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RACER

THE INSIDER ISSUE

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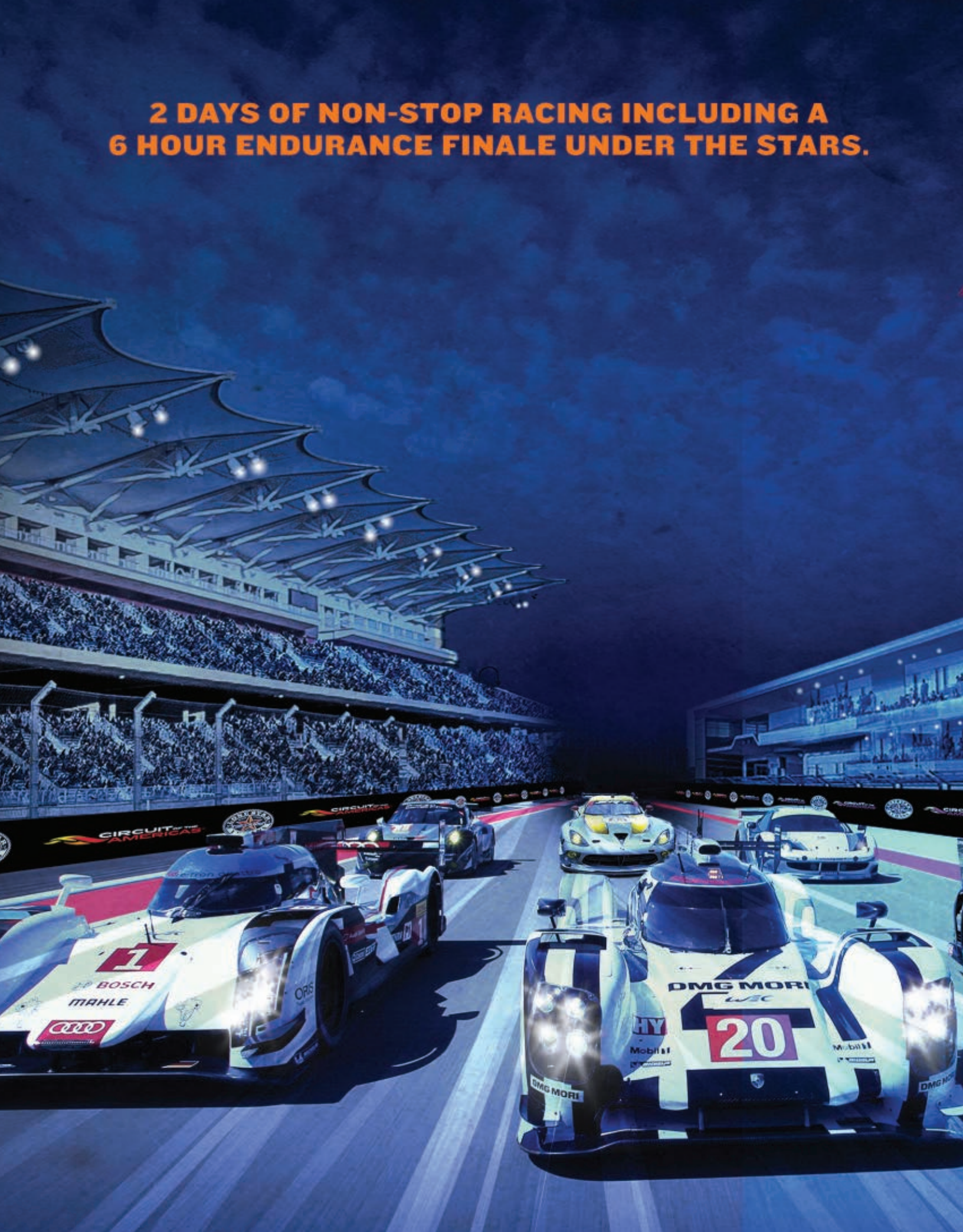
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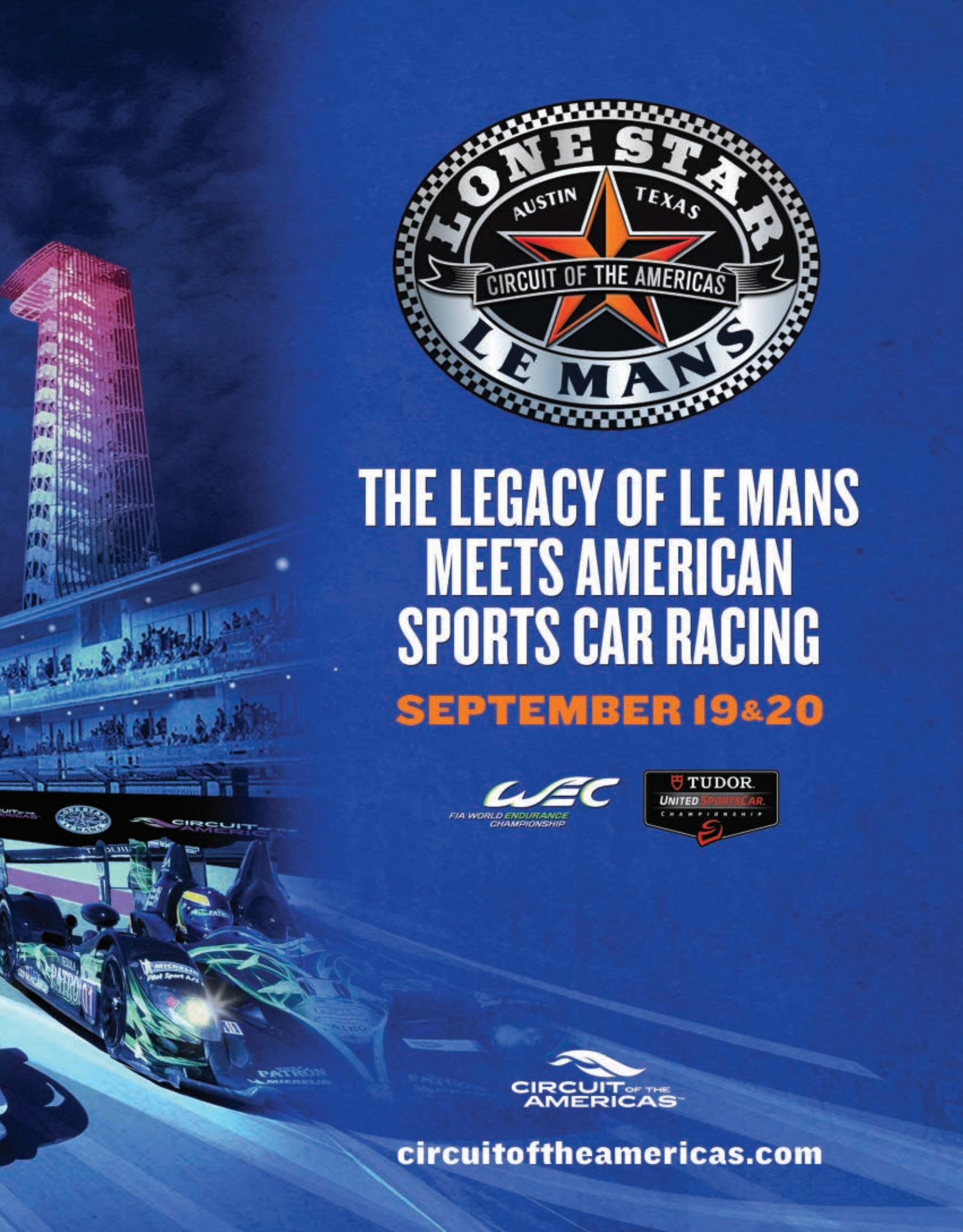
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The WEC's high-tech LMP1 warriors: Audi R18 e-tron quattro, Porsche 919 Hybrid, Toyota TS040 HYBRID. Illustration: Paul Laguette

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Glenn Dunbar/LAT

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Gabi Tomescu/AdrenalMedia.com

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Phillip Abbott/LAT

"The best oval racers have a strong feel for the car, can analyze what's going on and can relay it to the engineers"

ED CARPENTER

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Camden Thrasher

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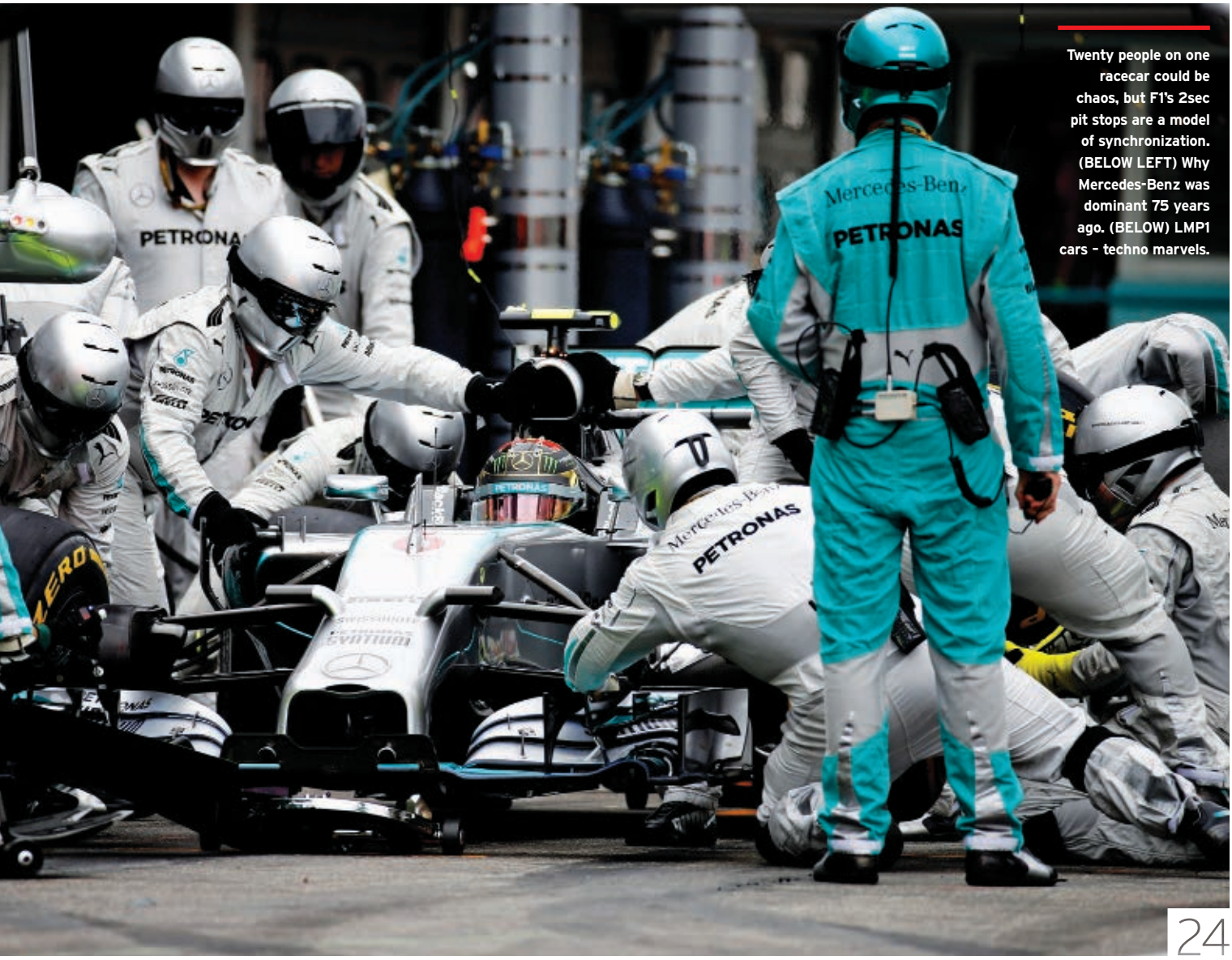
Peter Harholdt



Twenty people on one racecar could be chaos, but F1's 2sec pit stops are a model of synchronization. (BELOW LEFT) Why Mercedes-Benz was dominant 75 years ago. (BELOW) LMP1 cars - techno marvels.

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Gabi Tonescu/AdrenalMedia.com

FREEZE FRAME

Kimi Raikkonen isn't really getting along with his Ferrari F14T in 2014. That's not great news for the Finn, but it does provide some excellent visuals on occasion.

WHERE Hungaroring, Budapest, Hungary
WHEN 07/25/14
PHOTOGRAPHER Andy Hone/LAT


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R.AIKKONEN
HUBLOT

FREEZE FRAME

Who's Eyvind Brynildsen, you ask? Well, he's Norwegian and he finished fifth in a Ford Fiesta in the WRC2 class at Rally Finland. Which is all terrific, but we just liked the photo...

WHERE Rally Finland, Jyvaskala, Finland
WHEN 08/02/14
PHOTOGRAPHER Jaanus Ree/Red Bull

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David Malsher
EDITOR

"We wanted to probe that little bit further, explaining the 'How' as well as the 'Why' of some truly varied aspects of motorsport"

Every issue of *RACER*, our purpose is to take you inside the sport we all love, with the stories of racing's past (we revel in it), present (we're absorbed by it) and future (we're excited by it). But with *The Insider Issue*, we wanted to probe that little bit further, explaining the "How" as well as the "Why" of some truly varied aspects of motorsport. And, honestly, there wasn't a writer among us who didn't gain a ton of understanding along the way.

For example, do you know how Formula 1's magnificently swift pit stops are achieved? How the World Endurance Championship's policies have allowed tech-laden LMP1 prototypes (RIGHT) to retain great diversity while achieving the same goals? How an IndyCar team perfects the art of oval racing? How Formula 1 regulations are passed (or rejected)? How differently a GT racer approaches a TUDOR Championship enduro, compared with a Pirelli World Challenge sprint?

Read on, and these questions and many more will be answered. Naturally, we haven't neglected the "Why"-type questions, either. Why is Mark Webber not missing Formula 1, but is instead totally absorbed by racing a Porsche 919 Hybrid in the WEC? Why is it so difficult to balance the performance of IMSA's Daytona Prototypes and P2 cars? Oh, and why is the pre-War Mercedes-Benz W154 one of the most overlooked overacheivers in grand prix history...and why was it so sleek and low compared to its contemporaries?

Camden Thrasher

One category whose performance is balanced from the start is Indy Lights, and so we're also thrilled to report in these pages how tests are proving the 2015 Dallara IL-15 to be very quick, very reliable, and the perfect vehicle for wannabe IndyCar Series drivers.

So this is the issue of *RACER* where we barely touched the rose-tinted spectacles, and instead used the X-ray vision variety. Come to think of it, perhaps we should have called it *The Enlightenment Issue*. ■

editor@racer.com

CONTRIBUTOR

F. Peirce Williams/LAT

A big thank you to Ed Carpenter and his lieutenants for revealing to *RACER* how to succeed on IndyCar's ovals. We trust their openness won't come back to haunt them....

STORYBOARD

LAT archive

Can you imagine the noise as this shot was taken?! Hermann Lang heads to victory in the 1938 Livorno Grand Prix in the glorious Mercedes-Benz W154. The car for our retro *In Focus* is in 1939 spec – still beautiful, even quicker.

2014 THE DAWN OF A NEW ERA

The TUDOR United SportsCar Championship represents a new era for sports car racing in North America. The Grantour Fly-Back chronograph acts as an instant measure of performance for the cars competing in the TUDOR Championship. In this world class showcase for prestige and precision, race length is determined by time and not distance. TUDOR, driving passion for motorsports.

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Andy Hone/LAT

Ferrari's season in the red (and not in a good way) has spurred rumors that one – or both – of its world champions will be gone at year's end. Management insists Fernando Alonso and Kimi Raikkonen will be staying on. Nothing to see here...right?

Jenson Button arrived at McLaren as reigning World Champion, and he remains its *de facto* leader. So why is the team's management seemingly reluctant to commit to his future?

RESTOCKING McLAREN

Impatient with mediocrity, the team ponders human as well as technical changes

> When you're not winning, Formula 1 can be a brutal place. And when you've done as much winning as Team McLaren, that frustration is multiplied.

It's obvious that a team with 20 F1 World Championships (12 drivers' and eight constructors') in its trophy case would be chafing after a half-season in which it languished in sixth place in Constructors' points; this, despite the benefit of the Mercedes power units that have been dominant in the back of the "works" cars.

