. After the first stage was cancelled because of heavy rain, several runners got caught out by the second stage's tricky conditions.



BT Sport has invested a lot in profiling series beneath F1



BEST OF TCR 2015

Motors TV
Saturday 1750-2000

It's early days for TCR but the evidence of 2015 is that the concept has legs, with increasingly healthy grids and a variety of machinery appearing through the year. Motors TV has been showing a season-review package through the winter and there's another chance to catch it this weekend.

that in the case of the World Rally Championship "the whole presentation of that event is done so well, it allows us to put it straight to air without interfering with it in any shape or form" may raise a frown. "We're not afraid to try something new, but things don't always work out. Often they do."

Given BT's willingness to shoot for the top in other sports, suggestions of a bid for Sky's F1 rights are inevitable. Green says he has "a stock answer" to the F1 question, but deviates a touch.

"My enthusiasm for growing BT Sport is immense," he says. "I would like to see BT invest in more sport over the future and I believe that we will. Whether Formula 1 rights come to the attention of the senior level at BT, only time will tell during an auction process. But as far as the BT Sport team are concerned, we would love to acquire more and more rights. I would say that Formula 1 is very, very high up on the list of our ambition."

MATT BEER

INTERNATIONAL MOTORSPORT

DAKAR RALLY

Stages 5-11
January 3-16
Buenos Aires, Argentina

Generally synonymous with scorching conditions and sand dunes, the Dakar Rally began this week with rain deluges and cancelled stages. The main theme was big gun Peugeot putting its poor 2015 return aside and showing potentially dominant pace, but its car was still not bulletproof.

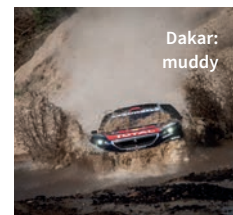
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on Eurosport
Times vary

ANDROS TROPHY

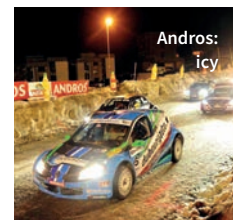
Rd 4/7
Isola 2000, France
January 8-9

With ice master Jean-Philippe Dayraut, Olivier Panis and Franck Lagorce all enduring troubles so far this season, it's consistent Jean-Baptiste Dubourg who emerged at the top of the standings before Christmas. It'll be a tough task for the star names to overhaul the Renault Clio driver.

WATCH ON TV
Sunday Jan 10
Motors TV
1210-1445



Dakar:
muddy



Andros:
icy



Asian
Le Mans:
very hot

ASIAN LE MANS SERIES

Rd 3/4
Buriram, Thailand
January 10

There are 17 cars entered for this weekend's Thai round, with nine across the three prototype classes - four in the top LMP2 category, three in LMP3 and two in CN. New interest will be injected by Oliver Webb (with points-leading Race Performance) and F3 star Antonio Giovinazzi (with Eurasia), both of whom will keep regular series ace Richard Bradley on his toes in LMP2.





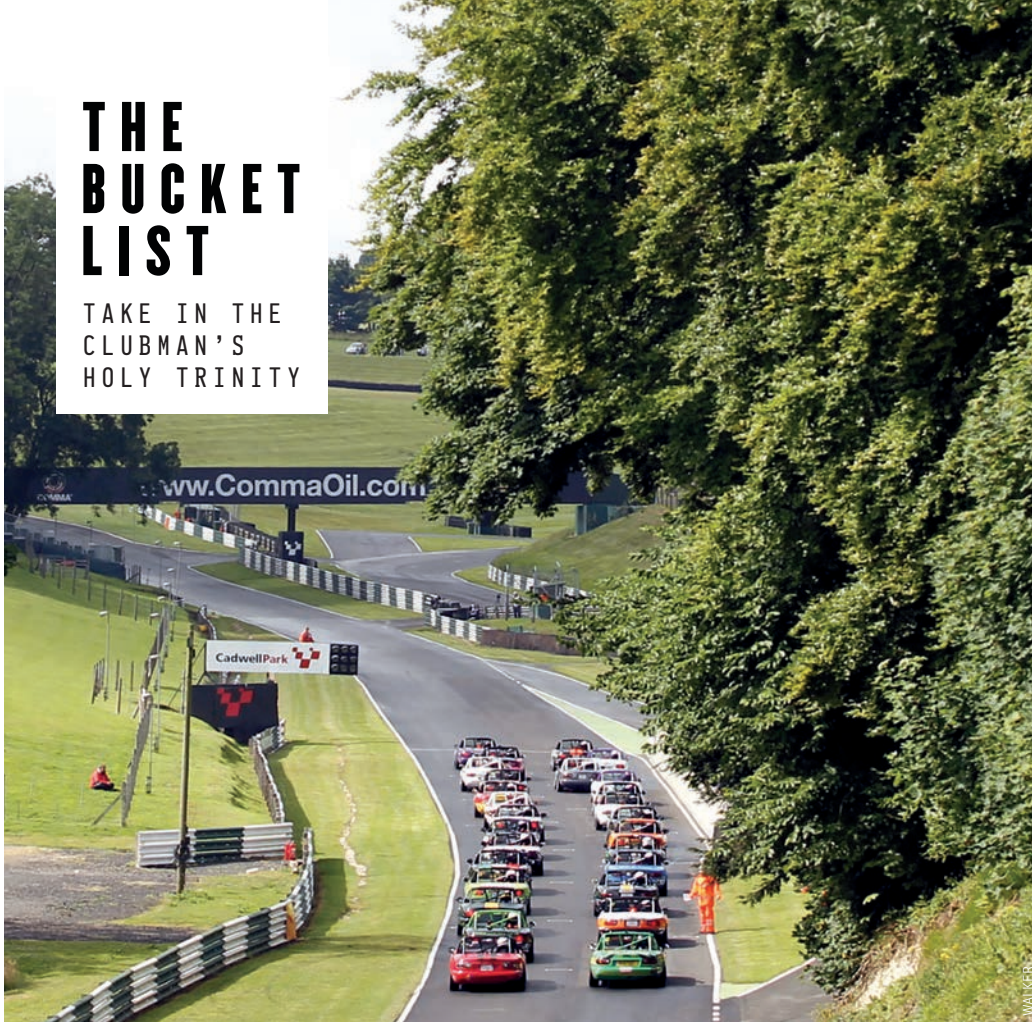
THE ARCHIVE

Drivers gather before the 1935 Monaco GP. Left to right: Etancelin, Sommer, Nuvolari, Dreyfus, Farina, Caracciola, Howe, race winner Fagioli and Zehender

LAT Photographic

THE BUCKET LIST

TAKE IN THE
CLUBMAN'S
HOLY TRINITY



W

HETHER YOU ARE A DRIVER OR A FAN, EXPERIENCING CADWELL PARK, Castle Combe and Mallory Park should be something you endeavour to achieve.

Let's start with the Lincolnshire Nordschleife. Don your hiking boots and the hills will take you to some brilliant vantage points. You can pretty much walk the perimeter of Cadwell and you won't be sorry if you do (though your feet might have a bone to pick afterwards). Cadwell features a great sequence of corners that really extracts the most from the undulations. To master it is an achievement not to be underestimated, one that requires bravery and precision

on an abnormally high level. Those who think of MSV venues and are immediately drawn to its British Touring Car Championship hosts Brands Hatch, Oulton Park and Snetterton would do well to remember there is another jewel in the crown.

From Lincolnshire to Wiltshire, where Castle Combe stands out as a brilliant rarity with its club championships. Aside from Knockhill north of the border, there is nowhere to find single-circuit championships, which means to succeed at Combe means to defeat genuine circuit specialists. It is also one of the few places that can attract a regular crowd to club events. In recent years Combe has broadened its horizons with the introduction of a special historic festival that returned 500cc Formula 3 to the venue, adding an enjoyable event to a busy national racing calendar.

As for Mallory, at the bare minimum you have the luxury of sampling an amphitheatric circuit that oh-so-nearly fell off the edge of the world a couple of years ago. The reprieve under Real Motorsport Ltd has been a tale of steady resurgence, with a handful of club meetings this year offering a glimpse into a very sustainable future for the venue.

One of the most popular testing venues in years gone by, its times of Wednesday morning practice runs might be limited these days through noise restrictions, but Mallory remains a popular place of clubbie worship. ❦

**Club-racing heaven:
a healthy field of
Mazda MX5s gets
set to do battle at
the picturesque
and challenging
Cadwell Park**

AT A GLANCE

Where The Shires
When March to December
Cost As ever, it depends on the series. All of Combe's club championships cost £225 in entry fees, testing

at Cadwell Park ranges from £150 to £250 and is well worth exploring before racing there, while Mallory's end-of-year Plum Pudding regular is a snip,

starting at £125 for two races. Ticket prices vary. **Key tip** Appreciate the smaller things. Cadwell, Combe and Mallory are well worth your time.



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2016 SHOW GUIDE



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WELCOME

IN THE MOTORSPORT WORLD, THIS TIME OF YEAR IS generally referred to as the off-season, yet in reality it is anything but. Away from the tracks, manufacturers, teams and their suppliers have been busy pushing the boundaries of engineering and physics, in the never-ending quest for those vital fractions of a second that can make the difference between a good 2016 and one that sends them back to the figurative 'drawing board'.

Every January, the *Autosport* International Show at Birmingham's National Exhibition Centre welcomes the best of the world's motor racing industry to not only display groundbreaking technologies that are refined year on year, but to showcase the latest in materials, processes and thoughts for competition.

Autosport Engineering, which this year runs on January 14-15 at the NEC, highlights the strength of an industry that, while it has its roots in motorsport, increasingly finds solutions developed for the racetrack crossing over into the aviation and marine worlds – even expanding into defence and medicine.

The UK has long been the spiritual home for the multi-billion-pound motorsport industry, and the most recently published figures confirm that more than 41,000 people are employed within this fast-growing sector. One segment that is expanding at a rapid pace is education, with universities and colleges offering various courses within the motorsport field to encourage and attract new talent into this increasingly valuable area.

None is more visible than the University of Bolton, its tie-up with Team RLR allowing its students to shine in the competitive spotlight that is Le Mans. That project alone highlights the need for talented newcomers to an industry that is crying out for the latest in software, electronics and aerodynamics.

Work at the very highest levels is quickly filtered down to grass-roots racers too. One look at the various data-acquisition systems now available to all racers that were once analysis tools for the cream of F1 shows just how fast the new technologies filter down.

Above all this is a showcase for a thriving, world-leading industry, one that *Autosport* is proud to be a part of.



Andy Hallbery

ANDY HALLBERY
EDITOR

CONTENTS

4 EXHIBITOR NEWS

Information on some of the key companies at the world's most important trade show

8 PRODUCT SHOWCASE

Motorsport products – from the latest video tech to a new spray detailer for the perfect finish

10 RATIONAL THINKING

Spotlight on solutions and procedures as the new-tech world of FIA Formula E expands into its second season

16 BIG SHOTS

The art of shot peening is a skill that can improve performance as well as extend component life

18 SENSORY OVERLOAD

Capturing data from a Mercedes Formula 1 car as it returns to the pits is an extremely complex operation

20 SIMULATE TO ACCUMULATE

Race-simulation systems are not just for F1 teams today, as up-and-coming drivers are discovering

22 RACE AND SHINE

Attention to the finish of bodywork isn't just for looks or sponsors. Detailing cars is now a science too

24 DEGREES OF ENGINEERING

Aspiring students can get their hands dirty if they aspire to a career on the technical side of the sport

26 ENCOURAGING TALENT

Introducing the Donald L Burgoon Formula SAE Scholarship in memory of the PFC founder



New award supports
future racing engineers



FOCUS ON ENGINEERS OF THE FUTURE

The motorsport industry craves new engineering talent, and the judging panel of this new award are on the lookout for the sharpest and most creative student minds

THE AUTOSPORT WILLIAMS ENGINEER OF THE Future Award, which gives an outstanding student the chance of a lifetime with a two-year placement with the team, was handed out for the first time last month. Oxford University engineering-science masters student Elizabeth Thompson became the inaugural winner.

Thompson emerged from a five-candidate shortlist, drawn from a number of students recommended by the leading British universities for engineering – Oxford, Cambridge, Imperial, Loughborough, Bath, Southampton, Oxford Brookes and Queens University Belfast. She won the award after impressing a panel of judges headed by Williams chief technical officer Pat Symonds.

“The standard was incredibly high and it has been a very interesting process to be involved with,” said Symonds. “We created some special

tests for the candidates, involving individual and group tasks, and it’s safe to say that all of the finalists have bright futures. We were looking for someone with the potential to take my job over one day, so the standard set is very high.”

Thompson will take up her position at Williams in September of this year, and the search is now on for the winner of the 2016 Autosport Williams Engineer of the Future Award.

“It’s unreal that I am going to be mentored by someone like Pat Symonds and hard to imagine where it’s going to go – but it will definitely be somewhere

“It’s unreal that I’m going to be mentored by Pat Symonds”

good,” said Thompson. “I think this award gives a bit of recognition to engineers in this sport. It’s a subject close to my heart and a chance to advertise Formula 1 engineering as something that is attainable. In the engineering, the same as driving, it’s almost an unattainable dream to work in F1, so it’s important to show that you can do it.”

The other members of the judging panel were former Jaguar Formula 1 team boss Tony Purnell, Williams HR director Nicola Slater and Autosport magazine editor Edd Straw.

The evaluations were held over two days at Williams F1, and the itinerary included meeting team principal Sir Frank Williams and his daughter and deputy team principal, Claire Williams. The candidates faced a number of challenging tasks, including an exercise to diagnose the cause of failures on F1 car parts.

TITAN MOTORSPORT HALL 8 STAND 8230

Titan reaches out

TITAN MOTORSPORT IS LAUNCHING its new carbonfibre production services to customers at the NEC next week. Long known for its own components, the company is now expanding this work to provide the process to others in the industry requiring quality parts.

Having been present in *Autosport Engineering* for the past 10 years, the Huntingdon-based business will move a small distance to become part of the main *Autosport International* show this year. It will display some examples of prototype automotive parts that highlight Titan's machining skills.

An estimated 50 per cent of Titan's business comes from the automotive sector, and 10 per cent from marine/aerospace customers. A lot of what is offered outside motorsport is focused

on its manufacturing services. The quick-turnaround service – essential in motorsport – is also appreciated in other markets that have short development timeframes.

As well as having products used in MSA Formula, Titan Motorsport supplied steering racks for the new, ground-breaking Ginetta LMP3.



Q&A

IAIN WIGHT RICARDO DIRECTOR PERFORMANCE PRODUCTS



Ricardo celebrated its centenary in 2015, and added to its reputation built on race-winning gearbox design and technology. There's no time for rest, though, as its staff and support teams of more than 2700 continue to

produce innovative products and services throughout various engineering industries. Iain Wight, Ricardo's director performance products, transmission systems, explains all.

Which success in racing is Ricardo most proud of being a part of?

This must be setting the benchmark for gearbox reliability at Le Mans in 2000 and onwards. Up until that point the gearbox had always been viewed as the weak link in the race car. From Ricardo's perspective it was the first circuit-racing gearbox made by us, and it has redefined the levels of expectation in modern sportscar racing.

What's new for Ricardo at Autosport Engineering this year?

Our R5 rally transmission system is being launched at the show, but our transmissions are continually evolving and the most recent evolution has come in the form of endurance sports and GT racing-car gearboxes.

For Ricardo, is the show about products or networking with customers?

The *Autosport* show is equally important for both. It is one of the few events of the year where a company with such a diverse product range can reach such a broad audience.

For a company as diverse and long-standing as Ricardo, how big a factor is motorsport?

It's easy to say that when your original field of expertise was engine and combustion technology that people will always want to make cars go faster... So, yes, motorsport has been a very important part of our history.

RICARDO UK HALL 9 STAND E590

VARIOHM EUROSSENSOR HALL 9 STAND E280

Sensing success

MANY OF THE COMPANIES represented at the NEC next week are component suppliers to winners in all forms of racing. But the very clandestine nature of top-level motorsport means disclosure agreements have to be signed, which means they can't all shout about their successes.

One such company is

Variohm EuroSensor, which has multiple wins with its products on both cars and bikes around the world. Its motorsports-proven Euro-XP non-contacting angle sensor with a new 8mm diameter D-shaft drive option will be on display in Birmingham, now available with a choice of 32 or

38mm PCD mounting. The D-shaft, with its integral magnet, makes for easier installation – particularly for throttle-position sensing, without the need for a separate coupling.



HNZ POWER SOLUTION HALL 9 STAND E647

Power from China

HNZ POWER SOLUTION COMPANY is coming all the way from China to exhibit at *Autosport Engineering* for the first time, highlighting the stature of the event in global terms.

The battery pack designer and manufacturer has been in business for 12 years, and has just moved into car and motorcycle racing domestically in



China, mostly focused on touring cars.

"We want to broaden our business further," says HNZ's Tony Xu. "We are starting by exploring the UK and EU markets with this show."

On display will be the company's racing batteries including the LiFePO₄, with its special BMS protection: anti-overcharge, anti-overdischarge and anti-overheat.

**ENGINEERING
SHOW 2016**

MOTORSPORT INDUSTRY ASSOCIATION: INTERNATIONAL BUSINESS LOUNGE HALL 8 STAND 8005

UK is global leader of motorsport industry

MANUFACTURERS AND suppliers from around the world will be heading to Birmingham for the *Autosport Engineering* exhibition to showcase their abilities, and to create networks. This is something the Motorsport Industry Association (MIA) encourages, having itself seen a 57 per cent increase in international members over the past two years.

“We are a global trade organisation serving an international sector, and welcome non-UK members”, says Chris Aylett, CEO of the MIA. “The motorsport industry, which is based

in the UK, is a global leader, and we are committed to maintaining this status. We’ll continue to keep up our close connection with the government and celebrate the innovation and dynamism.”

The levels of engineering solutions required to be successful in motorsport encourage innovation, and that is recognised by the spread of the industry into other realms: marine, aviation, defence and even medicine. All of these sectors require the same precision for which the UK motorsport industry is renowned.



COATES/LAT

The industry is attracting international members

DC ELECTRONICS HALL 9 STAND E181

Power assisted success

SYSTEMS DESIGNED FOR success at the highest levels of motorsport regularly trickle down to entry-level builders and racers. The new DC Electronics Pro Race power-assisted system is one such, says managing director David Cunliffe.

“Ever since we’ve been making electric power steering for professional race teams we have had requests for a system that is more accessible from a cost perspective.”

Customers in the United Sportscar championship had good reason to be

happy, he says. “Not only have we had winners in every class but at every race where the prototypes were on track we had a customer on the podium.”



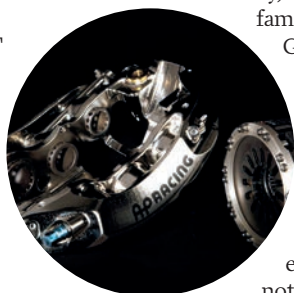
AP RACING HALL 9 STAND E380

Winning calibre calipers

AP RACING IS GIVING THE FIRST UK public airing of its innovative new Radi-CAL range of brake calipers at *Autosport Engineering*.