Patience isn't likely to have increased with the return to the helm of Ron Dennis, who presided over McLaren's last stint as F1's dominant team during its partnership with Honda – a partnership that will resume next year. It's widely assumed that McLaren wants another superstar driver in its stable, and the team is known to have put out feelers to both Ferrari's Fernando Alonso and Red Bull's Sebastian Vettel. But with both those luminaries unlikely to be willing to break their contracts, the team may have to consider other factors than star power in determining its future.

Current team leader Jenson Button says he wants to remain with the team, and seems perplexed, if not annoyed, that McLaren has yet to offer him a contract extension. Perhaps McLaren is pondering whether, at 34, the Briton's best years are behind him; but the depth of experience the 2009 World Champion brings could be invaluable in helping the all-new Honda engine get past its birth pains.

And what of Kevin Magnussen? After a fast start, the Dane's rookie season has been a difficult one, but he's also shown flashes of brilliance and, as a longtime McLaren junior, the team has a lot invested in his development. Still, to secure his place, Magnussen will have to strive for Button-like consistency, just as Jenson will need to prove he's still got the pace and motivation to lead McLaren into another hoped-for golden age.

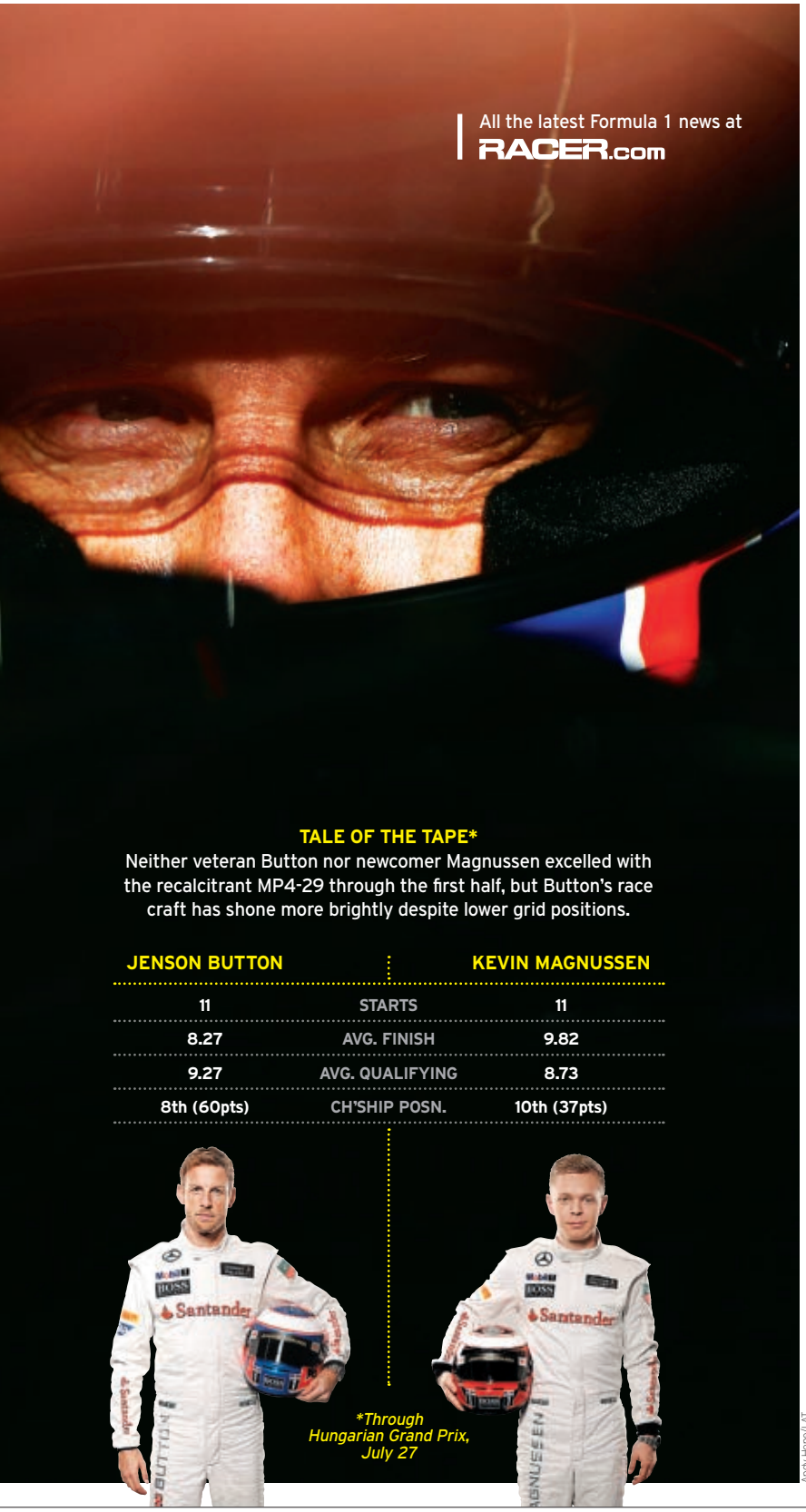

Alastair Staley/LAT

NO TENURED POSITIONS

Magnussen (20) was brilliant in Australia, eclipsing veteran teammate Button, but despite continuing to prove at least JB's equal in one-lap pace, the Dane's inexperience has resulted in some erratic race performances. Still, Button's steadier hand isn't fully satisfying his bosses, either.

Climbing the ladder is the traditional path to F1, but some talents just won't wait. Max Verstappen, 16-year-old son of former GP driver Jos, signed a race deal with Toro Rosso midway through his first season of Euro F3 – his first year out of karts.

Philip Platzer/Red Bull



TALE OF THE TAPE*

Neither veteran Button nor newcomer Magnussen excelled with the recalcitrant MP4-29 through the first half, but Button's race craft has shone more brightly despite lower grid positions.

JENSON BUTTON		KEVIN MAGNUSSEN
11	STARTS	11
8.27	AVG. FINISH	9.82
9.27	AVG. QUALIFYING	8.73
8th (60pts)	CH'SHIP POSN.	10th (37pts)

*Through Hungarian Grand Prix, July 27

Andy Hone/LAT

Finer fettle than Vettel brought RBR's new boy to the front.

Andy Hone/LAT

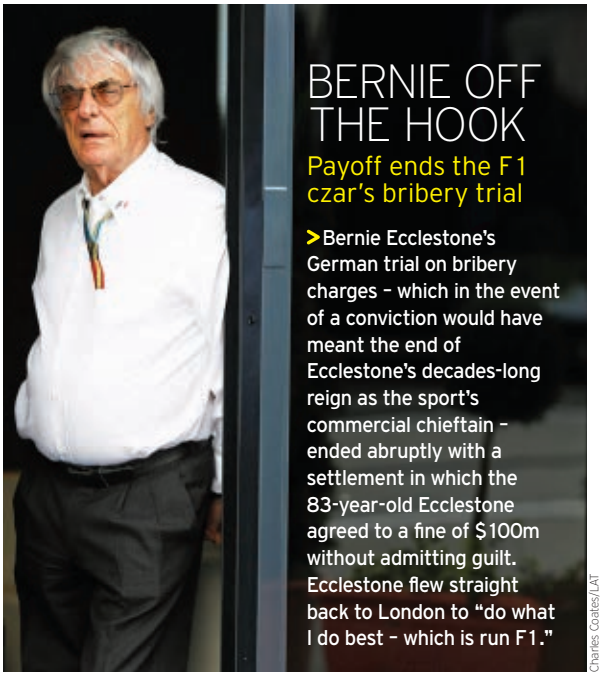
RICCIARDO TO THE RESCUE?

RBR newcomer steps up, but brain drain looms

> After four consecutive world championships with Sebastian Vettel, Red Bull Racing was behind the 8-ball from the outset in 2014 as Renault's V6 turbos haven't measured up, and Vettel has been all but off the radar. And yet, the team is the only one to have beaten *über* power Mercedes – three times – courtesy of its first-year driver Daniel Ricciardo, who clearly eclipsed his star teammate in the first half of the year. "He's exceeded all of our expectations, and probably even his own ," team principal Christian Horner declared.

Charles Coates/LAT

But, just as the team was clawing back momentum, its challenge deepened when design genius Adrian Newey (INSET) opted to step back from a day-to-day role. RBR has declined – so far – to name a replacement. Can Daniel rise above this, too?



BERNIE OFF THE HOOK

Payoff ends the F1 czar's bribery trial

> Bernie Ecclestone's German trial on bribery charges – which in the event of a conviction would have meant the end of Ecclestone's decades-long reign as the sport's commercial chieftain – ended abruptly with a settlement in which the 83-year-old Ecclestone agreed to a fine of $100m without admitting guilt. Ecclestone flew straight back to London to "do what I do best – which is run F1."

Charles Coates/LAT


Alastair Staley/LAT

Andre Lotterer, three-time Le Mans winning Audi ace, made his F1 debut at Spa, at the age of 32. Taking over Kamui Kobayashi's Caterham, Lotterer outqualified his teammate Marcus Ericsson by a full second, but retired on lap 2.

Steven Tee/LAT

The latest Mercedes F1 run-in came two laps into the Belgian GP. (MAIN) Lewis Hamilton pits for a puncture, passing Andre Lotterer's ailing Caterham.

TARNISHED SILVER

Mercedes AMG F1 struggles to keep its aces in order after Spa spat

> Just as the increasing frequency of thundercracks heralds an approaching storm, the regular flashpoints of the intra-team rivalry at Mercedes's Formula 1 squad are threatening to turn a glorious season into an escalating grudge match that polarizes opinion and leaves the marque struggling to translate its 2014 dominance into PR positives.

The latest in a line of "he said, she said" bickering (see sidebar on right) occurred at Spa-Francorchamps as the Formula 1 season resumed following its summer break. Nico Rosberg beat Lewis Hamilton to pole position, but it was the latter who grabbed the lead at the start. Rosberg drafted his way onto his teammate's tail on lap two, and had a half-hearted try around the outside at Les Combes, then backed off – but not enough to avoid clipping Hamilton's left-rear tire with his front wing. The subsequent puncture sent Hamilton to the pits at a high enough speed to damage his rear floor, while Rosberg's race was compromised by wing damage, and he finished second to Red Bull Racing's Daniel Ricciardo.

Hamilton afterward said Rosberg had admitted that he put his nose alongside to "make a point." Inevitably, Mercedes' team management was unimpressed by its drivers giving away what should have been an easy win. Fangio/Moss this is not...


Steve Etherington/LAT

BENZ BOYS' BUST-UPS

With the World Championship distilling to an all-Mercedes battle, many predicted Lewis Hamilton vs. Nico Rosberg would boil over. There was the wheel-to-wheel battle at Bahrain (ABOVE) – too hard-edged according to some, inside and outside the team. Monaco qualifying, where Lewis accused Nico of causing a yellow to spoil his own final run (BELOW). And then M-B itself caused more problems in Hungary by trying to order Hamilton aside for Rosberg.


Alastair Staley/LAT


Steven Tee/LAT

With the Marussia lineup so fluid, we may see Rossi make his race debut in 2014. CoTA, perhaps...?

ROSSI JILTED...FOR NOW

> America's Alexander Rossi, who'd only recently switched from Caterham F1 reserve driver duties to the same role at Marussia, appeared to have made the move of the year when he was announced as race driver for the Belgian Grand Prix in place of Max Chilton. Yet within 24 hours, news broke that Chilton would retain his ride, and Rossi's F1 race debut was on hold.

This mysterious and rapid reversal of the decision was met with confusion by those on the ground at Spa-Francorchamps, anti-climactic disbelief by Rossi's many supporters, but absolute professionalism and stoicism from the man himself.

"It was a surprise, but there is no point complaining," he said on learning his fate after first practice. "Coming to this team and being here for such a short period of time, the fact that they showed faith in me when necessary went a long way.

"Beyond all this, the biggest emotion I have is gratitude that I am here and that I am involved with these people."


Lorenzo Bellanca/ LAT

SPEED'S SPELL

Scott Speed was the last American in F1, driving 28 races for Toro Rosso, 2006-'07, with best finishes of two ninth places.

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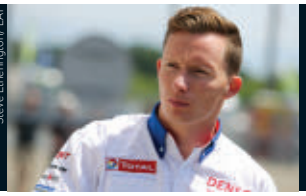
Competition GTS-class turbocharged Optima shown.


Steve Etherington/LAT

IndyCar street course ace Mike Conway, who's also reserve driver for Toyota's World Endurance Championship squad, will make his race debut in the TS040 HYBRID at Circuit of The Americas, Sept. 20. He'll sub for Kazuki Nakajima.

BRIEFING

MILE'S BACK

Andretti Sports Marketing, which has promoted the last three Milwaukee IndyCar races, stated its desire to have the series return to The Mile next year. However, as this *RACER* went to press, mooted 2015 events in Dubai and Brasilia, Brazil, were still to be confirmed, as was a New Orleans race.


Lesley Ann Miller/LAT

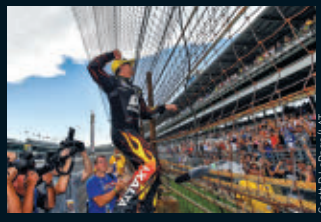
WHEN TO OPEN THE BOX?

IndyCar appears ready to adjust the development plan for aero kits to allow manufacturers more flexibility in the way they introduce updates. Originally the plan was to freeze kits once homologated, but IndyCar is looking at options to allow the same degree of change over a longer period of time.


IndyCar

GORDON'S HIGH FIVE

Jeff Gordon became the most successful driver in the Brickyard 400's 21-race history when its inaugural winner also clinched the latest edition, his fifth win there. It's been a rejuvenating season for the 43-year-old Hendrick Motorsports ace, who was leading the NASCAR Sprint Cup points by late August.


Scott R LePage/LAT

NEWGARDEN PUTS FAITH IN MERGER

IndyCar's American rising star sticks with the merged Carpenter/Fisher teams, despite becoming hot property right across the grid.

> Two of IndyCar's single-car teams, Ed Carpenter Racing and Sarah Fisher Hartman Racing, announced in August that they would merge. But a logical move of consolidation left a couple of key questions unanswered as *RACER* went to press.

One concerned engine supply, since ECR is a Chevrolet team and SFHR is allied with Honda. Were the new two-car Carpenter Fisher Hartman Racing to go the Chevy route in 2015, that would even up the engine distribution, with Ilmor and HPD each supplying 11 cars to the regular field.

Less black-or-white was the decision over driver lineup, although a major piece fell into place when SFHR's Josef Newgarden signed for 2015. Despite not reaching Victory Lane in the first 17 races of the year, Newgarden was consistently strong on all types of track, and potential wins at Long Beach and Mid-Ohio slipped away through no fault of his own.


Brian Cleary/LAT

MIGHTY COMBO

Mike Conway (road/street) and Ed Carpenter (ovals) took three wins in the No. 20 ECR car from 2014's first 17 races. Their combined points total would put "Ed Conway" seventh in the points standings with one race to go…

"I decided to stay here because I believe in our group and everything that we've built and where we are going," said Newgarden. "It's a very strong situation that's on the rise, and I think next year is the year to capitalize on it."

However, the fact that he signed only a one-year deal is significant, as it's believed three Ganassi, one Penske and two Andretti driver contracts are up at the

The new-for-2015 Indy Lights car, Dallara's IL-15, has been scintillatingly quick right off the hauler at all venues it's tested. It's also proven remarkably reliable for a prototype. Check out our insight to the car's testing progress, starting page 86.

Andersen Promotions

All the latest IndyCar news at RACER.com

end of next year. Switching to any team other than those three could be regarded as a sideways move, considering ECR has won three times this season.

In the mean time, given that he's been on a one-car team for all but two races in his three-year IndyCar career, many are eager to see what Newgarden will achieve with a teammate. He'll partner CFHR co-owner Carpenter on ovals, of course, but the identity of the road/street driver in Ed's car was unsettled as we went to press, with Mike Conway contemplating a full-time sports car ride in Europe. JR Hildebrand is one possible replacement, and he could also drive a third CFHR car in the Indy 500.

Paul Webb/LAT

COMING FULL....OVAL

Sarah Fisher (ABOVE, with husband Andy O'Gara) and her former driver Ed Carpenter have a victorious past, having won at Kentucky in 2011 – their last race together.

Brian Cleary/LAT

Jeff Zelevansky/Getty Images

AJ Allmendinger's decision to stick with NASCAR and join Sprint Cup minnow JTG Daugherty was a surprise to many. But at Watkins Glen, he became a winner by beating Cup's road course hotshoe Marcos Ambrose.