The company has expanded its popular PRO 5000 Range and added two new brake calipers designed specifically for GT and endurance race use.

The Coventry-based company’s use of its patented Radi-CAL brake technology began in Formula 1 in 2007 and continues with the new additions to the range. Taking the expertise and



experience from its F1 work, AP Racing has produced 80-plus different Radi-CAL caliper designs to date, as it continues to refine the product.

AP has a very successful motorsport history, beginning with Jim Clark’s famous victory in the Dutch Grand Prix in 1967 – also the first for the Ford Cosworth DFV.

Last year AP Racing celebrated its 750th F1 victory as a supplier of racing clutches and brake components, and by the end of the 2015 season had notched up 765 GP wins.

LANE MOTORSPORT HALL 9 STAND E391

Life in the fast Lane

NEW LIGHTWEIGHT ACCESSORIES TO SUIT SOURIAU 8STA connectors can be found on Lane Motorsport’s stand, made by Weald. These include lightweight metal protective caps, plug and receptacle, Viton gaskets and nut plates.

Designed to withstand shock and vibrations – as well as corrosive fluids and extreme temperatures – all of which are characteristic facets of a race vehicle’s internal architecture – these connections are suitable for a broad variety of applications in the world of motorsport.

Lane Motorsport, a division of FC Lane Electronics Ltd, is a supplier of connectors to world champions in Formula 1, WRC and the WEC.

AUTOSPORT ENGINEERING HALL 9

The scene to be seen

Autosport Engineering is the industry’s two-day trade show, part of *Autosport International*. Running on Thursday, January 14/15, *Autosport Engineering* is a dedicated to specialist suppliers to the motorsport and performance engineering sectors.

Located in Hall 9 at Birmingham’s NEC, the event provides many new business and networking opportunities. Look out also

for the Manufacturing Technology area, the fast-growing section within *Autosport Engineering* dedicated to manufacturers and suppliers of production engineering technology.

This year more than 250 specialist companies will showcase their latest technological solutions and products. *Autosport Engineering* is a must-attend event for all growing motorsport businesses.

Come see us at
Autosport 14-17 January,
Stand 8230, NEC

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Dynamic Engineering

PRODUCT SHOWCASE



VBOX MOTORSPORT

VBOX
MOTORSPORT

Racelogic manufactures the VBOX Motorsport range of GPS and video data loggers, and its latest product is the VBOX Video.

Developed with extensive customer feedback and designed to be used by anyone – without them needing to be a race engineer – the new system uses dual cameras to capture 1080p video at up to 60 frames per second, synchronised with 10Hz GPS data-logging and real-time graphical overlay. The output is stunning.

It also features a battery backup and 10-second video pre-buffer; Bluetooth for remote start/stop logging and connection to the vehicle's CAN Bus; and camera preview over WiFi to Android/iOS devices.

As with all Racelogic's data-loggers, VBOX Video is compatible with Circuit Tools, which allows for really easy analysis of track performance. Available for both PC and Mac, the software has helped many thousands of drivers, at all levels of motorsport, to achieve faster

and more consistent lap times. A significant number of racing instructors around the world use it as an integral part of their coaching.

More information available from vboxmotorsport.co.uk – and you can see the new product and talk to the Racelogic team at *Autosport International* next week on Stand 7535 in Hall 7.

VARIOHM

Variohm EuroSensor has increased the interfacing flexibility of its motorsports-proven Euro-XP non-contacting angle sensor with a new 8mm diameter D-shaft drive option, which is available with a choice of 32 or 38mm PCD mounting. The D-shaft, with its integral magnet, makes for easier installation, particularly for throttle-position sensing, without the need for a separate coupling.

With the optimal magnet-to-sensing-element gap maintained within the assembly, and a choice of mounting diameters, form-fit interchangeability with competitive models is made easy. The coupling-free sensor is also convenient for direct connection on other motorsport position-sensing applications such as steering angle, suspension and gearbox.

The comprehensive 28mm diameter Euro XP family, also available with Form 'U', spring coupling or separate 'Puck+Magnet' versions, features the motorsports industry-preferred 5 VDC ratiometric output and includes a redundant dual-track 360-degree measuring range for safety-critical use. With two factory-programmable angles from 30 to 360

degrees for both measurement range and characteristic curve, the sensor can be configured for a constant voltage output over pre-defined angles, which is very useful for gearbox applications. The position output covers five per cent to 95 per cent of the 5 VDC supply voltage and, being absolute, does not lose position after power loss. The precision of the Euro XP family combines an independent linearity of +/- 0.5 per cent of each signal range with repeatability to better than 0.2 per cent.

The new D-shaft sensor joins the Euro XP family with completely contactless technology and a mechanical bearing-free design with a long-life specification in excess of 50 million movements. The fully encapsulated sensor element ensures complete environmental protection – rated to IP68, in addition to IEC 60068-2-6 protection against shock and vibration – making it a perfect choice for challenging race track conditions. The sensor is moulded in resilient glass-filled PBT plastic with threaded inserts and a reinforced mounting flange with stainless steel kidney washers that add further durability. The

D-shaft material is moulded nylon 66 and the 32 or 38mm PCD mounting for two M4 screws includes slots for radial adjustment. A choice of three cable exit offsets is offered, and electrical connection for the standard model is Raychem 55 cable and DR-25 sleeving at 500mm length.

Variohm manufactures and supplies the motorsports industry with a wide range of sensors and transducers including rotary and linear position sensors in contacting and non-contacting technologies, in a range of mounting styles.

Hall 9, Stand E280



TITAN

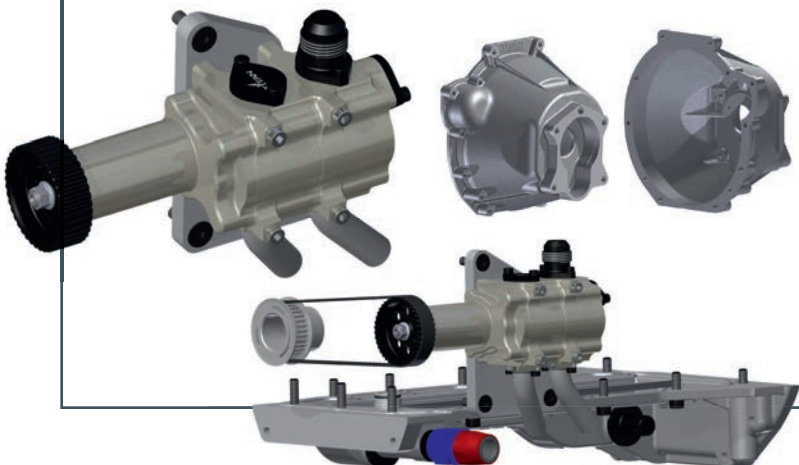


This January Titan will be exhibiting at the *Autosport* International Show at Birmingham's NEC for the 10th consecutive year.

Moving into the main section of the show for the first time, Titan's stand (number 8230) will showcase examples from Titan's latest product range as well as some special projects completed for customers. Central to the display will be Titan's latest range of Ford EcoBoost products, which are being launched at the show. In addition Titan will further display throttle systems, steering racks, limited slip differentials and more.

Titan's increased profile at *Autosport* International seemed fitting given the major changes that have taken place. The company has doubled its design department and moved it into a dedicated facility in Titan's multi-building compound. In addition, major investment has taken place in both new machinery and staff, and a specialist carbon-fibre production facility has also been added.

Visit Titan in Hall 8, Stand 8230 to discover how they can help you meet your engineering challenges, or contact Zoe Timbrell on +44(0) 1480 474 402 or zoe.timbrell@titan.uk.net for further information.



VALETPRO

Non-gloss wraps and paint are an increasingly common sight, both on the road and at race tracks the world over. In the early stages of this trend ValetPRO went back to the drawing board to design and formulate a quick detailer that was effective, fast to use and offered genuine protection without leaving a shiny finish.

Matte Protect was introduced to the market, and soon word spread. So much so that ValetPRO has subsequently been approached by Sports Car Protection to create a Matte Wax for long-term protection. Sports Car Protection is a company that looks after an engineering business that manages around 200 top-level racing cars. These include manufacturer entries for Le Mans, and 20 of these race cars are wrapped in a 'frozen' vinyl.