Whether to defame or defend, Tony Stewart's celebrity status meant that the masses were eager to judge his actions.

Nigel Kinrade/LAT

SMOKE UNDER FIRE

Tony Stewart's sprint car attraction goes from problematic to tragic

> After Tony Stewart's NASCAR Sprint Cup championship hopes were wrecked last year by an injurious crash at one of the many sprint car events the ex-open-wheeler does for fun, his detractors called it a foolish mistake. They were saying a lot worse after the horrific incident on Aug. 9 that left a young racer dead, Stewart in seclusion, and the national media gearing up for another tilt at the sport it only tends to notice when a fatality is involved.

When the NASCAR star hit Ward during a caution flag period at a sprint car race at Canandaigua Motorsports Park in upstate New York, fatally injuring the 20-year-old, everyone with a YouTube player seemed eager to weigh in on the causes of the incident and the motivations of both men. Stewart released a brief statement expressing his profound sadness but then avoided comment, skipping the Sprint Cup races that followed.

While Ontario County Sheriff Phillip Povero said Stewart was cooperating fully with the investigation and no evidence of criminal intent was found, that didn't stop the internet from hyperventilating. The *Charlotte Observer* made a more salient point with its report noting that two of every three deaths in U.S. races over the past three years occurred on short tracks, suggesting more rigorous and uniform safety standards are needed.

KEVIN WARD JR. 1994–2014

No one will ever know what he was expecting to achieve as he walked into traffic, gesticulating at and apparently confronting Tony Stewart's sprint car, before its right-rear tire engulfed him. Briefly stuck beneath the car, Kevin Ward Jr. was then hurled down the track, suffering what the coroner termed "massive blunt trauma." It was an incalculable, incomprehensible moment that ended a career of promise. It also prompted a hardening of rules against drivers exiting their cars – a positive, one hopes, in a cruel sea of negativity.

Longtime teammates Edwards (99) and Biffle will be in opposing camps in '15.

Russell LaBounty/LAT

EDWARDS HOPES FOR A LEAP FORWARD

> Aside from those trademark backflips off the roof of his racecars when he wins in NASCAR Sprint Cup, Carl Edwards is widely known for his association with Jack Roush. But not for much longer.

The 34-year-old Edwards has spent his entire top-level career with Roush, having first joined "the Cat in the Hat" for a Truck Series campaign in 2003 before being promoted to its Cup squad halfway through the following season. But after Roush Fenway Racing revealed in May that it had signed 2011 Daytona 500 winner Trevor Bayne for a full-time Cup role next year, it became increasingly clear that Edwards would be moving on. In August, he confirmed that he would be joining Joe Gibbs Racing for 2015, driving a fourth Toyota Camry alongside incumbent stars Denny Hamlin, Kyle Busch and former Roush stablemate Matt Kenseth.

"Matt's success over here was a big eye opener for me," said Edwards. "It just felt like it was time to change."

OLD-SCHOOL YOUNG GUNS

Roush Fenway Racing is trending younger, with Trevor Bayne and Ricky Stenhouse Jr. joining Greg Biffle. But it's brought back old Roush hand Mark Martin to coach them.

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Camden Thrasher

RealTime Racing gave the Acura TLX GT a promising Pirelli World Challenge GT debut at Mid-Ohio last month. Heavy rain in race one and a trip to the gravel in race two stymied hopes of a representative finish for RTR owner/driver Peter Cunningham.


Beverlee Larsson

SCCA road racers will take on the Corkscrew as the Runoffs shifts venues and heads to Mazda Raceway Laguna Seca in 2014.

CATCH ALL THE ACTION

Sports Car Club of America's National Championship Runoffs is not just for drivers; spectators are welcome, too. If you can't make it to Mazda Raceway Laguna Seca from Oct. 6-12 this year, head to **scca.com/runoffs** for live timing and scoring, as well as a link to a live video stream of all the races.

RUNOFFS HEADING WEST

SCCA Club Racing's prestige event goes on tour, with Mazda Raceway Laguna Seca hosting in 2014

> The National Championship Runoffs, SCCA's pinnacle amateur road race event, attracts some 700 competitors to the annual winner-takes-all showdown, each with dreams of putting his or her name in the history books next to the likes of Skip Barber, Mark Donohue and Graham Rahal.

Over 50 years, the event has completed stints at Road America, Heartland Park Topeka, Mid-Ohio Sports Car Course, Road Atlanta, Riverside International Raceway and Daytona International Speedway. In 2014, for the first time since 1968, the Runoffs head for the left coast, taking over Mazda Raceway Laguna Seca, Calif., Oct. 6-12. This marks a new era for the SCCA, as its Club Racing jewel will now switch location each year. In 2015, Daytona will be the host, while the following year it returns to Mid-Ohio.


Phil Binks

BACK IN THE DAY...

The SCCA Runoffs last hit the west coast in 1968, with 272 drivers battling at Riverside International Raceway, Calif. The entry for Mazda Raceway could potentially be double that number in 2014.

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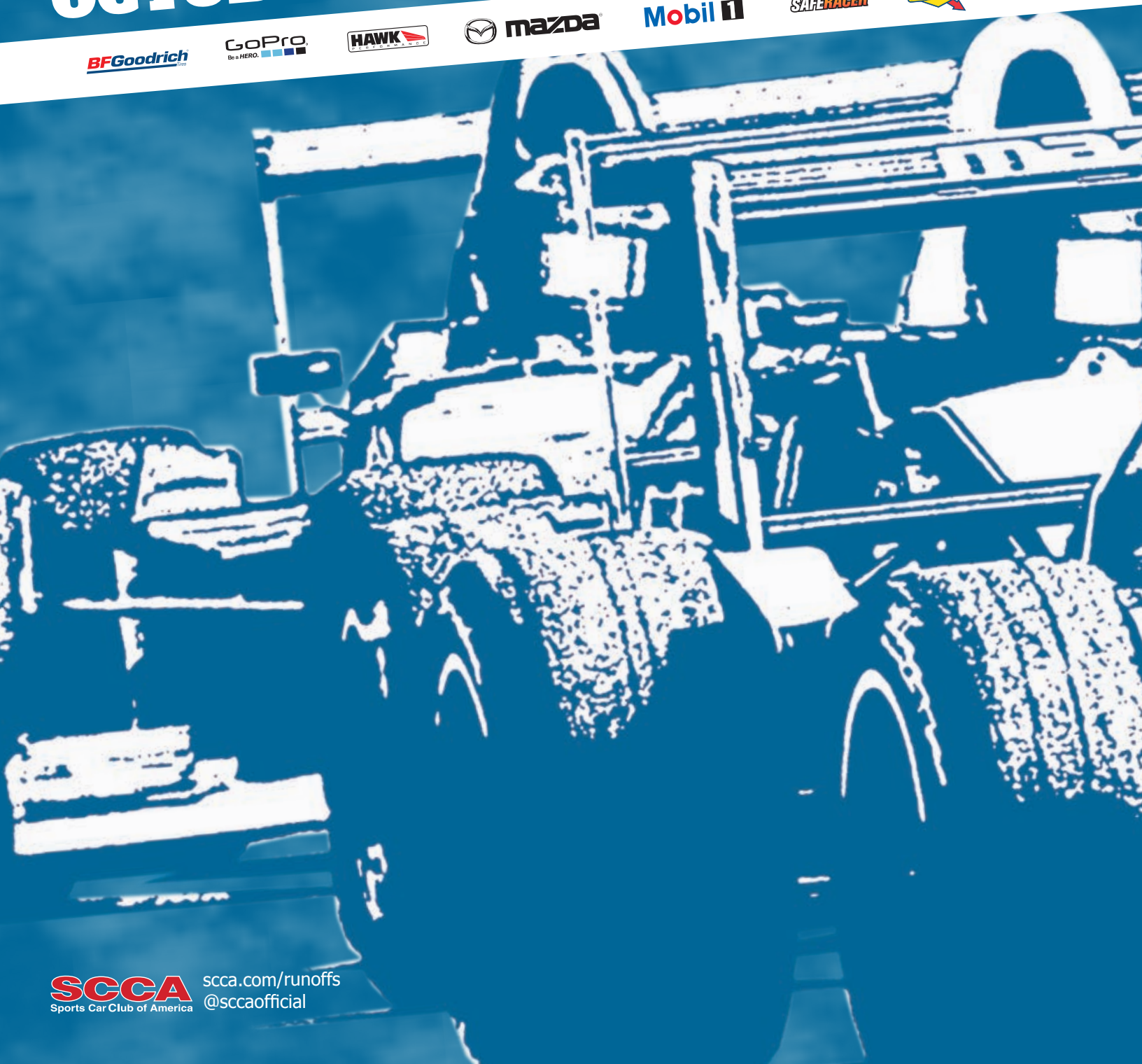

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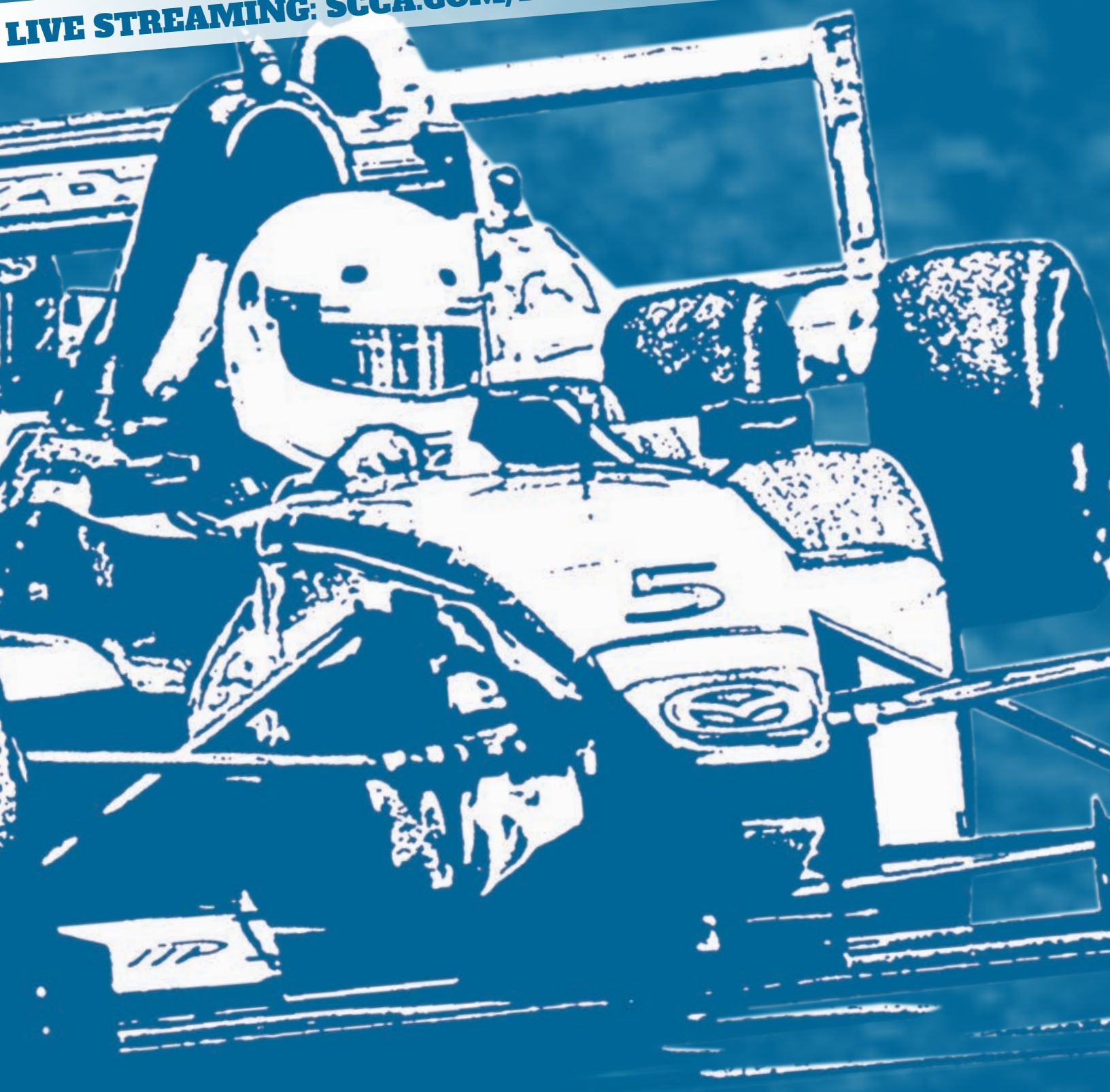


The McLaren pit crew are poised and ready as Kevin Magnussen enters his pit box at the Spanish GP in Barcelona. With an inch-perfect halt by the Dane and flawless execution by the 20 pit crew members, he could be rolling again in two seconds.

BLINK AND YOU MISSED IT

Wheels stopped to rolling again, a fast Formula 1 pit stop is completed in under two seconds. Complex choreography, technology and endless practice make for near-perfection.

WORDS Edd Straw
MAIN IMAGE Steven Tee/LAT

The Red Bull Racing pit crew put in some simulated pit stops. Practice doesn't make perfect – there's always a couple of hundredths hiding somewhere – but it *does* make consistent.

Andy Hone/LAT

Close your eyes and count to three. That's how long it takes a Formula 1 team to complete a competitive pit stop. Were it grand prix racing's fastest ever stop, when Red Bull changed all four wheels on Mark Webber's car in an astonishing 1.923sec during last year's United States Grand Prix, you need only be in the dark for a couple of seconds. Rapid F1 pit stops have become so commonplace that it's easy to become blind to these masterpieces of choreography, muscle memory and technology.

The return of in-race refueling from 1994-2009 meant that the artistry of the super-fast wheel change was temporarily lost. During that era, the time required to pump fuel into the car was the limiting factor, with sub-six second stops seen only in the most aggressive of strategies, so tire changes became more sedate (relatively speaking).

Prior to the refueling era, the record for the fastest pit stop is generally recognized to be 4.1sec. And that is broadly where the fastest times were at the start of 2010, when refueling was once again outlawed.

Glenn Dunbar/LAT

ROB SMEDLEY

Renowned for his no-nonsense approach to race engineering Felipe Massa at Ferrari, Smedley's new role at Williams – head of vehicle performance – is a wider one, covering all aspects of the team's at-race performance.

"The times dropped immediately to around 4.5-5sec in the first year," explains McLaren's Sam Michael, who as sporting director is ultimately responsible for the team's pit crew. "But teams began to invest more in it because it became a differentiator, whereas before it wasn't."

The benefits of fast changes are obvious. In simple terms, the quicker you make a pit stop, the quicker you get to the checkered flag. But relative to the guys you're racing against, a fast stop – or multiple fast stops in the case of two- or three-stop strategies – can be as effective in improving your position as the most sublime or audacious of passes, yet with way less risk attached, given that it all takes place in the comparative safety of the pit lane.

A car traveling down the start/finish straight at 180mph covers eight yards in a tenth of a second, so if you can get your car into the pitlane, stopped, tires changed and out again 0.1sec faster, it could make the difference between exiting first and second on the race track. That's why teams take pit stops *very* seriously. Williams, for example, has made big strides this year, pulling off a 2.1sec stop for Valtteri Bottas in Austria. And it has done so with the rigor typical of an F1 team.

> **"Teams began to invest more in pit stops because it became a differentiator, whereas before it wasn't"**
>
> **SAM MICHAEL**

"There's a pit stop working group at Williams, and we look at every area after each race and see where we need to improve, how we need to improve it, and whether the direction is the correct one," explains Williams' head of vehicle performance, Rob Smedley. "We're in a phase now where we are evolving and iterating, and there are no big revolutions on the horizon, but we are all still trying to find the last few tenths."

There are three key pit stop

HOW LOW CAN YOU GO?

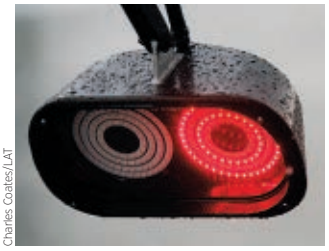
AS F1 TEAMS SEARCH FOR THE SMALLEST GAINS, HOW FAST COULD A PIT STOP GET?

Five years of relentless progress has lowered pit stop times to the current record of 1.923sec, but the days when gains of a half-second were there for the taking have passed. Some teams claim to have achieved practice pit stops in the 1.7-1.8sec bracket, so with perfect execution, it should be possible to knock a tenth or two off the record. But could there be even more to come?

"The teams can eventually get down to 1.5sec and deliver it on a regular basis," says Rob Smedley. "Every team measures it slightly differently as to when the pit stop begins and ends, but we are down to 2-2.1sec. With equipment changes and a bit more consistency on the human side, we can do 1.5."

In the short-term, improving consistency is the focus. After all, *averaging* 2.5sec will gain you far more than the occasional sub-two


Alastair Staley/LAT


Charles Coates/LAT


Steve Etherington/LAT


Steve Etherington/LAT

DETAILS, DETAILS...

(CLOCKWISE FROM TOP) From the stop-go lights in the driver's line of sight, to the glare-reducing visors on the crew's helmets, to the positioning arrows on the swivel jacks, and even the stance of the crew in the final moments before their car enters the pit box, attention to detail is everything in the quest to find increments of time.

performance areas and, as Smedley stresses, none of the three can ever be neglected, or looked at in isolation. The optimum pit stop is a complex matrix of all three working with and off each other.

EQUIPMENT

While the functions of the equipment used are not new, teams have found ingenious ways to customize the designs to minimize time spent in the pits.

With automated and onboard jacks outlawed, they must be manually operated. While the rear jack is relatively simple, allowing the jack man to move in behind the car, lift it and then use the quick-release mechanism to drop it, the front is not so simple. A swivel-jack allows the jackman to get out of the way of the car before, not after, he releases the car. Then, he simply drops the car and yanks the jack towards him to leave the way clear, saving several tenths of a second.

Retained wheel nuts, pioneered in the DTM but brought into F1 by Mercedes, are believed to be worth a half second.


Charles Coates/LAT

SAM MICHAEL

After stints at Jordan Grand Prix and Williams F1, Michael joined McLaren in late 2011, becoming its sporting director in '12, with responsibility to optimize and enhance all areas of operational performance.

Rather than the wheel nut being a loose item, running the risk of it being dropped or shot out of the gun, these are integrated into the wheel rim. Combined with sleeves on the wheel gun that allow it to locate easy, these allow wheel nuts to be gunned off and on incredibly quickly, especially with some cars only having three turns of thread on the axle. Watch a gunman closely, and they will locate the gun before the car has stopped.

Traffic light systems were pioneered by Ferrari in 2008, but have proliferated since refueling was banned. This eliminates the need for a crew member to hold and release the driver using a lollipop. But the system is not completely automated. There are torque sensors in the wheel guns, but this data cannot be used in real time, so only the release of a button on each wheel gun can indicate that the change is complete. A crew member monitoring traffic can delay the lights changing should another car be passing, so this system is a blend of the electronic and the manual.

With the exception of the wheel guns, which are supplied by specialist companies such as Italy's Dino Paoli, this equipment is generally designed and produced in-house by each team.

PERSONNEL

Unlike the fly-in specialists used by many NASCAR teams, the 20 or so people who perform the pit stop are all taken from the race team – they have to be, given that F1 rules limits each team to 60 operational personnel (i.e., people actually involved with any aspect of running the cars) at a grand prix. But so specialized has being on the pit crew become that their fitness levels are monitored closely, training regimes issued and performance closely scrutinized. In each team, an individual or group is tasked with analyzing human performance in pit stops and able to make suggested changes to technique. To perform under intense pressure, often in very high temperatures, all-around fitness, as well as upper-body strength, is required. >

second stop over a season.

But can times drop even further? Wheel guns top out at a little over 2,500rpm and cannot be made significantly quicker because of a 2012 rule mandating the use of compressed nitrogen or air, rather than lighter gases such as helium.

"The guns are getting toward the limit of their design capability," says Smedley. "Maybe the next stage is a completely different gun design. Or a different take on how we take off and put on the wheel, because it doesn't have to be a gun. All ideas are welcome!"


Steven Tee/LAT

FASTEST *EVER*, BUT...

...incredible as it was, Red Bull Racing's 1.923sec pit stop at the 2013 U.S. Grand Prix only helped Mark Webber finish third.

1.923sec

Steven Tee/LAT

(MAIN) Ferrari's pit crew waits for the call to get ready. Although the crew is pre-briefed on the basic pit-stop strategy for a grand prix, they must be in a constant state of readiness for the unexpected – rain, damage, safety cars. (BELOW) Mercedes F1's hand-picked 20 goes through its slick routine.

Steven Tee/LAT

JONATHAN WHEATLEY

As befits Red Bull Racing's refreshingly old-school approach to F1 racing, team manager Wheatley is very hands-on when it comes to pit stop training and optimization. The RBR pit crew's 1.923sec record stop says the system's working.

As well as the pit stop practices on race weekends there are also regular drills back at the team factory. These cover both regular stops and emergency ones for procedures such as nose changes or steering wheel replacement. No team can afford to carry any passengers. The car cannot be released until everyone has completed his specific task, so the weakest link (read, *slowest* link) is what defines your pit-stop time. No one individual is more important than his comrades.

"Those guys can make a huge difference," says Smedley. "It's amazing how motivated people can become when they know they're actually part of the race. And they love it!"

That stretches to competition for places, be it for a position as jackman, gunman or wheelman. Every team has reserves in each position in case of illness, or injury – or error – and those on the outside want to make the first team.

"It has to be healthy, but as long as it stays positive we must have competition," says Smedley. "You must have succession plans, you must have your 'spares' in there and they have to be vying for a top position. It's like a football squad."

Those on the pit crew have to be in a constant state of alert. While they know the planned race strategy, things can always change and, in the case of safety cars or on-track incidents, they have to be ready to go with only a few seconds notice. Particularly in safety car situations, there is the danger of the "double stack," where two pit stops have to be completed back to back. Even under green-flag conditions, the fact that each team has just one available box means that pit stops can be completed back-to-back when there is only five or six seconds between the two cars. This has its own choreography, with the need to get rid of the old tires and bring out the new ones for the next driver in a matter of seconds.

Glenn Dunbar/LAT

"You must have succession plans; you must have your 'spares' in there vying for a top position"

ROB SMEDLEY

DRIVER

A slow pit stop is usually blamed on the crew. But the driver is also an active participant, capable of having a significant impact on pit-stop duration.

"The consistency of deceleration into the box is very important," says Smedley. "It's something that Felipe [Massa] brought to Williams straight away in testing when he moved from Ferrari. He would come in, decelerate the car and stop on the marks the same way time and time again. All of a sudden, the mechanics could knock a second off pit stop times. If the driver stops a half-meter long, or one meter short, the stops are never going to be good because the gunmen and the wheelmen always have to reposition themselves."

Driver pit stop performance is also heavily scrutinized, with precision and consistency at a premium.

"There is quite a bit of time to find in the pit stop," says McLaren rookie Kevin Magnussen. "You need to brake late and accurately down to 80km/h (50mph) at the start of the pit lane. You have to hit that speed when you cross the line because if you hit it early, you waste time and if you hit it late, you get a speeding penalty. Then, you have to stop on the marks to give the mechanics an easier life. A good launch is important, as is switching off the speed limiter at the right time."

All of what Magnussen describes will typically happen in 20-25sec, with those two furious seconds of the stop itself at the heart of it all. In a sport that is, by definition, all about going as quickly as you can, stopping fast can make the difference between triumph and failure. ■

INDYCAR KEEPS IT LEAN AND MEAN...

So if an F1 pit crew can perform a stop in two seconds, why does it take more than three times that long for a quick IndyCar pit stop?

The fundamental difference is that the length of a typical IndyCar stop is defined by the time to refuel (from a gravity-fed system), not to change tires.

IndyCar allows only six crew over the wall, with two on fuel and jack, and one for each wheel. So, comparing like with like, i.e., tires only, one tire changer has to work the gun, remove the wheel, then lift and secure the new one – all in just 4.5sec. In F1, three guys do the same sequence, so kudos to the multi-taskers of IndyCar.

F. Peirce Williams/LAT

WORDS Laurence Foster
MAIN IMAGE Peter Harholdt

MERCEDES-BENZ W154

SILVER STANDARD

Mercedes-Benz dominates grand prix racing after a significant change in the regulations allows its engineering prowess and grasp of new technologies to shine.

Sounds familiar, doesn't it? But this isn't Nico Rosberg, Lewis Hamilton and the Three-Pointed Star's all-new turbo-hybrid power unit running riot in the 2014 Formula 1 World Championship. No, it's 75 years prior, when a switch from a weight-based to an engine-capacity formula was the catalyst for the awesome Mercedes-Benz W154 of 1938-'39, perhaps the greatest of all the "Silver Arrows."

Ironically, the W154's era of domination was curtailed by the Second World War – a conflict ignited by the same regime that had first financed Germany's incredibly successful 1930s foray into grand prix racing with Mercedes and Auto Union.

In hindsight, the fundamental flaw in the 750kg Formula rules used for grand prix racing between 1934-'37 was that they didn't take into account the sheer mass of intellectual firepower and engineering might that Mercedes-Benz and, to a slightly lesser extent, Auto Union would bring to bear in their quest to dominate.

The theory behind the formula was simple yet (apparently) brilliant: By setting a *maximum* car weight of 750kg (1,653lbs), minus driver, fuel, oil, coolant and tires, you naturally limit engine size and, therefore, power. If a manufacturer was able to build an engine big enough to put out, say, 225hp, yet still come in under 750kg for the whole car, then well played, sir. And a top speed of 150mph-plus? Bravo to that.

In reality, however, the advances and innovations in combustion technology, forced induction, metallurgy and lightweight construction techniques pioneered by the two German factories rendered the concept a mockery. By 1935, Mercedes' W25 was already producing almost 500hp from its 4.3-liter, alcohol-benzene-gasoline guzzling, supercharged inline-8, and reaching speeds in excess of 190mph.

In the fall of 1936, grand prix racing's governing body, *l'Association International des Automobile Clubs Reconnus* (AIACR), attempted to put the genie back in the bottle by limiting engine size to 3-liter supercharged or 4.5-liter naturally aspirated for 1938.

Continuing down the supercharged route would be Mercedes' eventual choice, but first there was the small matter of 1937, the final season of 750kg Formula racing, and a chance to take its revenge on Auto Union after a lackluster '36 with a short-wheelbase version of the W25.

For 1937, the Three-Pointed Star

LAT archive

unleashed the W125, the first design overseen by Rudolf Uhlenhaut. Its inline-8 M125 was pushed out to 5.6 liters by in-house engine wizard Albert Heess, with the supercharger fitted downstream of the carburetors to compress the final mixture entering the cylinders, not just the air charge. The result was a staggering 600hp – if it could be used efficiently.

ELEGANTLY EFFECTIVE

The elegant packaging of the 1939 Mercedes-Benz W154 is testimony to the attention to detail of engineers Rudolf Uhlenhaut and Max Wagner. However, note how the saddle tank behind the engine and the main tank that fills most of the rear section form a "cocoon" of alcohol-benzene-gasoline fuel around the driver...

(LEFT) Mercedes-Benz factory drivers Richard Seaman (left) and Manfred von Brauchitsch head to the grid for the 1938 German GP at the Nurburgring-Nordschleife. Von Brauchitsch would end his day early, crashing out in his W154, while Seaman would take his only European Championship race victory.

But Uhlenhaut's prowess as chief engineer was matched by his skill behind the wheel, and driving the W25 on countless laps of the Nurburgring-Nordschleife had revealed its shortcomings – hard suspension on a relatively soft chassis was unable to cope with the power it was producing. For the W125, he opted for significantly softer suspension on an ultra-stiff, nickel-chrome molybdenum tube-frame chassis – and signed off on a car that didn't just reassert M-B's superiority over Auto Union, but dominated like no other. A 1-2-3-4 finish in the European Championship for Rudolf Caracciola, Manfred von Brauchitsch, Hermann Lang and Christian Kautz said it all.

So, 1938... Start with the W125, fit a 3-liter version of the M125 engine, and take up where '37 left off, right? Well, no.

For Uhlenhaut, producing a new engine without trying to take the whole car to >

ULTIMATE ACCOLADES

The AIACR European Championship was grand prix racing's main event. Mercedes won three of four races in both 1938 and '39, Rudolf Caracciola taking the '38 title. A '39 champ was never crowned, despite Hermann Lang dominating.

Mercedes in the 1938 European Championship

RACE	1st	2nd	3rd
French GP	⊛	⊛	⊛
German GP	⊛	⊛	
Swiss GP	⊛	⊛	⊛
Italian GP			⊛

Mercedes in the 1939 European Championship

RACE	1st	2nd	3rd
Belgian GP	⊛		⊛
French GP			
German GP	⊛		
Swiss GP	⊛	⊛	⊛

MERCEDES POLES 6
MERCEDES WINS Manfred von Brauchitsch, 1 (1938 France); Richard Seaman, 1 ('38 Germany); Rudolf Caracciola, 2 ('38 Switzerland; '39 Germany); Hermann Lang, 2 ('39 Belgium & Switzerland)
NON-CHAMPIONSHIP RACES/WINS 8/5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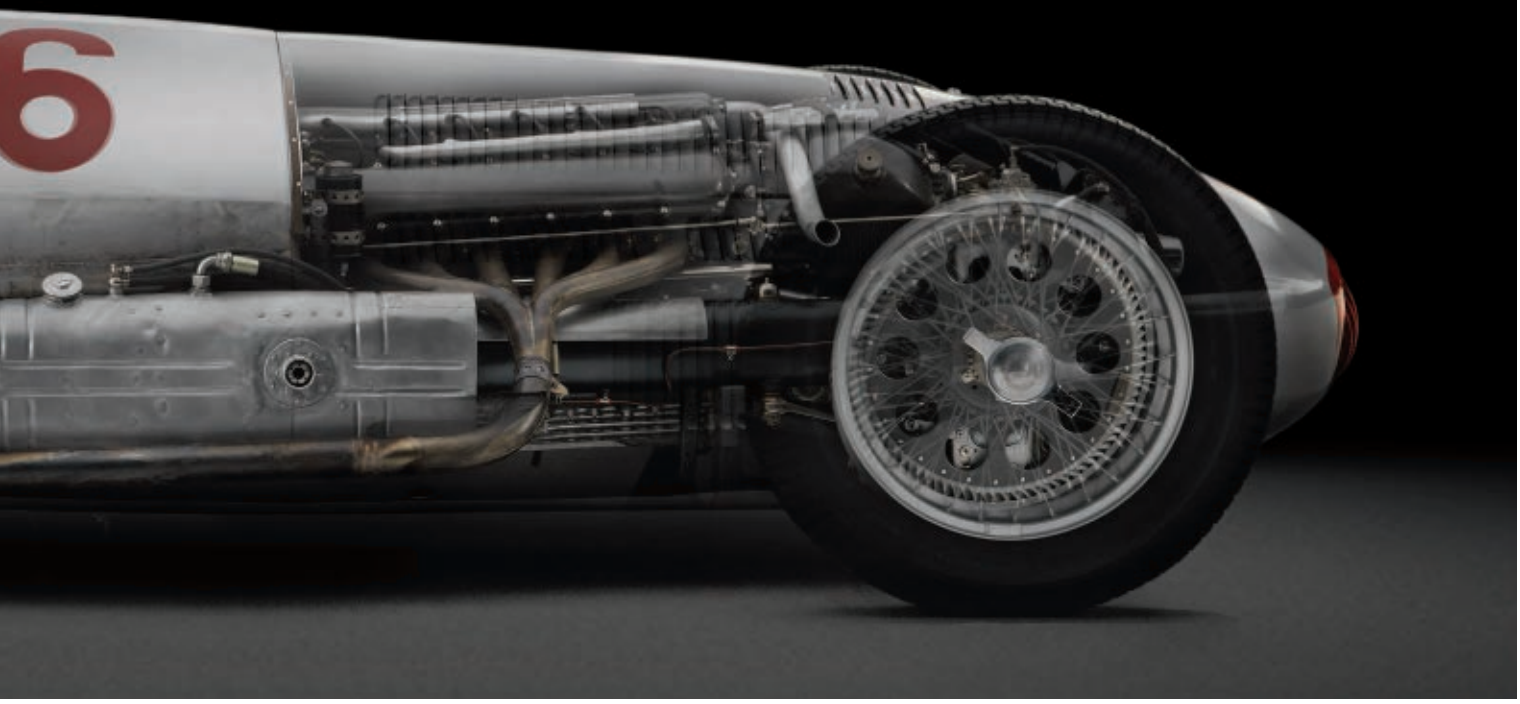
FRENCH CONNECTION

Lang's W154 won the Tripoli GP in May 1938, but von Brauchitsch's French GP victory (LEFT) in July was its first points-scoring win.