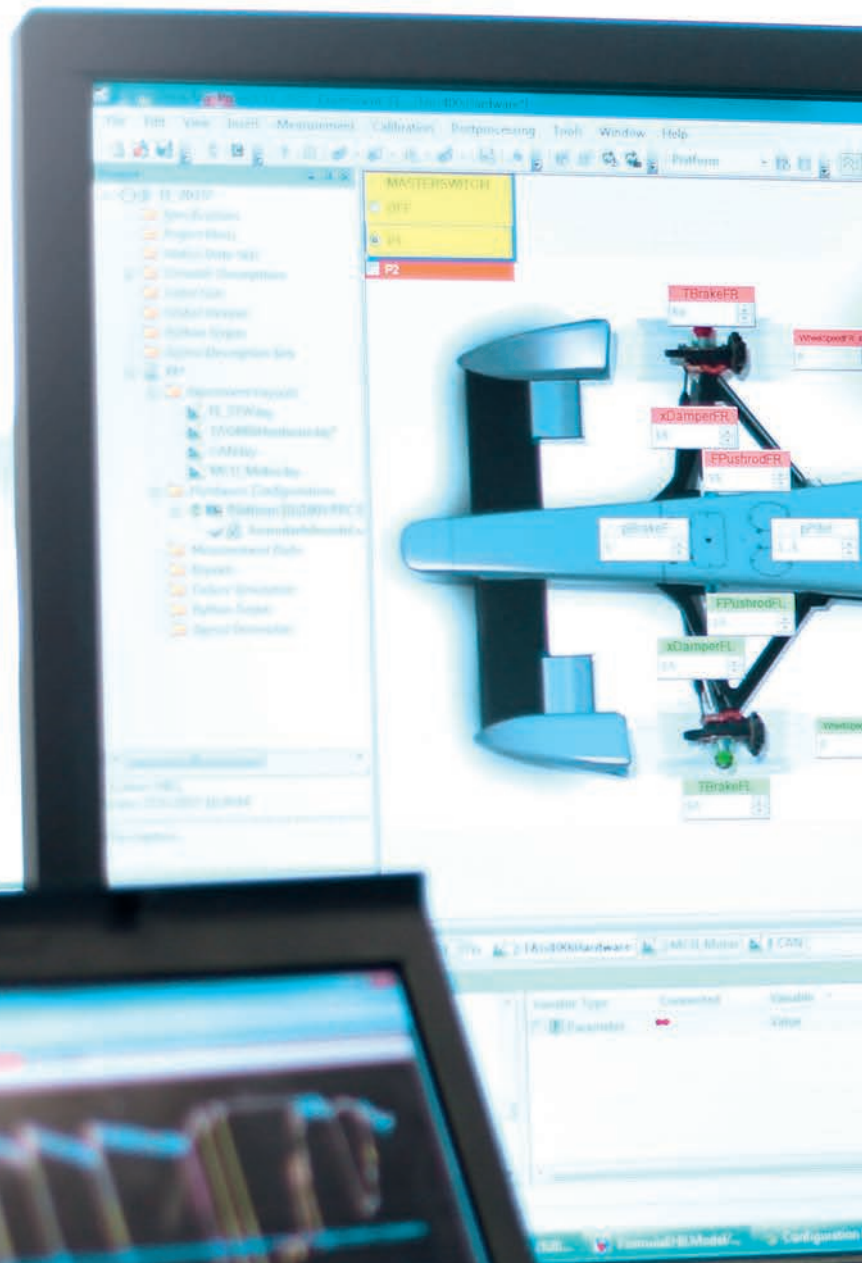
ValetPRO's Matte Protect is now an important part of maintaining these race cars at race circuits worldwide, and employed to keep and return this specialist paint and vinyl finish to 'as-new' condition without a gloss effect.

For more information on the range of Valet PRO products, please visit us in Hall 9, Stand E643.



CUTTING EDGE IN MOTION

German-based Rational Motion is currently plying expertise gleaned from the pinnacle of motor racing but it has big ambitions beyond sport, as Scott Mitchell found out





Motorsport is self-contained in only the rarest of cases. It has always been a hotbed for development throughout its history, from the first organised gasoline-fuelled ‘car’ race in the 19th century to the all-electric Formula E Championship – and each iteration of the internal-combustion engine in between.

Small wonder that the companies servicing the peak of motorsport hone and practise their expertise away from racing as much, if not more, than they do as part of it. Rational Motion is a company that is proud to have its grounding in the sport, but has grown to the point where more than half its time is spent on external projects.

Founder Robert Marusic describes motorsport as “DNA for us”, and that’s thanks to work with high-profile manufacturers and companies at the top of the motorsport tree in hybrid and electric racing. But while its grounding in racing enabled it to develop an electrical-engineering expertise – an invaluable service in motorsport – it has also allowed the company to naturally develop an ever-increasing portfolio that is not limited to one sport.

“It’s speed of development,” Marusic explains. “In the first six months we existed, the reaction from some of our business leads was ‘this isn’t doable in this time’. Its almost as if what we quoted would have resulted in leads walking away from us!”

“Now we approach projects with the speed and focus we had in Formula 1. So the DNA is one of perpetual updates, where nothing is ever finished. It means long days, but that’s motorsport. We never assume that a job is entirely done.”

Like everything in F1, the development tools it requires are expensive technology. Rational Motion has invested in that very ecosystem, buying from the same vendors as it did in F1. While that means it’s operating at almost too high a calibre for some jobs, especially projects outside of racing, it’s not worth investing in lesser technology when its employees are used to working with the best.

Flash as that may sound, investing in the tool chain is about substance, not style. It enables the team to turn jobs around quickly. It oozes confidence and that’s something customers notice in any business.

As F1 has moved into an engine era defined by >>

“We approach projects with the speed and focus we had in Formula 1. So the DNA is one of perpetual updates. We never assume a job is entirely done”

Formula E is a way for RM to demonstrate its prowess



“Rational Motion’s raison d’etre is clear – cutting edge suits us, its moniker reads. It is keen to showcase its electrical engineering expertise. Where better than on a racetrack?”

complex turbocharged hybrids, so electronics development has been pushed to the top of the priority list. One area Rational Motion lends its expertise to, for example, is increasing performance from the main ECU by working on software coding.

In the WEC, it has been a part of simulation work and feasibility studies for manufacturers of electric motors and inverters, to determine performance gains, improve lap times and optimise fuel efficiency. This boils down to helping an LMP1 component manufacturer select which megajoule class to design their systems for. Its electronics development extends to software-code verification and helping optimise work in-house, namely dynos and simulators.

Rational Motion was part of a two-year development programme alongside three major suppliers – gearbox builder Xtrac, electronics specialist Magneti Marelli and brake supplier Brembo – to create a low-cost hybrid system in LMP2, which was eventually culled after rule changes by the FIA.

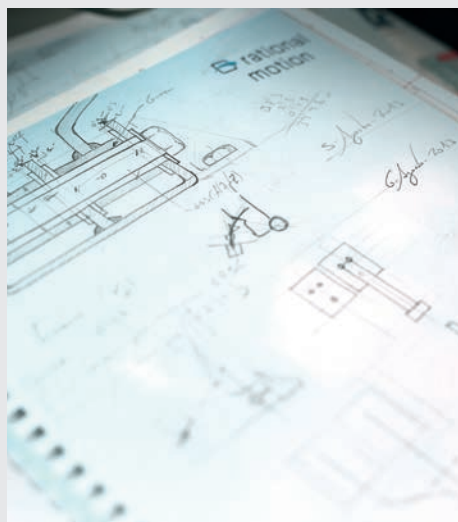
Its raison d’etre is clear – *cutting edge suits us*, its moniker reads. It is keen to showcase its electrical engineering expertise, something it first brought to the world of motorsport as part of the team behind Toyota’s eventually unraced Kinetic Energy Recovery System (KERS), and where better than on the racetrack?

That meant little surprise when it tied up with Formula E team NEXTEV TCR. As one of



On-event support is just part of RM's Formula E remit

Rational Motion is applying its electrical prowess to the real world, not just racing



the few companies drafted in for the championship's second season, Rational Motion is at the heart of Formula E's push to drive electric-vehicle technology and all of the elements that go along with that.

So what does it do?

The forming of a technical partnership with the Shanghai/Houston-based Omnigear company is part of Rational Motion's push for programmes that will expand its primary involvement from rapid prototyping and pre-development to systems validation and production. In terms of Formula E, it means developing motor and inverter technology and the associated controls for NEXTEV TCR.

For the second season of the revolutionary

all-electric championship, the regulations have been opened up. While the base Dallara-built chassis and Williams Advanced Engineering-supplied battery remain, the electric motor, gearbox and inverter have been free for teams to develop their own solutions. Within this, the cooling system and suspension are also down to the teams, though this is not something within Rational Motion's remit – naturally, it is difficult to integrate the output of various technical partners into Chinese electric-vehicle-company NEXTEV's development roadmap for Formula E, since it has a view to becoming an Original Equipment Manufacturer.

Simulator work allowed Rational Motion to guide NEXTEV, which takes over the Team

China Racing squad, on the number of gears there should be on the NEXTEV TCR001. It used track data from season one to create overlays from Piquet's Spark SRT_01E and recreate a car that would not have to shift. Thus a single-gear system was chosen to complement the twin-motor set-up.

The company's record in motorsport meant its next responsibility was to help specify the right suppliers for the team. "I will be the conduit," says Marusic, "and we specify the right component for the application. Then if the product doesn't exist, we have the option of telling them who to have engineer it. Simulation, specification and customisation."

This is a more engaging, more active >>>



ELECTRIC NORDSCHLEIFE

What's the fastest electric lap of the legendary Nordschleife? When you consider that high-performance vehicles are regularly going below seven minutes per lap, the perception that electric vehicles are slower might lead you to consider an underwhelming answer. If you did, you'd be wrong.

Toyota Motorsport GmbH's Radical SR8-based EV P002 completed a 7m22.329s lap in October 2012. The 350kW (469bhp) machine's effort stands as the fastest lap for an electric vehicle around the Green Hell, and one of the Japanese marque's key partners was Rational Motion.

The German company was a known partner and built the 'version-zero' car under the supervision of Toyota at its Cologne base. The result was a 350kW twin-motored machine with all the bells and whistles, including torque vectoring (the process of each motor directly powering its own wheel and not going through a differential). Then when Toyota upped its investment, Rational Motion was placed in charge of the integration of the powertrain as things were ramped up.

In addition to the blistering Nordschleife lap, a time done with the driver avoiding hitting the kerbs too hard and arguably being quite conservative, the car was taken to the Pikes Peak Hill Climb to compete in 2012. This was entered under the name of Toyota Motorsport but with Rational Motion contributing significantly to race strategy and engineering. The car won the EV class. In 2013, with an upgraded powertrain, its effort on the famed event was hampered by rain on the final third of the run, limiting it to fourth.

But, crucially, the purpose of the project was fulfilled. Think EVs lack performance? Think again. Much like in Formula E, it's a process Rational Motion was at the heart of.