MERCEDES-BENZ W154
TECHNICAL SPECIFICATIONS (1939)

Configuration front-engine, rear-wheel drive, open-wheel, single-seat prototype

Category Grand Prix
Championship AIACR European Championship (1938 and '39)

Engine Mercedes-Benz M163 (superseding 1938-spec M154); longitudinally-mounted, 2,962cc, 60-degree V12 w/double overhead camshafts; two-stage Roots-type supercharger (superseding twin superchargers on M154)
Engine weight 558lbs/253kg
Power/torque 483hp @ 7,800rpm; 361lb.ft @5,000rpm
Transmission Mercedes-Benz 5-speed manual transmission w/ZF differential

Chassis Nickel-chrome molybdenum oval tube frame w/aluminum bodywork
Brakes Hydraulic drum
Front suspension Independent w/double wishbones, coil springs and hydraulic dampers
Rear suspension De Dion axle, longitudinal torsion bars, and driver-adjustable hydraulic dampers

Weight 2,160lbs/980kg
Length 181.1in/4,600mm
Width 72.8in/1,850mm
Height 49.2in/1,250mm
Wheelbase 107.1in/2,720mm

the next level wouldn't just be a wasted opportunity, it would be a compromise – and compromise was something the Mercedes-Benz racing department didn't deal in. Yes, the W154's chassis would be based on the W125's sturdy tubeframe design, but that was by choice, not expediency.

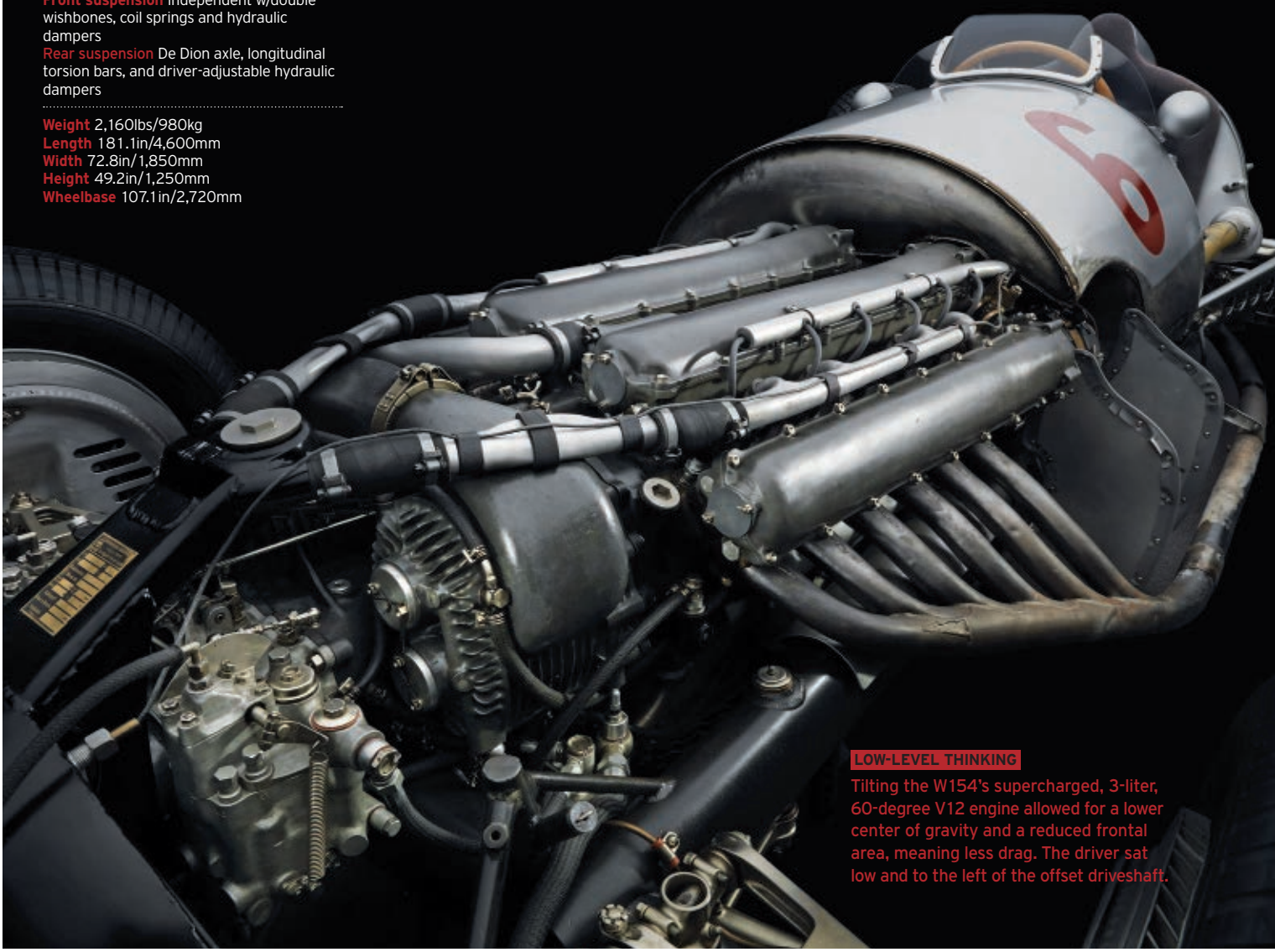
Proving that it's not just modern grand prix teams that possess the manpower and resources to work on current and future designs concurrently, preliminary design on the W154 began in early 1937, in parallel with development of the W125.

With the new-for-'38 3-liter engine barely half the capacity of the M125, Heess knew 600hp was out of the question. But with the goal of increasing power per liter by 50 percent, he'd still set his sights high.

Options considered, but quickly discarded, for the W154's engine and basic layout included a naturally aspirated, direct-injection W24 (three banks of eight cylinders) mounted in the rear, *a la* Auto Union, with a streamlined "teardrop" body.

A 4.5-liter inline-8 was also mooted, but the chosen solution was a front-mounted, twin-supercharger, 3-liter, 60-degree V12, the M154. For cooling, each block of three cylinders had its own welded steel-plate cooling jacket, while engine oil flow was 100 liters per minute.

Bench testing of the engine began Jan. 1938. Heess initially chose to run with fuel injection, but settled for twin carburetors



LOW-LEVEL THINKING
Tilting the W154's supercharged, 3-liter, 60-degree V12 engine allowed for a lower center of gravity and a reduced frontal area, meaning less drag. The driver sat low and to the left of the offset driveshaft.

CONSTANT EVOLUTION

Detail changes on the 1939-spec W154 included (LEFT) cooling fins on the brake drums and (ABOVE) a two-stage supercharger on the new M163 engine.

similar to the ones used in M-B's land speed record attempts. Problems with valve bounce necessitated a less aggressive cam profile for the early races of '38, yet the M154 still came out of the crate with 427hp at 8,000rpm. That would rise to 474hp as reliability improved, but the W154 was still fitted with a five-speed transmission to compensate for its reduced power and torque compared with W125.

On the chassis side, engineer Max Wagner wanted a lower, more streamlined car, so the engine was tilted over to allow the driveshaft to run offset to the right, with the driver sitting low and to the left. A lower, wider radiator was key to a reduced frontal area, and the overall result of the car's low-line configuration wasn't just a reduced center of gravity, but significantly less drag, too.

On the minus side, the high-revving M154 gorged on fuel and oil, so a 140-liter saddle tank was fitted over the driver's legs. Added to a 240-liter rear tank capacity, the W154 was capable of running a grand prix distance with just one stop – good enough.

With Wagner improving torsional rigidity of the basic chassis by 30 percent, early testing was impressive, and that was borne out by the W154's results in 1938. As well as winning three of the four grands prix counting for the European Championship, with Caracciola, von Brauchitsch, Lang and Richard Seaman finishing 1-2-3-4 in the >

LAT archive

Gently does it... Manfred von Brauchitsch drifts his Mercedes-Benz W154 on the throttle in the 1939 Eifelrennen on the Nurburgring-Nordschleife. For the rapt crowds, drivers like von Brauchitsch were the astronauts of their era.

THE END OF AN ERA

W154/15

The star of *RACER*'s photo shoot, 1939-spec chassis 15, was one of two Mercedes-Benz W154s to start the Belgrade City Race, Sept. 3, 1939 – two days *after* the start of World War II.

Manfred von Brauchitsch (nephew of the German army's commander-in-chief) put it on the pole, but decided a much better plan than racing would be to fly to neutral Switzerland. Team manager Alfred Neubauer apprehended him at Belgrade airport and convinced him to take part.

Von Brauchitsch duly led the early laps, ahead of Tazio Nuvolari's Auto Union, but spun – irony alert – in front of the French Embassy. He recovered to finish second in the very last race of the Silver Arrows era.

Revs Institute archive

Mercedes-Benz W154/15 is wheeled out for the start of the 1939 Belgrade City Race.

THE REVS INSTITUTE

RACER thanks The Revs Institute® for kindly allowing us to photograph its stunning 1939 Mercedes-Benz W154.

The Revs Institute for Automotive Research, Inc., based in Naples, Fla., is a not-for-profit 501(c)(3) organization featuring The Collier Collection of more than 100 significant and rare automobiles built between 1896 and 1995 – vehicles that variously blazed technical trails, redefined aesthetic standards, made history and changed the world.

The Institute and its extensive archive is a haven for scholars, preservationists and connoisseurs of automotive history, and open to the public Oct.-July by advance reservation. Visit **revsinstitute.org**.

W154/15 (ABOVE) is one of more than 100 cars of the Collier Collection curated and maintained by The Revs Institute.

standings, the W154 took three out of five non-championship GPs entered. All good, but Uhlenhaut and Mercedes-Benz racing manager Alfred Neubauer wanted more.

Over the winter of 1938-'39, M-B developed a new engine, the M163, that reduced oil consumption and featured a higher compression ratio. In the early part of the season, a two-stage supercharger was added, ultimately increasing power to 483hp, as well as delivering a wider, more consistent band for the drivers to work with.

Detail changes on the 1939-spec W154 (often incorrectly called a W163) included a smaller radiator that resulted in a reduced frontal area, new bodywork, small fins on the edge of the brake drums that acted as cooling fans and a larger, 185-liter saddle tank. Sadly, with another 235 liters in the rear tank, the W154's enormous fuel capacity (420 liters/110 U.S. gallons) would


LAT archive

add to the severity of the blaze that claimed the life of Seaman after he hit a tree in a soaking Belgian GP at Spa-Francorchamps. Still, despite the brutality of the cars and the rough and ready nature of the tracks, the British racer was the only driver to die in a Mercedes during the pre-war period.

Factory W154s ran in just seven races in 1939, winning three out of four European Championship GPs held and two of three non-championship events, the third of which, the Belgrade City Race, ran Sept. 3, two days *after* the start of World War II (see sidebar, page 35). Lang was the season's dominant driver, but with the advent of hostilities and confusion over the points system, the French-based AIACR never officially declared the German as champion.

In the fall of 1939, based on the bluster and bombast of Adolf Hitler and his cronies, Germany expected a short, successful war – indeed, M-B's racing department initially hunkered down on preparations for 1940 – yet the reality proved rather different.

As the conflict escalated and dragged on, the cars were lost, stored or dispersed piecemeal (a story in itself). For the Silver Arrows and their fearless drivers, it was the end of a golden era, but not quite the end of the W154 story (see sidebar, RIGHT). ■

MERCEDES F1: PERKS OF THE JOB...

Dull and repetitive PR duties come with the territory when you're a Formula 1 driver. But one perk of being on Mercedes' F1 payroll is getting to play with some of the jewels from the company's museum in Stuttgart, and all in the name of PR.

In 2013, Lewis Hamilton was given a chance to drive a 1938 ex-Rudolf Caracciola W154 on the Nurburgring-Nordschleife.

Was he impressed by the ultimate pre-war Silver Arrow? That would be an understatement...

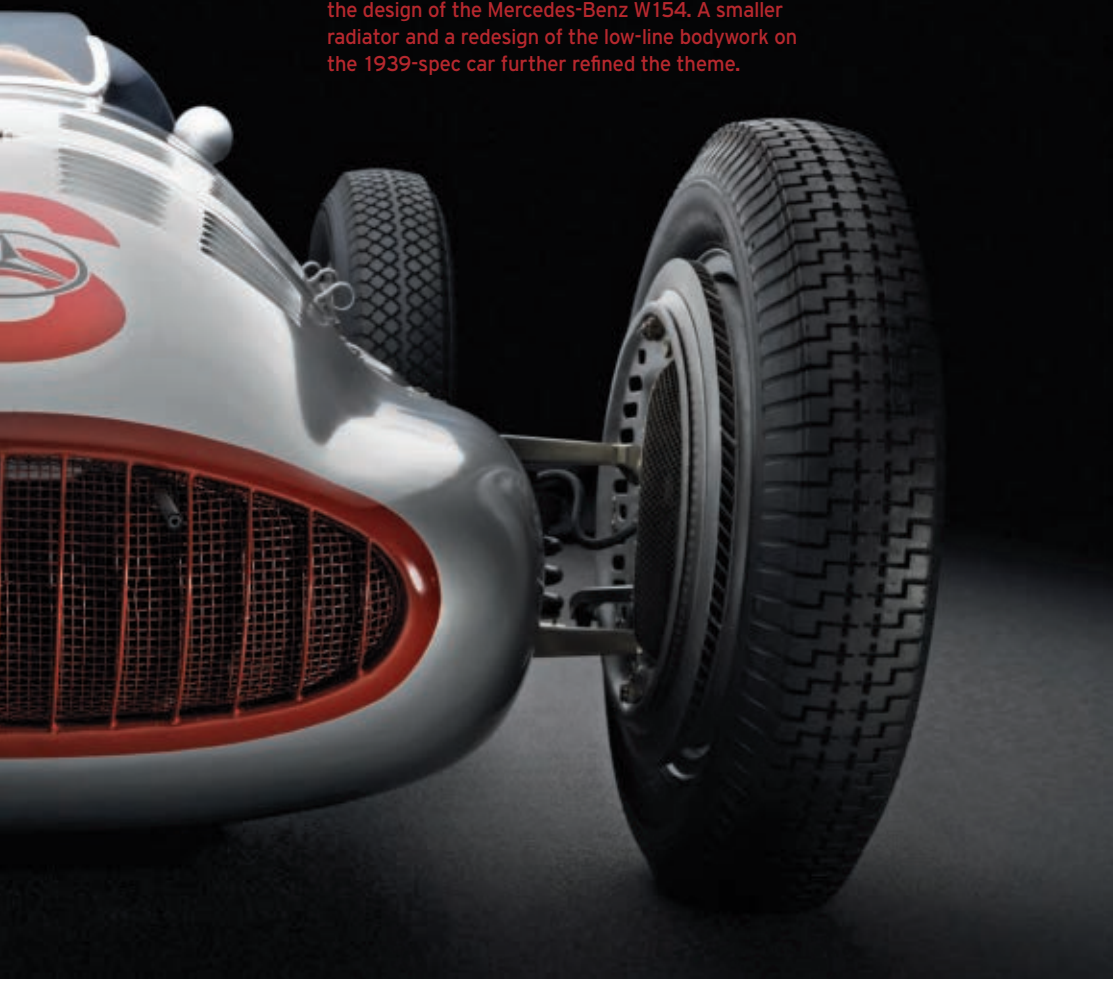
Search YouTube for **Lewis, W154** and **Nordschleife.**


Steve Etherington/LAT

Although compact for its era, the W154's cockpit still provided plenty of room for its driver to manhandle the steering wheel in classic bent-elbows style, albeit in elegantly upholstered comfort... (LEFT) The 1939 Swiss GP was the last European Championship victory for the W154. Eventual winner Hermann Lang leads Rudolf Caracciola at the start.

FRONTAL ATTACK

Reducing frontal area to minimize drag was key in the design of the Mercedes-Benz W154. A smaller radiator and a redesign of the low-line bodywork on the 1939-spec car further refined the theme.



W154'S FINAL FLOURISH

AN AMERICAN CODA

With Europe ravaged by six years of fighting, finding intact Mercedes-Benz W154s at the end of World War II seemed unlikely. And yet, eight of the 16 built survived the maelstrom, having been spirited to the far-flung corners of eastern Europe.

Chassis No. 9, Hermann Lang's winning car at the non-championship 1938 Coppa Ciano, was found in what is now the Czech Republic and shipped to the U.S. in 1946 by Tommy Lee, who'd inherited a number of L.A.-based radio stations from his father, Don.

The mighty V12-powered machine was entered for the 1947 Indianapolis 500, Duke Nalon driving. After major

IMS archive

(ABOVE) Duke Nalon qualified Tommy Lee's newly-acquired Mercedes-Benz W154 18th for the 1947 Indianapolis 500.

engine problems necessitated casting a new piston, Nalon started 18th, but retired after 119 laps when the part failed.

In 1948, Chet Miller qualified the same car 19th, but it retired on lap 108 with relief driver Louis Tomei on board.

A year later, ol' No. 9 was entered by owner/driver Joel Thorne, who'd fitted a straight-six engine but failed to make the field. Interestingly, Mercedes team manager Alfred Neubauer was in attendance to gather information for a mooted 1951 "500" entry by the Three-Pointed Star and its W154s.

That never happened, but the W154s did get one final runout, in 1951, when M-B sent cars to Argentina for Lang, Karl Kling and local hero Juan Manuel Fangio to race in the non-championship, two-heat Buenos Aires Grand Prix. Lang and Kling each earned a second place, with Fangio taking a third followed by a non-finish.

LAT archive

(ABOVE) Juan Manuel Fangio explains his non-finish in heat two to Argentine president Juan Peron and his wife, Eva, AKA "Evita."


Sam Bloxham/LAT

Charles Coates/LAT


Alastair Staley/LAT

Andy Hone/LAT

WORDS Adam Cooper | **MAIN IMAGE** Steve Etherington/LAT

CHAIN OF COMMAND

If you've wondered how Formula 1 decides its rules, but don't know your Strategy Group from your Formula One Commission, read on...

As anyone with a passing interest in Formula 1 probably knows, its commercial side has traditionally been governed by the Concorde Agreement. But after the last one expired at the end of 2012 we're still in a strange limbo: a "Concorde Implementation Agreement" exists, signed by F1's governing body, the FIA, and its commercial rights holder, Formula One Management (FOM), but not the teams. It's still not clear what the next step will be.

Leaving aside those commercial aspects, the sport itself is governed by three key FIA documents. The basic framework for all FIA-regulated competition is the International Sporting Code, which in essence outlines how a meeting is organized and run, and defines the powers of the stewards and so on. With specific reference to F1, it also contains information related to superlicenses and the licensing of senior staff, brought in after the 2007 McLaren/Ferrari "Spygate" scandal.

The other two documents that pertain to the F1 World Championship are the F1 Technical and Sporting regulations. The first does exactly what it says, outlining in detail every conceivable parameter of the cars and power units. The technical rules for each season are finalized by June 30 of the preceding year, in order to give teams sufficient lead time as they design their new cars. In exceptional circumstances, and only with unanimous agreement, changes can be made after that date.

In addition, as seen in the past, rules can be fast-tracked on safety grounds. The actual phrasing in the International Sporting Code reads: "Changes that the FIA makes to the regulations for safety may come into effect without notice or delay."

"The perception was that it was all being driven from the bottom up. We have more of a top-down approach now"

CHARLIE WHITING

The Sporting Regulations contain everything related to the running of a Grand Prix event, and that includes some crossover with the technical side in terms of specifying such things as the number of tires permitted over a weekend, rules relating to usage of gearboxes and power unit elements, and the penalties

MEET THE CAST

(OPPOSITE PAGE, from top left) FIA president Jean Todt; F1 commercial czar Bernie Ecclestone; FIA headquarters in Paris; Luca di Montezemolo, chairman of Ferrari – one of the teams with permanent seats on both the F1 Strategy Group and the Formula One Commission; (BELOW LEFT) F1 race director Charlie Whiting. (BELOW) The role of technical directors, such as Mercedes F1's Paddy Lowe, has diminished since the demise of the Technical Working Group in 2012.

associated with any transgression.

Overseen by the FIA's Charlie Whiting, the Sporting and Technical Regulations are organic, tweaked and updated every year. But how does that process occur?

Until recently there existed a Sporting Working Group, made up of the 11 F1 team managers and the FIA, and a Technical Working Group – the 11 technical directors. All the teams had a say as ideas were discussed, agreed, then passed up the chain via the F1 Commission for ratification by the World Motor Sport Council.

Amid some controversy, the process was changed after the old Concorde Agreement ran out. Now there is a body known as the Strategy Group, on which only six of the 11 teams are represented. There are five permanent members in Ferrari, Red Bull Racing, McLaren, Mercedes and Williams, while the next best-placed team in the championship becomes a member for the following year. So that honor currently belongs to Lotus.

Each team has a vote, while the FIA and FOM (in other words F1 commercial czar Bernie Ecclestone) have six votes each, with decisions requiring a simple majority. The other five teams, namely Force India, Sauber, Toro Rosso, Caterham and Marussia, are not involved, to their obvious frustration. They get no official information about what happens in those meetings, and they don't have a formal opportunity to contribute to new ideas, other than by asking a Strategy Group member to put them on the agenda of a meeting.

However, they do have some input by participating in "informal" sporting and technical meetings, which involve all the teams, but are only used to refine ideas that come from the Strategy Group.

"The Sporting and Technical Working Groups don't exist formally any more," says Whiting. "They were in the old Concorde Agreement. We do consult all the teams of course, and we have sporting and technical regulation meetings, but only because, for example, the Strategy Group, as part of their overview, says something like, 'We don't want brake ducts.' We'll refer it to a technical regulations meeting. Based on what the Strategy Group wants, the regulations meeting will come up with the regulations to fulfil those requests."

There is some logic to the principle of the big decisions emerging from a group >

THE SILENT MAJORITY

Despite the advent of fan forums and surveys, F1 fans are distinctly absent from any formal decision-making. Would the double-points finale have been adopted if they were more involved?

Steve Etherington/LAT

of team principals, rather than technical directors or team managers, even if it doesn't include all 11 players.

"Previously, everything went into the Working Groups and got discussed there," says Whiting. "When they were happy with it, it was sent up to the Formula One Commission. In theory, the first time the F1 Commission heard about anything was when it arrived there from the Working Groups. So the perception was that it was all being driven from the bottom up. We have more of a top-down approach now."

"We [the FIA] can say something is illegal if we think it is. It's up to the teams to contest it"

CHARLIE WHITING

Proposals that emerge from the Strategy Group go to the Formula One Commission, on which all teams are represented by their bosses, along with other key stakeholders, namely Ecclestone (its chairman), Jean Todt as FIA president, eight race promoters, tire-supplier Pirelli, two sponsors (currently Rolex and Marlboro), and an engine supplier (Renault, which does not have its own team). Proposals have to secure 18 out of 25 votes to be passed, or unanimity of the 11 teams is required if it's post June 30.

Charles Coates/LAT

(LEFT) Bernie Ecclestone and FIA president Jean Todt sign the "Concorde Implementation Agreement." Teams are yet to ratify the new version of F1's commercial contract.

If approved, they proceed to the World Motor Sport Council. If they've got that far, passing them is usually a formality.

While all teams are involved at the Formula One Commission stage, the body can only discuss proposals that have come from the Strategy Group. Thus, while the five disenfranchised teams do get a vote, their input is limited, and they may have little or no warning about what they are about to hear when they enter a meeting. This has been the cause of considerable tension. Clearly, the big teams often have very different agendas, especially when it comes to subjects such as cost control.

It seems a little hit and miss as to what does get through the F1 Commission. The plan to make the last race of the season pay double points made it all the way through, seemingly without anyone realizing what a public outcry it would cause. By the time it became apparent and some key players began to question it, it was too late.

In contrast, other controversial changes – a ban on tire warmers and a package of cost control measures, including major changes to the weekend schedule – did not get passed at the last Commission meeting, despite approval by the Strategy Group.

A rule change that left fans despairing when they first saw the 2014 cars related to the noses. You could question how the technical directors could have come up with the rule without realizing the outcome, but Whiting denies that was the case.

"I don't think they did know how it would end up when the rule was written," he says. "It was written with the best of intentions to make the noses safer, but when they started wind tunnel development, they realized there was a more aerodynamically beneficial way, which involved making them look a little less conventional."

The good news is that it will – hopefully – be addressed by changes for next year: "It wasn't so much the aesthetics, as the fact that the tip of the nose – the bit that was structural – was too high," says Whiting.

Alastar Staley/LAT

"They probably won't look so bizarre now."

A fascinating case study was provided by FRICS, front and rear interconnected suspension. Such systems had been in use since 2009, but the FIA began to suspect teams were pushing the limits of legality, especially with regard to where they planned to take things in 2015. Whiting issued a "Technical Directive" just before the German GP questioning the legality of FRICS. It opened the door for teams to protest rivals. One by one they all decided to take the systems off their cars – nobody wanted to be the test case in a protest.

"We can say something is illegal if we think it is," says Whiting. "It's up to the teams to contest it. Before Germany, we sent the note out saying we think something could be called into question, or words to that effect. It soon became clear that no one was prepared to risk it in Germany, or in Hungary.

"Then we looked into it in more detail on some of the systems and felt that there is really very little doubt that they do contravene the rules. Hence, another Technical Directive which says that any car using it *will* be reported to the stewards, whereas before it said they *might* be."

Whiting sends out many such Technical Directives during the year, and they usually represent a form of "housekeeping," tidying up loose ends. Often – as might be the case with FRICS – they may be incorporated into the following year's regulations.

Charles Coates/LAT

(ABOVE LEFT) F1's bizarre 2014 noses somehow sneaked in under the F1 Strategy Group's radar. (LEFT) Charlie Whiting prepares to get the 2014 Grand Prix of China underway.

"You can't put all those things in regulations, because they're living, evolving documents. You keep changing them slightly to keep up with what you learn about, say, FRICS. You could argue it's too complicated sometimes, but that's how it's evolved."

One positive development this summer was a directive from the F1 Commission to the effect that stewards should be more lenient on driver behavior, and in effect allow them to race hard – a bit like a soccer referee being told to keep the action flowing, rather than blow a whistle for every possible transgression. It was an unusual move, but one that showed that, contrary to what some fans might think, those in charge do try to do what's best for the sport. ■


Charles Coates/LAT

F1 RACE STEWARDS

ENFORCING THE RULES

As F1 race director, Charlie Whiting runs the track action and makes calls on things like the use of safety cars or red flags, but he does not impose penalties – his job is to inform the stewards and let them make a judgement.

The FIA Sporting Code says that the stewards "shall have supreme authority for the enforcement" of the regulations. Generally they respond to reports sent to them by Whiting or from FIA F1 technical delegate Jo Bauer, if there is an issue directly related to a car.

In recent years the FIA has improved the stewarding process by focusing on a smaller pool of trusted individuals.

There are four stewards at each race, headed by a Permanent Chairman from a rotating group of four. He's joined by two other "regular" stewards, one from an FIA pool of around a dozen, and one nominated by the national federation.

In an initiative introduced by Jean Todt, the fourth steward (and not a mere advisor) is a former driver – a role filled by the likes of Nigel Mansell (ABOVE), Alain Prost and Emerson Fittipaldi.

The stewards have a shopping list of available penalties, from reprimand to exclusion, via grid penalties, time penalties and drive-throughs. New this year is a five-second stop-and-go penalty that could be added to a regular pit stop – it was created at the behest of the stewards, who wanted something for minor offenses.

The stewards can also hear protests from competitors, which usually relate to the eligibility of a rival team's car.


Andrew Hone/LAT

Charlie Whiting focuses on the operation of an F1 race, including safety car deployment. Any penalties are handled by the stewards.

AMERICAN DEBUT
The 6 Hours of Circuit of The Americas sees the North American debut for Porsche on its return to prototype sports car racing with its high-tech 919 Hybrid (RIGHT).

STARS SHINE IN TEXAS

The 2014 FIA World Endurance Championship is heading to Austin's Circuit of The Americas for a battle royal under starry Texas skies.

North American sports car racing fans get to experience some of the unique atmosphere and excitement of the 24 Hours of Le Mans and see the world's most high-tech racecars in action when the FIA World Endurance Championship races into the night at the 6 Hours of Circuit of The Americas, Sept. 20.

The Austin, Texas, track hosts Round 4 of the 2014 FIA WEC in an unmissable double-header with the TUDOR United SportsCar Championship.

But it gets even better. With a 5:00 p.m. CT start time for the 6 Hours of CoTA and the sun setting on the Lone Star State just a couple of hours later, the majority of the WEC race will take place with headlights blazing. Darkness always cranks up the intensity level, and with action guaranteed throughout the multi-class field, it promises to be an awesome spectacle.

Stars of the show are the factory LMP1-H prototypes from Audi, Porsche and Toyota. These hybrid racers are bristling with cutting-edge technology that harvests otherwise wasted energy and uses it to provide breathtaking performance *and* unprecedented efficiency (see page 48).

But efficiency doesn't mean these guys are taking it easy. Far from it...

Ebrey/LAT

"The rules are there to provide racing, not an economy run to save fuel," says FIA WEC boss Gerard Neveu, "and for six hours these cars will be *racing*."

Toyota's TS040 Hybrid won the opening two six-hour races, but Audi hit back in the 24 Hours of Le Mans. With class newcomer Porsche already proving it has the pace and reliability to race at the front, too, the battle for the overall victory at CoTA will surely be an epic.

Behind the three-way LMP1-H fight, the action promises to be just as exciting and unpredictable through the rest of the field.

FLASHBACK TO 2013

Last year's inaugural 6 Hours of CoTA was won by the Audi R18 e-tron quattro of Loic Duval, Tom Kristensen and Allan McNish (LEFT). The trio went on to take the 2013 FIA WEC title.

John Rourke/AdrenalMedia.com

Nothing else in top-level motorsports compares with the variety found in endurance racing. (MAIN) LMP2 Morgan-Nissan, LMP1-H Toyota TS040 and GTE class Aston Martin Vantage share the asphalt at the Spa FIA WEC round.

Jeff Bloxham/LAT

NINE-TIME STARS

Nine-time Formula 1 Grand Prix race winner Mark Webber (ABOVE) and nine-time 24 Hours of Le Mans victor Tom Kristensen are just two of the star names competing in the 2014 FIA WEC.

"Stars of the show are the factory LMP1-H cars, hybrid racers bristling with cutting-edge technology"

The privateer LMP1-L prototypes from Rebellion Racing and Lotus will be dueling behind the factory P1 cars, with the LMP2 class adding extra sizzle, too (see page 60).

The production-based GT classes are set to provide their own brand of ultra-close competition until the checkered flag flies, with Corvette Racing's mighty C7.R taking on the European invaders from Aston Martin, Ferrari and Porsche in GTE Pro, and Krohn Racing putting Texas into the middle of the slugfest for GTE Am honors.

But experiencing the FIA WEC live doesn't end with the action on the track. Accessibility is an important part of every event, with fans getting a chance to see the cars up close in the pit lane and meet their drivers in the autograph session.

"At CoTA, there will be plenty to see and do around the event for the whole family to enjoy," says Neveu. "With the WEC, we are taking the Le Mans endurance spirit all around the world."