Rational Motion invests a lot of time in simulation

approach than mere guidance. After all, Rational Motion is not only offering electrical advice, it is able to apply motorsport expertise to relevant scenarios. Next up is packaging and integrating the systems into the car, with 3D CAD work to package items, and providing the manufacturing drawings.

Then it starts to get more specialist – the electrics. The company's experience means its technicians know how to read circuit diagrams and how to wire everything that communicates to the motor, inverter and auxiliary battery. When a team becomes a manufacturer and decides to throw out the Hewland gearbox package, that job is exactly what it needs to do. So Rational Motion designed its own harnesses.

With 28kWh of energy available and a peak power output of 200kW for qualifying and 170kW for the race, plus the bespoke components of the powertrain, it's an incredibly complex unit. Getting all that to talk to, let alone understand, each other is a big task.

"The biggest responsibility is powertrain controls," Marusic affirms. "In becoming a constructor you can decide to run with the spec McLaren ECU hardware and software or build your own code. The customer felt it would be better to use a small layer of the McLaren software and then we write a custom code.

"We've made sure the software talks to all of the different technologies. That meant we had to make a new interface with the Williams battery, create new control strategies and write the code, fill that ECU with code..."

Such an undertaking was the beating of a Formula E rival in pre-season, as software issues caused Andretti Autosport to revert to the season-one car for the 2015-16 campaign. No such dramas for NEXTEV TCR. But that's largely down to the amount of testing it had – and not just on track.

It's called regression testing, with Rational Motion set on trying to test it as much as it can, not just provide something half-baked.

"After you've done all of that designing you have to validate it," explains Marusic. "We do this by simulating thousands of different drive-cycle scenarios, from repeating single laps of previous races, to replaying over and over complete race events in order to try and prompt

defects. We don't have an FE car at our Cologne base so we virtualise it. That's what we do for all our software and controls."

The final part of Rational Motion's contribution to the Formula E team is applying its expertise trackside. It supplies two performance engineers to work under the race engineers, with Benoit Vareille working with Nelson Piquet and Carlos Eslava Urbina with Oliver Turvey. Michael Koch is the team's high-voltage technician and car electrician. The company's tireless quest to improve resulted in a major software update that made the NEXTEV package significantly more competitive in the third Formula E round in Punta del Este than it had been in the opening two races.

Formula E was a natural step in a quest to find new and relevant solutions for road-car technologies. But it's not the be-all and end-all. Motorsport is a channel through which Rational Motion can exemplify its expertise, develop new skills and hone existing ones.

After all, the world is changing rapidly. From an automotive perspective, the ongoing electrification of vehicles is likely to induce more change over the next five years than the industry has seen in 30. This world is becoming ever more carbon-conscious and driving down emissions is key, which is why more urban areas are looking at cleaner technologies for cars, vans, buses, trucks – anything that runs on a public road. Energy storage and increased efficiency are just two examples of how real-world change can be instigated by the sort of technologies Rational Motion as a company has long invested time and

"It is unusual for a company of Rational Motion's size to be targeting so many areas. The aim is to be an OEM supplier and distributor"



Software upgrades have led in-season improvement

effort in understanding and improving.

Generally speaking those “on-highway” changes are obvious, because they are things we can see happening already as more and more car manufacturers, for example, embrace electric vehicles. A forward-looking company does not react to the problems of a world in need of cleaner tech – it searches for potential solutions. This is what Rational Motion is doing.

At present the company is heavily involved in the pre-development stage of various projects, and that means having a big impact on speeding up the stages between samples being produced and the finished product being validated and calibrated in the field.

It has helped build its initial relationships by

offering what Marusic calls a “fire-brigade” service. That means Rational Motion has come in to lend assistance on projects it wasn’t originally a partner in. “You take on jobs where you haven’t had a point landing but you start building your reputation,” he explains.

The aim for the company is to go beyond consultation and become an OEM supplier and distributor, to have products to sell in the future.

This, almost, is what the Formula E partnership with Omnigear is achieving. It isn’t quite product manufacturing in the sense that there is product to buy on the shelves, but it’s a lot closer to the company’s ultimate goal than previous projects.

“We’re partners with a couple of tier-one

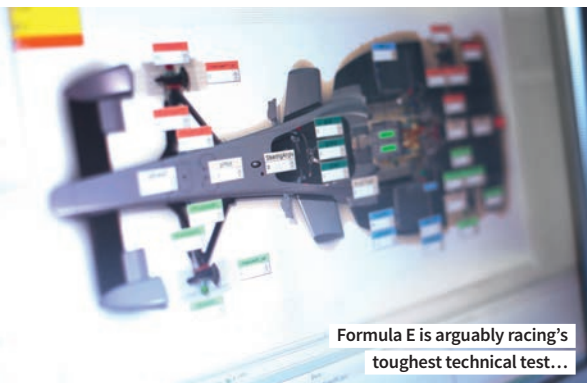
suppliers from the automotive sector, and they love us as far as firefighting is concerned, but we want to work out what we can do long term for them,” points out Marusic.

“The whole thing about product design means we have to address a part of a job that they’ll scrutinise and validate. Customers do that at the moment, and that’s validation. It’s relatively easy to build a powertrain system or control, and 90 per cent of customers then say the development is done – ‘OK, we’ll take it from here.’”

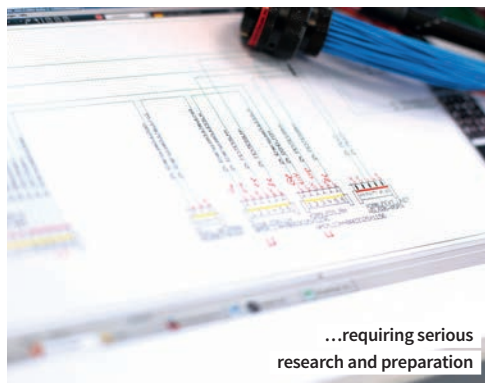
Naturally there’s a risk with just being interpreted as firefighters, but that’s why Rational Motion, still a young company, has grown from a racing entity into one that has a healthy mix of projects – and why it still wants to grow.

Generally, the move to clean-technology solutions has been slow. It’s an area that needs a company to be proactive. So while it is unusual for one of Rational Motion’s size to be targeting so many areas, pushing this area is actually a natural reflection of its founding philosophies and the continued development it is targeting. It does not want to be on the back foot, so it has eyes on the future.

Formula E is a great platform to showcase real-world relevance, but is only a microcosm. That’s why diversifying its portfolio is so important to what Rational Motion does. And that’s why cutting edge suits it. ❧



Formula E is arguably racing’s toughest technical test...



...requiring serious research and preparation



TAKING THE BEST SHOT

Invisible processes that have become standard procedure can make a difference. Both component life and performance are ripe for improvement, writes Seb Scott

It's true that race-winning cars do not necessarily have the most aesthetically pleasing liveries, but they still command attention in design and preparation. Yet much bigger attention is paid to surfaces on components that you often don't – or even can't – see. They undergo a process called shot peening, a very specific action that can legitimately be described as an art form.

Sandwell UK specialises in surface engineering, most notably shot peening, and the company prides itself on its in-depth knowledge and wealth of experience in the applications in that area.

Shot peening presents tremendous value for money, since it can more than double the life of a part without sacrificing performance – and in some cases actually increase it. Performance is the ultimate arbiter of success in motorsport, and weight loss is by far the most cost-effective way to improve vehicle performance. Simply put, a manufacturer can use less material on a part that is shot peened and still yield a longer lifespan than a heavier, unpeened equivalent.

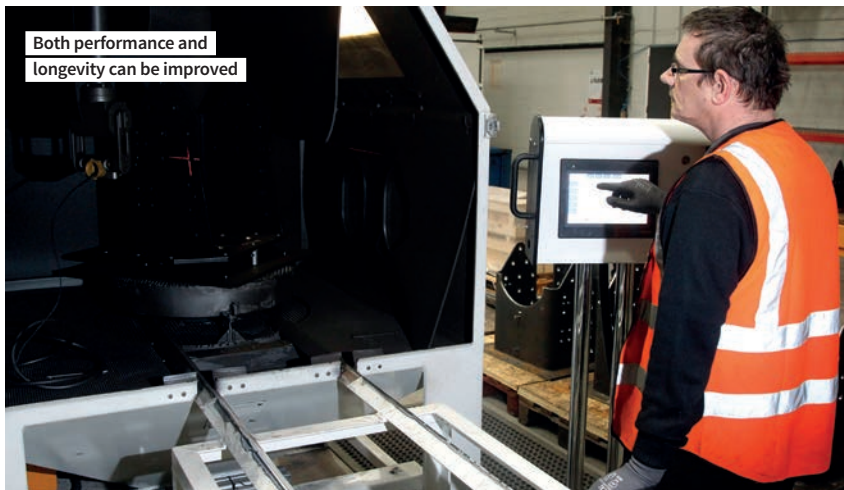
In 1997 Colin McGrory (technical director) and Liz Slater (managing director) came together to create Sandwell UK. That two-person operation

has since gone from strength to strength. Sandwell started out as a part-time project, in which McGrory was able to put his expertise in metallurgy to the test during evenings and weekends outside his Formula 1 work. The company has been transformed since then and Sandwell now boasts a team of 20 people, in-house machines for small parts to large five-metre pieces, with its own premises and strong working relationships with F1, World Rally, World Superbike and many more national and international championship racing teams.

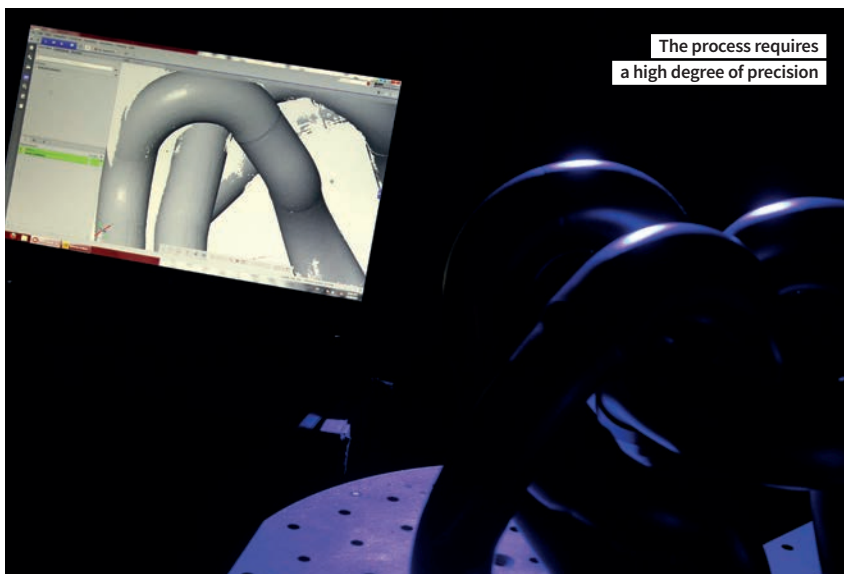
“Shot peening presents tremendous value for money. It can more than double the life of a part without sacrificing performance – in some cases it can increase it”

Shot peening is Sandwell's speciality, and a process McGrory is most passionate about and experienced in. The basic principle and process is fairly simple, yet incredibly difficult to master. The fundamentals of cold-working metals has existed for centuries – working the surface of a metal or composite part to alter its mechanical properties, with the main aim of producing a compressive residual stress layer that is essential to increasing a component's lifespan. Shot peening involves impacting the surface of a part with round spherical media (made of metal, ceramic or glass) with a magnitude that can create plastic deformation.

Sandwell is an industry-leading master in its precise understanding and knowledge of shot peening. The difficulty lies in the fact that each surface Sandwell works on is different from the next, requiring a fine-tuned approach to seeking the 'sweet spot' of a material; this is integral to the benefits of shot peening. The sweet spot is so precise that it requires a microscopic level of precision. If a surface is overpeened by mere microns then more damage will have been done than any good, rendering a component useless. If underpeened, the surface



Both performance and longevity can be improved



The process requires a high degree of precision

would be visibly different yet there would be little or no benefit.

The company's expertise is so extensive that Sandwell has built its own machines in conjunction with developing its own software. Not content with custom builds for its machines, Sandwell has been developing robotics using its own processes since 2012. These applications are part of a drive to be at the forefront of available technology while improving the services offered, through efficiency and eliminating human error.

Shot peening is at the core of Sandwell, yet it is not the only service offered by the Towcester-based firm. McGrory has great enthusiasm for superfinishing, a refined polishing process to enhance component performance, reducing friction and therefore rolling resistance. When certain parts are superfinished, less energy is wasted from a mechanical perspective and components are under less loading. It is essential for gears and bearings that would potentially lose

more energy owing to friction should their finish be sub-standard.

Sandwell has been able to branch out into industries including oil and gas, aerospace, defence and medicine. Working with multiple industries has provided Sandwell with an unparalleled amount of knowledge, helping the team become accustomed to thinking outside the box. Methods used to optimise a suspension bracket, for instance, could be transferred to prolong the life of prosthetic joints.

What makes Sandwell set such a high standard is also what makes it unique. When presented with a problem or project, it approaches every opportunity with an open mind. Making no two things the same means every square micrometre is thought out with the same care and precision as the last. Pulling together a knowledge base from multiple industries, and drawing from experience of working with parts used at the highest heights, the fastest of speeds and the deepest depths, results in a tailored service like no other. ❄



F1 knowhow feeds in to Sandwell's methods

A PASSION FOR PEENING

COLIN McGRORY IS THE TECHNICAL DIRECTOR OF Sandwell UK, a metallurgical engineer with a wealth of experience in Formula 1, and both civil and military aircraft. While working for Arrows International Grand Prix in 1983, McGrory introduced shot peening to the team.

Demonstrating the benefits of the process on gearbox efficiency, he went on to spread the mantra through other leading teams.

After Arrows, McGrory worked at Leyton House before joining Stewart Grand Prix, which became Jaguar Racing, as engineering manager until the end of 2002. Colin is part of the SAE Standards committee, which is focused on the development of shot peening and surface enhancement standards, working with industry heavyweights Lockheed, Boeing and General Electric. His passion is all things shot peening, enabling him to dedicate a lot of time to research and visiting conferences, stimulating his desire to develop shot-peening technology and its applications.



Colin McGrory: peen there, done that

SENSORS WORKING OVERTIME

Seven billion points of data. This is F1 team Mercedes' estimate for the amount of information it collects during a race weekend from its cars. By Matt Youson

Sensor technology and, just as significantly, handling, processing and presenting the data it produces, has become a new front in Formula 1's technology war. Since rudimentary telemetry first entered the sport in the 1980s, it's been an increasingly valuable tool.

With the advent of a testing ban and the associated increase in practice workloads and decrease in driver familiarity, engineers need to understand what the car is saying – perhaps more so than parsing the comments of a driver. Seven billion points sounds like a wealth of data, but the reality is that engineers, and behind them analysts and designers, would like a lot more.

Despite the adoption of a standard ECU in F1 and the looming standardisation of telemetry, this is still a technology arena ripe for innovation.

Mercedes' technical partnership with US semiconductor manufacturer Qualcomm is a good example of the push for better, more timely, data. In what both parties describe as the first of many areas of collaboration, the W06 uses a wireless protocol to send data to the garage as the car enters the pitlane. Separate from the primary telemetry system, it transmits a video feed from infrared sensors mounted on the chassis and front wing, used to record surface temperatures of all four tyres. The wireless system replaces one in which the data was held on board in a discrete storage unit,

“We download this data as soon as the car appears at the pit entry, adding it to our servers before it's wheeled back into the garage”
Paddy Lowe

to be downloaded via an umbilical when the car returned to its stall in the garage.

Paddy Lowe, Mercedes' executive director, technical, started his F1 career in the late '80s as joint head of Williams' electronics department. He's recognised as one of the founding fathers in the field of F1 data communications and programming language, and talks enthusiastically about his current team's latest incremental gain.

“The infrared sensors aren't wired through our normal telemetry, which is used to manage the gearbox and the power unit and so on,” says Lowe. “That system is already saturated. These cameras are producing a huge quantity of bulk data that previously we had to download via a wired method in the garage.

“It limits the turnaround of the car. You have to wait to download the data before you can send it out again. This way, we're able to download this data as soon as the car appears at the pit entry. We're already adding it to our servers before the car is wheeled back into the garage. It's allowing us to work with the data run to run, rather than the slow process we've had in the past.”

Nico Rosberg adds an example of how the system works in practice: “High-speed wireless automatic transfer of data has had an immediate impact on our performance. Consider Q3: we do two runs. At some circuits I've just enough time to get pulled into the garage, topped up with fuel and out I go again. Perhaps I'm not in the garage for more than a minute. By the time my car is connected with a cable, I have to go again. The infrared data from my first run is pretty much useless. Data that arrives before I get into the garage, on the other hand, helps massively. It can have an influence – maybe I have tyre pressures adjusted, or drive the out-lap differently. It might be the difference between pole and P2.”

The Mercedes system uses Qualcomm Snapdragon 805 processors and the 802.11ac wireless networking standard on the 5GHz band. Multiple access points (one in the pitlane, one in the garage) improve the speed and connectivity of data transfer. The standard WLAN implementation runs in between 200 and



Sensor pods negate need
to plug into an umbilical



600Mbit/s, though Qualcomm says its 802.11ac architecture is significantly faster and more efficient. It also states that in the future it hopes to migrate the system to the imminent 802.11ad standard in the 60GHz spectrum, to further increase the speed of the data transfer.

The advantages for Mercedes are fairly obvious but, marketing aside (and Qualcomm's logos are fairly discreet) what's in the technical partnership for the chip manufacturer? Qualcomm president Derek Aberle claims it's all about the advantages of accelerated development.

"The interesting thing for Qualcomm is that we drive innovation as quickly as possible and often when we work with a partner they're slower than we are. One of the things that's been both gratifying but also pushed us is that Mercedes is probably moving more quickly than we are. The demands to stay ahead of the competition drives innovation at a pace that's even quicker than the cell-phone industry – which in the mainstream is probably the fastest in the world."

Using 802.11ac isn't particularly groundbreaking – it's a wi-fi standard in common use – but a harsh environment in which pressure exists to use it more efficiently and make data transfers seamless is a good catalyst for expedited development. And, given Qualcomm is



Merc tech kingpin Lowe
is an F1 data pioneer

very active in various automotive projects aimed at developing the connected car, it is also a very useful mobile laboratory.

"Through this project, we've learned new ways to use wi-fi in the automotive environment," says Aberle. "Innovation in motorsport often drives advancements in the consumer auto industry, and we believe this technology has the potential to shape developments in DSRC [dedicated short-range communications], vehicle-to-vehicle and vehicle-to-infrastructure communications. These technologies will lead to increased driver safety and provide important data pertaining to the vehicle's journey." ❦

**BASE PERFORMANCE SIMULATORS
HALL 8 STAND 8201**

VIRTUAL REALITY

The trickle-down of technology is a common enough trend in all facets of motorsport. Nowhere is it more apparent than in the darkened interior of the driver simulator, writes Matt Youson

Once a vastly expensive tool for the elite, simulator time has become commonplace for drivers in all categories. It is now viewed as a necessary component of preparation for the real thing.