2014 FIA WORLD ENDURANCE CHAMPIONSHIP

1	April 20	**6 Hours of Silverstone** Silverstone Circuit, Silverstone, United Kingdom
2	May 3	**6 Hours of Spa-Francorchamps** Circuit de Spa-Francorchamps, Spa, Belgium
3	June 14-15	**24 Hours of Le Mans** Circuit de la Sarthe, Le Mans, France
4	Sept. 20	**6 Hours of Circuit of The Americas** Circuit of The Americas, Austin, Texas, USA
5	Oct. 12	**6 Hours of Fuji** Fuji Speedway, Oyama, Japan
6	Nov. 2	**6 Hours of Shanghai** Shanghai International Circuit, Shanghai, China
7	Nov. 15	**6 Hours of Bahrain** Bahrain International Circuit, Sakhir, Bahrain
8	Nov. 30	**6 Hours of Sao Paulo** Autodromo Jose Carlos Pace, Sao Paulo, Brazil

FIA WEC TIMETABLE

6 HOURS OF CIRCUIT OF THE AMERICAS

Thursday, Sept. 18	
2:45 p.m.–4:15 p.m.	FIA WEC free practice 1
7:30 p.m.–9:00 p.m.	FIA WEC free practice 2
Friday, Sept. 19	
10:20 a.m.–11:20 a.m.	FIA WEC free practice 3
6:00 p.m.–6:25 p.m.	FIA WEC qualifying (GTE Pro/GTE Am)
6:35 p.m.–7:00 p.m.	FIA WEC qualifying (LMP1/LMP2)
Saturday, Sept. 20	
9:30 a.m–10:15 a.m.	FIA WEC autograph session (paddock – behind pit garages)
11:35 p.m.–2:20 p.m.	TUDOR United SportsCar Championship – 2hr45m race
3:00 p.m–4:30 p.m.	Concert – Blue Oyster Cult (Austin360 Amphitheater)
4:30 p.m.–4:50 p.m.	FIA WEC pre-race ceremonies
5:00 p.m.–11:00 p.m.	**FIA WEC 6 Hours of Circuit of The Americas**

John Rourke/AdrenalMedia.com

SECOND SCREEN APP

Fans can now get unprecedented access to live feeds, information and data from the FIA WEC, thanks to the series' Second Screen app. It's free to download, so go to **fiawec.com** and find out more.

ESM GUNS FOR P2 GLORY

Crack TUDOR Championship squad Extreme Speed Motorsports brings its HPD ARX-03b to play in P2 at CoTA, with Scott Sharp, Ryan Dalziel and Ed Brown as the driver lineup.

LOCAL HEROES vs. THE WORLD

Corvette Racing to take on the GTE Pro regulars in Texas

After an impressive, but ultimately frustrating debut for its new C7.R at the 24 Hours of Le Mans, Corvette Racing is set to battle the WEC's GTE Pro class big guns once again – this time on its home turf at the 6 Hours of Circuit of The Americas.

The team fell just short of its eighth GT class win at La Sarthe in June, finishing second to AF Corse's No. 51 Ferrari 458 Italia after niggling new-car problems and an epic fightback during the early hours.

But Tommy Milner and Jordan and Ricky Taylor will be looking to go one better when their solo C7.R goes up against two-car entries from Aston Martin, Porsche and AF Corse at CoTA.

U.S.-based Krohn Racing also returns to the WEC to take on the seven GTE Am regular entries heading to the Lone Star State. Texan Tracy Krohn shares the 458 Italia with Nic Jonsson and Ben Collins.

Jeff Bloxham/LAT

YOUNG AMERICANS

Not lacking in experience, but with an average age of just 25, Tommy Milner and Jordan and Ricky Taylor are the youngest combo ever to race a factory Corvette.

Camden Thrasher

LOTUS LET LOOSE

The WEC's LMP1-L class for non-hybrid privateer entries is set for a significant boost with the debut of the new Lotus P1/01 (RIGHT) at the 6 Hours of Circuit of The Americas. The AER V6 turbo-powered machine, driven by Christophe Bouchut, James Rossiter and a yet-to-be-named third driver, will take on Rebellion Racing's Toyota-powered R-Ones. Both teams are looking to make ground on the factory LMP1-H cars, thanks to a post-24 Hours of Le Mans weight reduction for P1-Ls.

Lotus

Ebrey/LAT

WEC ON THE ROAD

SHIPPING THE SHOW

The AF Corse team, which runs almost a quarter of the cars that will be on the FIA WEC grid at CoTA, undertook a massive logistical task involving seven cars, 40 tons of equipment (that's not including those cars) and more than 100 people to be ready to race in Texas, Sept. 20.

AF team manager Batti Pregliasco is the man charged with ensuring that four AF Corse Ferraris (ABOVE), 8Star's 458 Italia and the two SMP Racing ORECA-Nissan LMP2s made it to CoTA and then on to the final four WEC rounds.

Five of the cars were transported by sea freight in a package organized by the WEC's transportation partner, DHL.

The other two – the No. 51 GTE Pro Ferrari and No. 71 GTE Am entry – left on a Boeing 747 freighter in early September bound straight for Austin. They'd remained in Europe for testing purposes and to undergo repairs after an accident at Le Mans, respectively.

After the CoTA race, the entire WEC grid will be flown to Japan for the Oct. 12 Fuji race in four 747s. A mixture of air and sea freight is then used to transport the cars to the remaining races.

"DHL does a great job," says Pregliasco. "But the unexpected can sometimes happen. In 2013, our equipment arrived in Bahrain a week before the race, but it rained in the desert and everything was full of water when we arrived."

WEC on the move... A total of 60 sea containers carrying cars and equipment left the port of Antwerp, Belgium, headed for Houston, Texas, at the end of July.

ITS OVERACHIEVEMENT STARTS FROM WITHIN.

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It's easy to get caught up in the details that make the SRT® Viper stand out. From hand-sewn Nappa leather-wrapped seats to hand-painted body panels and stripes, this car may be seen as something to be saved for special occasions only. But Viper wasn't built to sit idle. Its carbon fiber components weren't created to live beneath a car cover. Its unique options make for a truly rare, one-of-a-kind vehicle, but there's nothing a daily commute can dish out that it can't handle. This is the kind of collector car that is meant to leave them in the dust, not collect it. Learn more at ***driveSRT.com***

CAN TOYOTA MAKE IT THREE?
Toyota has won both six-hour FIA WEC races held in 2014, at Silverstone and Spa (RIGHT). Can its LMP1-H TS040 HYBRID make it three at CoTA, or will Audi or Porsche end the streak?

John Rourke/AdrenalMedia.com

Q&A

GERARD NEVEU

CEO, FIA WORLD ENDURANCE CHAMPIONSHIP

Ahead of its return to the Circuit of The Americas, FIA WEC boss Neveu gives us his thoughts on the series, the spectacular on-track product, and its possible future direction.

Halfway through its third season carrying world championship status, where does the FIA WEC stand relative to your initial aims and hopes for it?
The FIA WEC has come a long way since the announcement by the ACO and FIA Presidents in 2011 and its first season in 2012. In 2012, the championship was a baby, and in the past three years it has grown up and achieved a lot in a relatively short space of time. We are slightly ahead of where we hoped we would be at this stage. ACO president Pierre Fillon and FIA president Jean Todt are very involved in the championship, and both take a personal interest in its development and direction.

The LMP1-H class is proving to be a spectacular battleground for the participating factories. For a manufacturer wanting to go racing, what is the unique selling point of competing in the WEC over, say, Formula 1 or the World Rally Championship?
The area with the greatest stride forward is the fact that two major manufacturers have joined, or will join. This is due to several factors, but mainly the new technical regulations, which give manufacturers the freedom to showcase new technology, and due to the growing marketing and promotional reach of the championship. In many other championships, the regulations are quite restrictive, whereas the WEC technical rules have been written to give each manufacturer a good deal more latitude to develop new systems.

"The rules are there to provide racing, not an economy run, and for six hours the cars will be *racing*"

THE WEC CALENDAR

NORTH AMERICAN EXPANSION?

There's speculation that a second North American race could be added – perhaps in Canada?
The USA will continue to figure strongly in any future FIA WEC calendar. It's no secret that we are talking to tracks for a second North American race, but those negotiations are still ongoing.

In terms of number of races and locations, how close are you to the optimum WEC calendar?
Eight races on four continents is a good calendar, and one we feel meets the needs of the championship and our partners. We're always looking for new opportunities, but the conditions must be correct.

Is a new-format calendar, running fall to mid-summer, a possibility?
There are several plus points to running a new format calendar, starting September and finishing at Le Mans in June. The most obvious is marketing the calendar as "The Road to Le Mans." It makes sense to have the biggest motorsport

John Rourke/AdrenalMedia.com

LMP1'S OTHER BATTLE
At CoTA, Rebellion Racing's 2014 dominance of the LMP1-L class for privateers (LEFT) will gets its toughest test so far when Lotus joins the fray with its AER-engined P1/01 contender.

John Rourke/AdrenalMedia.com

(ABOVE) The LMP1-H factory hybrids from Audi, Porsche and Toyota head up an FIA WEC field that provides multi-class variety and spectacular racing.

GETTING THE FAN VOTE

263,300 fans attended the 2014 24 Hours of Le Mans, up 18,300 from 2013. The Second Screen App was downloaded 225,000 times during the week of the race.

Gabi Tomescu/AdrenalMedia.com

Technology – and, specifically, road car-relevant technology – is a key storyline for the WEC. How do you tell that story?
For more than 90 years, endurance racing, especially the 24 Hours of Le Mans, has been a test bed for technical innovations, some of which are now common on road cars. Disc brakes, radial tires, turbocharged engines, direct injection and high-performance diesel engines, to name a few.

The FIA WEC is continuing this story. We work with the manufacturers to tell the story of these new hybrid systems, but not so it is too technical and switches people off. Diesel engines used to be boring and only for people who wanted to save money, but Audi won Le Mans and now diesel engines provide economy and performance, and the majority of cars in Europe are now diesel. We can provide a communications platform to do the same for hybrid technology.

What can U.S. fans expect to see when Audi, Porsche and Toyota battle it out over six hours at the Circuit of The Americas?
Toyota won the first two races at Silverstone and Spa, and Audi won at Le Mans. Porsche has been quick from the first event, taking a podium at Silverstone and leading Le Mans. The races have been just that – *races*. The rules are there to provide racing, not an economy run to save fuel, and for six hours these cars will be *racing*. These are the best sports car drivers in the world, and add in the team strategy and you have the potential for some brilliant on-track entertainment.

How is the atmosphere and the excitement of the 24 Hours of Le Mans infused into the other races in the WEC?
The FIA WEC is the ambassador for Le Mans; it is the 24 Hours of Le Mans on tour, and we try to bring that sense of excitement that is very evident at Le Mans to every track we visit.

Le Mans is more than just a race, it is a legend and a huge celebration of human endeavor. We've been very successful at giving the fans at our races the same atmosphere. Each WEC race has a party atmosphere, and this will be the case at CoTA, with plenty to see and do around the event for the whole family to enjoy.

A STRONG PARTNERSHIP

ACO president Pierre Fillon (BELOW, left) and FIA president Jean Todt (CENTER) take a keen interest in the WEC, working closely with series CEO Neveu (right).

Paola Depalmas/AdrenalMedia.com

(LEFT) Could a future FIA WEC calendar culminate with its jewel in the crown, the 24 Hours of Le Mans?

event in the world as the finale of the world championship. It's also easier to market the events when there is little other high-profile motorsport over the winter.

However, there are challenges, and we're still working with the FIA, ACO, our teams and partners to see how best it could be achieved. Firstly we need to consider stability for the events, which have been carefully built up and marketed over the past three years. There is also the impact of any changes to sporting and technical regulations to take into consideration.

It's still being discussed and we are not yet able to give a definite answer on if and when it could happen.

THE WEC FAN EXPERINECE

YOU'RE PART OF THE STORY

When a fan attends a WEC race, what can they expect from the experience?
Anyone attending a round of the FIA WEC is an important part of the event, and not made to feel like they're on the outside. Ticket prices are reasonable and aimed at the whole family.

The fans are given the opportunity to walk in the pit lane, get close to the cars, meet the drivers and grab a picture and autograph. The drivers are accessible and not hidden away behind high fences or in the back of VIP motorhomes for the whole day, only coming out to drive the car.

Endurance racing is a human story, one that is interesting and engaging. The fans are part of this story and we want them to be part of our event.

For fans at the track, or following a WEC race from home, tell us about how you've enhanced the viewing experience with new technology.
Yes, for 2014 we've introduced the FIA WEC Second Screen app, where fans either at the track or at home can follow the action on their computer, iPad or Android device and have control of what they can see and follow.

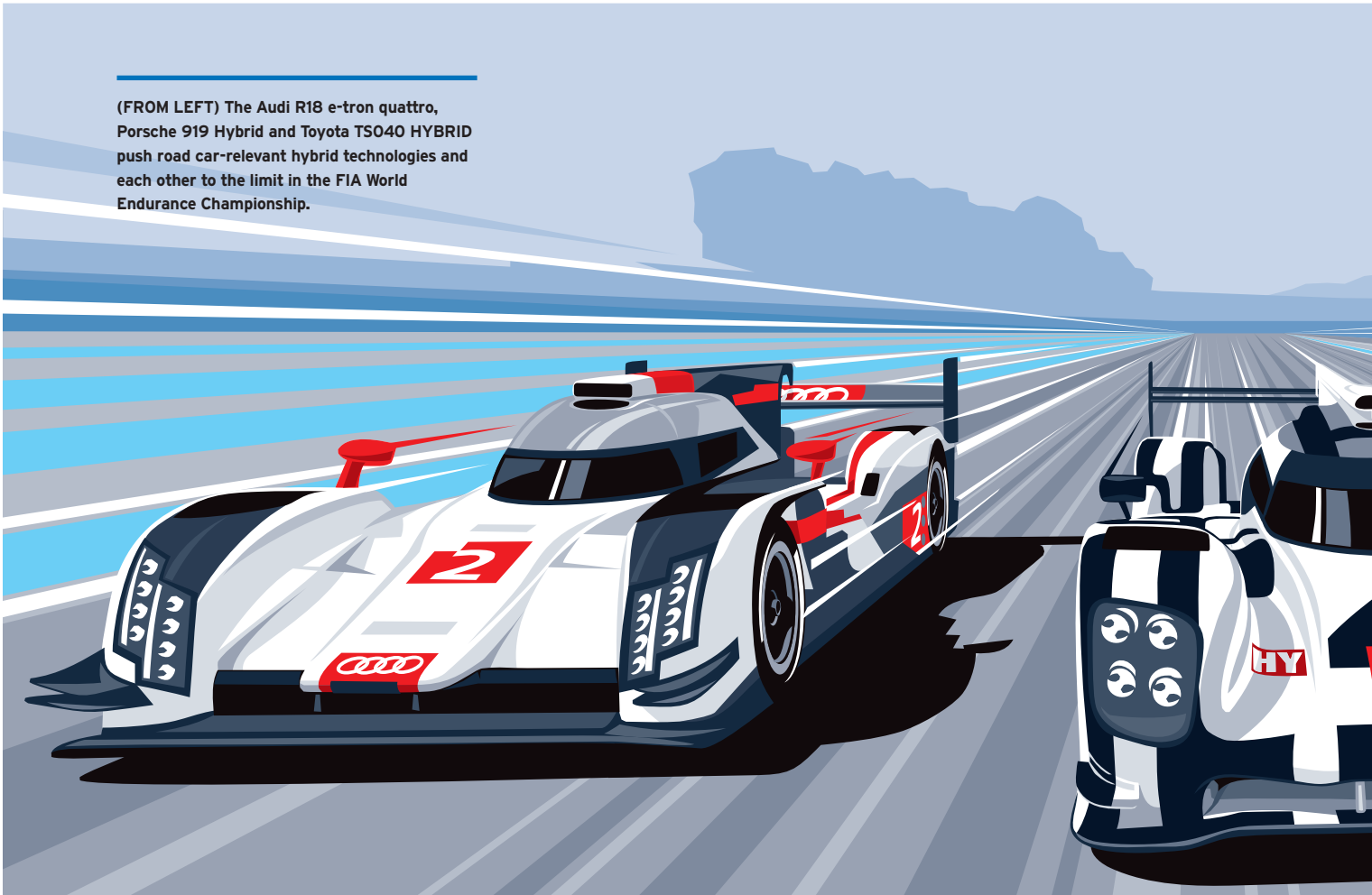
Selectable onboard cameras, live timing, live TV feed and other information at their fingertips makes watching an FIA WEC race more enjoyable, and it's easy, and free, to download at **www.fiawec.com**.

You don't need to have the app to follow the race, but it certainly brings another dimension to the fan experience.

How important is the U.S. to WEC?
The USA is a hugely important market for everyone involved in the WEC, and the Circuit of The Americas is the perfect place to host our U.S round.

Paola Depalmas/AdrenalMedia.com

(ABOVE) At every FIA WEC race, there are plenty of opportunities for fans to get up close with the cars and the drivers



(FROM LEFT) The Audi R18 e-tron quattro, Porsche 919 Hybrid and Toyota TS040 HYBRID push road car-relevant hybrid technologies and each other to the limit in the FIA World Endurance Championship.

TIME MACHINES

Like something out of a science fiction movie, the LMP1-H cars from Audi, Porsche and Toyota push technology to the limit, with future benefits for the street cars we all drive.