But simulators require a huge investment in infrastructure, hence the burgeoning popularity of renting time in a commercially available facility. Base Performance, located in Banbury, Oxfordshire, is one of the more prolific. With both a GT and single-seater simulator, the company taps into a growth market for virtual seat time.

"We have 157 circuits and 100-plus cars in the simulator and we probably have 500-plus different customers coming through the doors every year," says business manager Ella Barrington. "Some visit once a year, others we'll see every other week for the whole season. We have everyone from kids out of karting to GP2, WEC and Formula E drivers."

There is a twin standard in that Base Performance pitches its offering as a professional

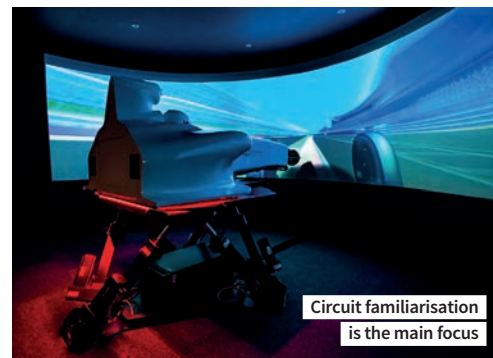


Individual sessions last two to three hours

service, but is equally well-disposed to the corporate session, frequently organised by race teams wanting to give sponsors some added value. At the high end of the market the simulator is a rented tool, but lower down the experience scale the company is happy to provide instruction from on-staff professional drivers or race/performance engineers.

Unlike the in-house driver-in-the-loop simulators of Formula 1 and WEC teams, Base Performance primarily concentrates on circuit familiarisation, offering drivers a better chance to hit the ground running when they arrive at the real racetrack. While it's commonplace to see a driver in an in-house sim sitting idly for half the day while engineers tweak set-up, the emphasis in the commercial operation is getting down as many laps as possible.

"As it's mostly about extending seat time, and because our clients are either guys paying for themselves or teams working to a tight budget, they like to do as much driving and as little talking as they can," says Barrington. "A typical session will run to two or three



Circuit familiarisation is the main focus

hours or, if it's a team, maybe four to six, possibly with two or three drivers rotating and downtime kept to a minimum."

Despite its growing ubiquity, there's still a perception of the simulator as a tool beloved of the Xbox generation, but Barrington insists the appeal has grown far beyond that.

"There was a perception, even a few years ago, that it was for kids who liked PlayStations and were on their way to F1, but our oldest customer is well into his eighties and competes in historic racing. If anything it's more relevant for that type of series, because track time really is at a premium, both in terms of the limited spare parts but also the paucity of test days available at, for example, Goodwood or Monaco.

"Our experience is that a few brave ones come and give it a go first, and when that translates into success on track they come back with their colleagues and all of a sudden the perception changes. It's definitely not just for kids. It's for anybody that needs extra track time – which is pretty much everybody." ❄



Base can simulate over 100 cars

"As it's mostly about extending seat time, and they're on a budget, they like to do as much driving and as little talking as they can"

PRODUCT SHOWCASE

SPA DESIGN

SPA Design is proud to announce that it has passed the new FIA Standard for Fire Suppression 8865 - 2015 for the World Rally Championship

The FIA has homologated SPA Design's new fire-suppression system with APS technology. The SPA systems are now available for teams to run trials in preparation for the 2016 World Rally Championship. The SPA fire-suppression system uses new APS technology that features a unique single auto-flow nozzle that allows for optimum spray coverage. This means that only one nozzle

is required in each area – one for the engine and one for the cockpit.

SPA systems are designed to cope with the punishment meted out by rally cars racing at the limit, and have undergone an extensive testing, development and validation programme in order to fully comply with the new stringent FIA regulations. These state that the system is deployed in both the engine bay and the cockpit, which means that teams will use two bottles.

Hall 9, Stand E241



NATIONAL MOTORSPORT ACADEMY

The National Motorsport Academy, in partnership with Staffordshire University, is proud to launch the world's first motorsport engineering degrees – online. The NMA Foundation Degree FdSc and BSc (Hons) in Motorsport Engineering will help you enter or advance your career in the exciting world of motorsport.

FLEXIBLE: Unlike other universities, there are no term times or semesters. Simply choose your own start date and work at your own pace.

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COLLEGE LEAVERS: Earn while you learn, study from home and gain practical motorsport experience.

At the end of your degree you will be a qualified motorsport engineer with all the necessary skills for any motorsport team or performance manufacturer. Motorsport engineers are highly sought after by engineering employers.



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WALERO

Walero is excited to announce that it will be attending Autosport International in 2016. It will be joined by a host of familiar faces in race and rally driving who will be chatting about their

journey behind the wheel.

You'll be able find Walero in the Fitness and Preparation Area on stand number 7162. More details about the talk schedule will be

announced ahead of the show on it Facebook and Twitter pages.

Hall 7, Stand 7162



CLEANING UP

Can bespoke car-care technology advance motorsports programmes and yield a competitive advantage on the racetrack? One British manufacturer is very keen to hear your thoughts, explains Ross Ringham

When it comes to motorsport technology, success seldom results from employing “off the shelf” products. To gain and maintain a competitive edge, even the tiniest components are obsessively analysed, redesigned and improved. That’s true of what lies under the skin of racing machines and exotic supercars – but what about the products that protect those skins? Is bespoke car care the last unexplained technology frontier of motorsport?

Protecting sponsor visibility

Sponsors are the lifeblood of most racing teams; keeping their logos bright and vibrant on the racing cars is vital. “Selecting cleaning products that won’t discolour decals or paint, that will help the logos stand out even in the rain, and that will help the surface resist clinging rubber and other materials, will ensure that sponsors get the most value for their money,” says Greg Spink, director at ValetPRO, a British manufacturer of car-care technologies designed for professional use. “When all that is required to achieve this is a careful selection and application of cleaning products, this must surely be a solution worth exploring.”

Protecting the base material

“Strong formulations may introduce corrosion, decay or discolouration to materials such as aluminium, magnesium and the plastic decals used for sponsor branding,” Spink adds. “They can turn Perspex opaque and attack base metals when degreasing engines. On painted carbonfibre, concentrated solutions may react with the resins, lifting the colour away and leaving a white powder residue. Solvents used

in waxes may also dry out the gel coats typically applied to bare carbonfibre, making the surface prone to chipping.

“Replacing damaged carbon is hugely expensive. ValetPRO’s pH neutral cleaning products will extend the life of carbon products when compared with more aggressive cleaners, and our waxes have low-VOC [volatile organic compounds] solvents and are much kinder to gel coat surfaces.”

Alkaline-based products are usually used for cleaners; solvents tend to be used for finishing products, such as waxes, wheel sealants and other dressings. Solvent can also be employed to remove tar and glue from painted surfaces.

“Professional car-cleaning products commonly use formulations based on alkaline or solvents – both must be used with care to avoid damaging the base materials,” says Spink.

Selecting the right formula for the job, and using products with care, are important ways of prolonging the life of a surface. The time the products are in contact with the surface can also be a key factor.

“A good cleaning regime will help keep expensive parts working as intended for longer,” Spink explains. “That’s why we focus on pH-neutral formulations at ValetPRO, which offer a much wider time window to work within. ValetPRO’s Dragon’s Breath is a great example. A pH-neutral wheel cleaner which targets the iron particles, removing brake dust safely.”

Manipulating the chemical level

“Cleaning products can alter surface tension,” Spink continues. “For example, you can create formulations that will cause water to either bead or sheet on contact with a surface. Applying these different products to different parts of a car could alter how the car performs in rain or spray, or even in the different atmospheric conditions experienced by series that travel around the world.”

The chemicals applied to car surfaces can also affect how easily foreign matter, such as rubber debris from tyres or bugs, stick. “Any material sticking to an aerodynamic surface will have an effect on its performance, however small,” says Spink. “Keeping these surfaces as close to their designed profile as possible is in the best interests of the driver, which is why it makes sense to apply a protective coat that will help repel matter while the car is on track.”



“Matter that would otherwise stick to the paintwork, such as tar and rubber deposits or bug splats, simply wash off with the wax”
Greg Spink



A shiny surface will enhance the sleek lines of any car



Polishing a car no longer requires elbow grease. It's now a full-on science

Prototyping protection

As with other areas of automotive technology, achieving optimum performance in car care requires continuous innovation and a willingness to step outside convention. Spink and his team aren't afraid to take on new challenges.

"We were approached recently to design a wax suitable for matt vinyl wraps," he recounts. "The end client is an engineering business that looks after some 200 top-level racing cars, including manufacturer entries for Le Mans. The matt wraps being used for some cars can't be machine polished and conventional waxes aren't suitable, as they're simply too glossy."

While a wax often produces a deep shine in paintwork, that isn't necessarily the product's primary aim. "Waxing a vehicle creates an invisible sacrificial layer; foreign matter that would otherwise stick to the paintwork, such as tar and rubber deposits or bug splats, are trapped in this layer and simply wash off rather than eating into the paintwork," Spink explains. "The challenge here was to create a wax with these characteristics but without the glossiness."

In most waxes, the ingredient used to enhance gloss is silicone – but it's also the ingredient used to help pliability, making it difficult to simply exclude from the product. Spink explains: "Without silicone, the wax becomes difficult to apply and buff off; in my view, professional car-care products need to be as easy to use as possible, to maximise performance while minimising the amount of time required."

The solution was to find a replacement for silicone. It was a time-consuming process, but the result has been better than he had hoped for. "We've found an ingredient that actually works far better as a lubricant than silicone," he says. "The ingredient is also a by-product of industrial processes, so we're recycling a waste product. The formulation is currently being trialled and we'll make it available shortly." ✂

● Spink's team is keen to open a discussion centred on how their technologies might be better engineered for motorsport needs. ValetPRO will be exhibiting at Autosport International in the Engineering hall, Stand E643 trade days only: join the conversation.

THE UNIVERSITY OF BOLTON/CAPE HALL 7 STAND 7120

FROM CAMPUS TO RACETRACK

It's not often you associate students with getting their hands dirty, but that's just what happens if you want a career in motorsport engineering, writes Aaron Rook

It's no secret that securing a job in the motorsport industry is hard, particularly in the engineering sector. Of course, a relevant degree will help anyone on their path to a full-time role in a racing team – but if all you plan to do with it is frame it, hang it up on the wall and hope for the job offers to come in, you had better think again.

That's where the University of Bolton steps in with the Centre for Advanced Performance Engineering (CAPE). As well as offering honours degrees in Motorsport Technology (BSc) and Automotive Performance Engineering (BEng), Bolton can boast to be the only university in the UK to have a fully functioning race team based on campus, in the form of RLR Motorsport.

During *Autosport's* visit to the CAPE it was easy to be blown away by what the centre had on offer to its students. There are two fully operational workshops complete with an array of beautiful machinery ranging from an LMP2 racer to a Shadow Formula 1 car.

The CAPE also has facilities that are advanced enough for aspiring Adrian Neweys to learn their craft upon. There's a scanner worth £80,000 that is used to measure tolerances, a CNC machine for 3D manufacturing, a scaled-down wind-tunnel and, of course, a rolling road.

With such high-tech, hands-on courses it's easy to imagine that students would be enrolling in their hundreds, but that's not the case yet. Director of Advanced Engineering Dr Rory Perrett says that the centre, although in its infant years, is building a reputation, and numbers are growing. "Last year's final year was the first final year we've had," says Dr Perrett. "But numbers are growing. As a new university it's all about just getting people to know you exist."

"Certain universities have reputations for doing certain things. So if you were to talk about motorsport, people would say Cranfield and Oxford Brookes, and automotive is Warwick, so it's about breaking those cliches, building a reputation and getting the message out."

The students at the CAPE are getting a lot out of it. In particular three second-year students: Tom Pickering, Joel Knox and Dan Broadbent. They all come from very different backgrounds with different qualifications, but are bound together by what they have learned at the CAPE



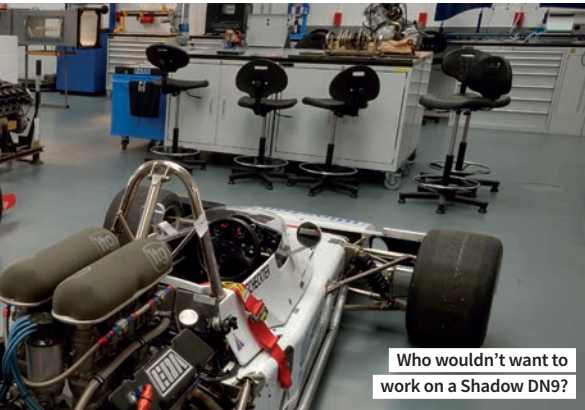
and their passion for motorsport. Pickering has three A-levels in maths, accountancy and sport. Knox has a BTEC in Motorsport Engineering, while Broadbent was a mechanic and wanted to work in motorsport, something the University of Bolton has given him every chance to do.

"I was a mechanic for about 17 years, and trying to get into university at my age [36] is hard," says Broadbent. "But this university takes such a diverse range of students. That's how I managed to get in."



Knox was attracted by the fact that RLR Motorsport is on site. "There's a race team physically based here," he says, "so you can go out to the track with people who know what they're doing. And you can shadow them, get to see what they're doing, and take it on board."

Pickering was impressed by the wide range of cars the university has on offer, in comparison with others. "There's a real diversity," he says. "In the other workshop you've got LMP2 cars, we've got GT cars, and we've got the rally car in there."



Who wouldn't want to work on a Shadow DN9?

“There’s a race team physically based here, so you can go out to the track and shadow them, get to see what they’re doing, and take it on board”



University of Bolton will be at the NEC again



There was success for RLR Motorsport in ELMS



Practical work is a principal focus



Bolton students get hands-on experience



Bolton team ran Reid's Toyota at Goodwood

It's not just one type, so the diversity is great because you can see how different things work.”

In their short time at the University of Bolton the trio has already been on an incredible journey. Pickering and Broadbent played a vital part in RLR's ELMS LMP3 win at Imola in May, before all three of them found themselves having champagne in Lord March's house after helping Anthony Reid tackle the Goodwood hillclimb in a NASCAR Toyota Camry. They are living the dream – and they haven't even graduated yet.

“We actually work as a team outside the university as well,” says Broadbent. “We did the VW Fun Cup this year and the hillclimb at Goodwood with Anthony Reid in the NASCAR, where we were invited to Lord March's house. We've also worked with Noble and Chevron as well. We're getting noticed and motorsport is all about contacts.”

“We're also in talks with Richard Petty to run the NASCAR at Goodwood again this year,” adds Pickering. “Hopefully we'll be working on the Fun Cup again as well and possibly British GT, with Beechdean Aston Martin.”

Of course the main purpose of a university is to educate and prepare its students for life outside the classroom.

“Our aim is to not have to apply for a job at the end of the course – we want someone to come to us,” says Broadbent. Pickering shares his sentiment, adding: “Hopefully by the time we have finished this course we can walk into a job.”

One man who works tirelessly to try to ensure students can walk out of the CAPE with a job is Russell Howard, the Managing Director of RaceStaff.com. He believes that while a degree from a university may be impressive, it doesn't stand out to potential employers. What does stand out is desire and hands-on experience. Experience that you can only get at the CAPE.

“Employers are looking for qualifications, but they're also looking for passion,” says Howard. “It's an intense industry. It is long hours, it's every weekend and you have strict deadlines. A lot of employers will say to me, ‘We need someone with passion,’ because some people come in and think they're going to work nine-to-five. They don't last five minutes.”

Dr Perrett talks about building a reputation and breaking cliches, and if this trio of students is anything to go by then the CAPE is going to accomplish both, very quickly. The facilities, the personnel and the drive are there for the CAPE to help achieve brilliant things and help make students' dreams of working in motorsport come true.

Anyone who has even the slightest hope, or has thought of working in the motorsport industry, should take a look at what the University of Bolton has to offer. Because if you have the application and the passion needed to work the often-crippling hours racing teams have to put in, then the CAPE will give you the tools to carve a career for yourself. ❄

PERFORMANCE FRICTION UK HALL 9 STAND E662

ENCOURAGING TALENT

The death of Performance Friction Brakes Corporation founder Don Burgoon has not halted his quest to nurture young engineers, writes Steve Slater

The late founder of Performance Friction Brakes Corporation, Donald L Burgoon, is set to leave a legacy to future American race engineers with the creation of a scholarship scheme to support entrants in the Formula SAE series.

Burgoon, who died aged 60 in a car accident in Italy last September, was well known in paddocks around the globe. The esteem in which he and his company are held is already clear from the pledges of support to the scholarship scheme from across the motorsport world. Several thousand dollars have already been committed to the goal of \$100,000.

A former FF2000 racer, Burgoon was the personification of his product philosophy of 'No compromises'. In 1986 he and Mary Ann, his wife of 31 years, moved from Canton, Ohio, settling in Gastonia, North Carolina. Their new home was just across the State Line, barely 12 miles from the Performance Friction Brakes HQ and factory, sited in Clover, South Carolina, the heart of NASCAR and short-oval racing country.

Together Don and Mary Ann built PFC into a dynamic force in the US motorsport industry, while Don's vision and dedication to innovating new technologies was a passion. PFC remains a family affair – his daughter Nina has assumed day-to-day responsibilities as company president and Mary Ann continues to serve



Burgoon was dynamic force in racing industry

“The respect for Burgoon is clear from the pledges of support for the scholarship”

on the board of directors as chairman.

Burgoon had a competitive spirit from the outset. At high school and college he was a successful wrestler, winning an invitation to the national Olympic trials. In addition to his passion for motorsport, Donald was an avid cyclist and loved to ski. He especially enjoyed rolling his sleeves up and getting his hands

dirty – not too difficult in the world of carbon brake production and fitment!

The 2015 racing season highlighted the diversity of PFC's racing products. The success started in January when the Ganassi Racing Target/Ford EcoBoost Prototype of Kyle Larson, Jamie McMurray, Tony Kanaan, and Scott Dixon took victory in the Rolex 24 at Daytona. PFC was also selected as the official brake supplier for the Indy Lights Series and, more recently, PFC brakes have contributed to wins in Dirt Oval and NASCAR Late Model stock car events.

The Formula SAE series, originally the brainchild of University of Texas professor Ron Matthews, has grown since 1981 to be not just a US national competition, but an international series. Today FSAE and Formula Student teams can be found working to design, build and race their cars within challenging regulations in the USA and in Europe, the United Arab Emirates, Japan, Singapore and China.

It is hoped the Donald L Burgoon Formula SAE Scholarship will allow more students from the USA to compete at home and on the world stage. Contributors include big industry names such as Jack Roush, Porsche Motorsport and Team Ganassi. A crowd-funding web page has been set up to receive further contributions at <https://saefoundation.thankyou4caring.org/pages/donald-burgoon-tribute>. ❄



PFC-braked Danny Bohn is the man to beat in NASCAR's Whelen Southern Modified Tour

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