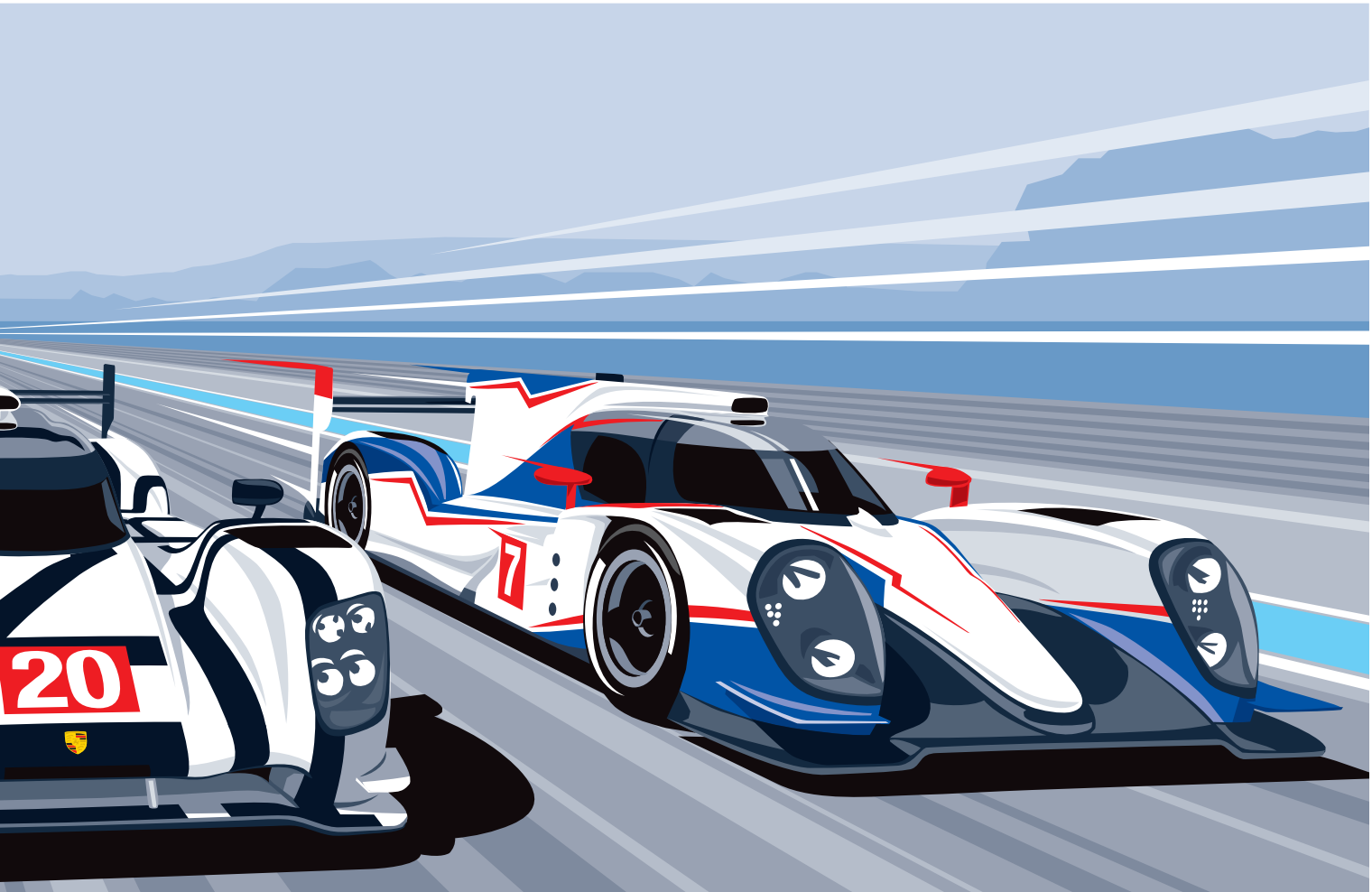
WORDS Marshall Pruett
ILLUSTRATION Paul Laguette

Hidden away inside the recesses of the *Automobile Club de l'Ouest* and the *Federation Internationale de l'Automobile*, the men in charge of crafting the new LMP1-H regulations decided a half-ration of insanity and a full measure of inspiration was needed to prod the automobile industry.

Within the minds of those freethinkers, a concept involving the shift from heavy reliance on fossil fuels began to percolate. It quickly expanded to an interwoven matrix of aerodynamic purity, decreased curb weight, reduced fuel capacity, fuel usage limits per lap, and increased hybrid assistance to steer its marquee prototypes in a greener, more relevant direction.

The ACO/FIA decided a complete sea change was in order, and the risk/reward factor would certainly favor those capable of mastering the challenge, but at what price?

Announced in 2012, the new-for-'14 regulations could perhaps have been perceived as a massive overreach. To comply with them, costs would rocket and



taking huge gambles would be required at every step of the design process.

Yet Audi, Porsche, and Toyota immediately answered the call and, through the first three rounds, the eco-friendly regulations devised by the ACO's Vincent Beaumesnil and his FIA brethren allayed any fears that the World Endurance Championship would become a tedious fuel-saving exercise for LMP1-H cars.

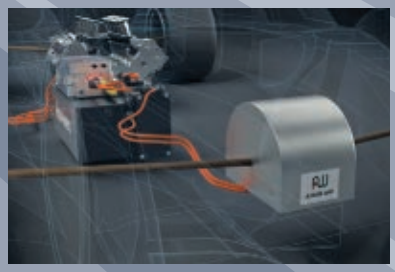
June's 24 Hours of Le Mans featured lap times that eclipsed the best seen in 2013 by more than a half-second, and even with new-formula reliability issues that inevitably hit each camp, the 82nd running of the race was defined by fierce LMP1-H battles.

The endurance classic also brought three wildly disparate technical interpretations to the world's attention, stealing a technological march from Formula 1 in the process.

"Our target was to motivate our manufacturers in new ways – to improve fuel consumption and reduce the use of fossil energy by 30 percent, while maintaining the same performance," says Beaumesnil. "It's a massive challenge. Le Mans had diesel and gasoline; it had hybrid, so it was logical to do more innovative things with the technology. The idea was to not become an economy race, and it isn't all about hybrid systems. It's about every part of the car being better and smarter – we are the only series with big freedom on the internal combustion engine. LMP1-H is in its own category in motor racing."

CHOOSE YOUR ENGINE

Porsche opts for a 2-liter, turbo V4 (ABOVE); Toyota uses a 3.7-liter, naturally-aspirated V8; Audi chooses a 4-liter turbodiesel V6.



CHOOSE YOUR ERS

Toyota (ABOVE) harvests energy from both axles; Audi and Porsche harvest front only, with the latter adding heat energy recovery.

The brilliance of the new rules comes in a pick-and-choose menu where only maximum values are documented. Manufacturers select an engine size, its corresponding fuel allowance per lap and >

John Rourke/AdrenalMedia.com

"This is energy that would otherwise be lost. As soon as we can harvest and convert it, it's pure power gain"

PASCAL VASSELON

an energy recovery level (8MJ max.; 2MJ min.), and then massaging the specific balance between engine displacement and energy recovery system (ERS) oomph is open to individual interpretation.

Go the route of a bigger engine and you pay the price with more frequent stops for fuel. Opt for something smaller, and you overcome the power deficit by saving time with fewer trips to pit lane. On the surface, this could have been a minefield for manufacturers – a set of rules demanding a sacrifice of speed or economy, yet the formula allows efficiency to be increased *without* surrendering performance.

Motivated by the liberal LMP1-H rulebook, the three marques set off in three very different directions, choosing engine architectures and hybrid power levels that prescribe to unique ideologies.

Toyota put its faith in a 6MJ super capacitor ERS system mated to a growling 3.7-liter, naturally-aspirated V8 that combine to rattle the earth with 1,000hp. The TS040 HYBRID is an engineering marvel, yet packs a punch as subtle as an earthquake. Wins at the first two six-hour rounds and pole at Le Mans spoke volumes about the German-built machine.

Audi's pioneering nature was diverted from the engine bay to material sciences. The R18 e-tron quattro is a technical masterpiece, its 4-liter, turbodiesel V6 and flywheel-based ERS system were thoroughly optimized, and with the smallest 2MJ hybrid solution in the series, the German brand also made a statement on where its interests lie.

Porsche, meanwhile, channeled *Star Wars* and quirky Swedish automobiles for its return to prototype sports car racing.

Reprising a 40-year-old engine layout last seen in the Saab Sonnet, the most famous name in endurance racing married a brand-new 2-liter, turbo V4 to a 6MJ flywheel ERS unit. Impossibly short and light, the V4 engine is complemented by a featherweight chassis and running gear – it's the waifish supermodel in the paddock. While all LMP1-H cars feature electric motors driving the front wheels, only Porsche chose a secondary exhaust-driven ERS system to spread the recovery load.

Of the three, Porsche took the task of total vehicle efficiency to the extreme, while their rivals embraced a Texas-sized appetite for brute force through mechanical or electrical means. Those seemingly random choices are a byproduct of science, math and philosophy, and reveal firmly held – and opposing – views on the right path to follow. At one extreme, if you want to get an earful on whether hybrid systems belong in racing, just ask Audi Sport engine guru Ullrich Baretzky about how the R18 ended up with the smallest 2MJ system...

"If you look at the big hybrid systems, the combustion engine in the same time per lap is producing 140MJ of energy," he says. "Compared to the 100kg [220lb] of weight the hybrid unit adds, making 6MJ has a marginal effect on the car. So you are carrying an enormous weight for the dream to save energy, but you waste 10 times more. This is not the path to efficiency. This is the wrong way to go and I'm absolutely against it from the very first day."

At the other end of the spectrum, and in sync with the Japanese giant's class-leading Prius hybrid road car, Toyota aimed for the maximum MJ figure it could capture.

"We went for 6MJ because this is energy that would otherwise be lost, and as soon as we can harvest this energy and convert it, it's pure power gain," says Toyota Racing technical director Pascal Vasselon. "6MJ option with kinetic energy recovery is absolutely right – the most efficient."

Toyota's decision to stick with a V8 during the new ultra-efficiency era was indeed a surprise; something small and turbocharged would seem to be a better fit

LMP1-L PUTS PRIVATEERS IN THE MIX

LMP1-L (as in, Light) is a P1 category purely for privateer teams running non-hybrid P1 cars.

Without the high-tech energy recovery systems (ERS) used by the factory LMP1-H cars, costs are reduced.

The privateer machines weigh less than a factory prototype, run larger fuel tanks and are allowed to consume more fuel per lap in ongoing efforts to bring them closer in performance to the LMP1-H machines.

Rebellion Racing (BELOW) will be joined by LMP1-L newcomer Lotus at the 6 Hours of CoTA.

Sam Bloxham/LAT

Rick Dole/LAT

John Rourke/AdrenalMedia.com

Camden Thrasher

A WHOLE PACKAGE

The LMP1-H hybrid power units grab the headlines, but Audi (ABOVE LEFT) and its competitors still put considerable resources into optimizing aero efficiency and performance. Slick pit work remains a key ingredient, too, given the closeness of the competition among Audi (LEFT), Porsche and Toyota as they fight for WEC honors.

(LEFT) Porsche's 919 Hybrid makes sparks fly at the 24 Hours of Le Mans. (MAIN) Toyota's No. 8 TS040 HYBRID, already a two-time 2014 winner, gets some TLC from its ever-attentive crew.

for the bigger company philsosphy, but Vasselon's team came to its decision based on performance needs.

"Everyone said a 2-liter turbo-4 would be best and, for a city trip, a small turbo engine can only be more efficient than a V8," he says. "But we're talking about a race engine that spends 75 percent of its life cycle at full throttle. Key things do change and it can be extremely efficient."

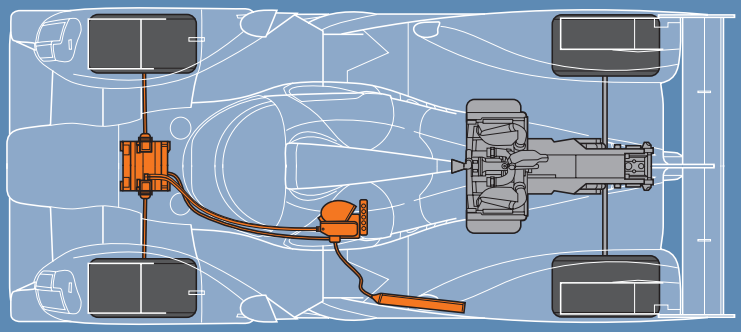
Porsche's Alex Hitzinger's view on the 919's needs was clear from the beginning.

"The aim is to combine the most efficient combustion engine with the maximum recovery potential and most effective hybrid system," he says. Porsche's self-described "atypical" V4 barely registers on the scales, allowing the addition of a second ERS while maintaining its lightweight philosophy.

"If you start with a naturally-aspirated engine, KERS is your only option," Hitzinger explains. "But turbocharging gave us >

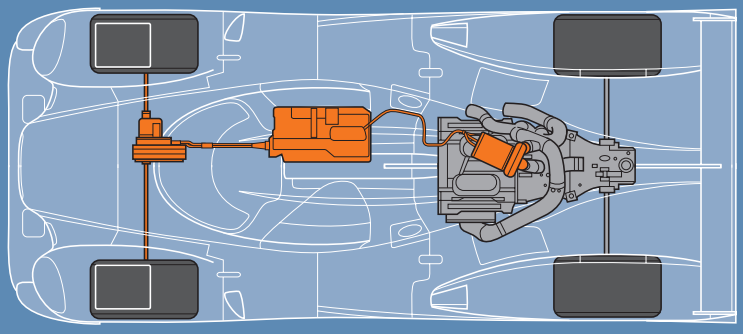
AUDI R18 E-TRON QUATTRO

The 2014 R18 could easily be mistaken for the '13 model, yet the Christopher Reinke-led design team penned an all-new ultra lightweight chassis to carve 97lb off the R18 to meet the new minimum weight. Sleek, drag-reducing aerodynamics transformed it at Le Mans, and with a new 4-liter, turbodiesel V6 engine – up from the previous 3.7-liter unit – sporting the same "bundle of snakes" top-mounted exhaust and turbo plenums on each side of the block, engine wizard Ullrich Baretzky's nod to 1960s Indy car engines was carried over.



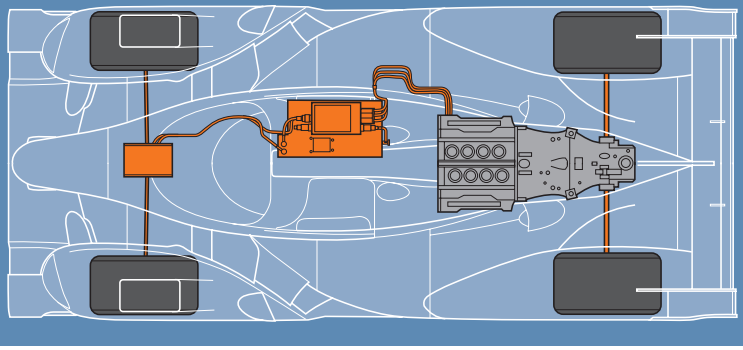
PORSCHE 919 HYBRID

Tech geeks would stand slack jawed if Porsche allowed its 919 Hybrid to be viewed without its bodywork. The official renderings it has distributed don't start to tell the true story. The 2-liter V4 engine is real enough, but due to its absence of length, Porsche engineers designed a bellhousing that looks more like a carbon-fiber art installation than something with the simple purpose of connecting the engine and transmission. Without the long bellhousing, the 919 would be more than a foot shorter.



TOYOTA TS040 HYBRID

Like Audi's 300cc leap in capacity, Toyota moved from 3.4 liters in 2013 to a new 3.7-liter V8 this season. As the only naturally aspirated LMP1-H, the relatively small endurance racing V8 lacks the big power numbers afforded by turbocharging, and that's where the TS040's hybrid motors make up for any shortcomings. Claimed engine power of 520hp and another 480 from ERS system's electric motors give it unparalleled thrust, and with the energy charge released in the blink of an eye by its super-capacitor, it shreds asphalt.




Gabi Tomescu/AdrenalMedia.com

NEW RULES DELIVER REAL RACING

Anyone thinking the high-tech LMP1-H rules would transform the WEC into a high-speed economy run was forced to think again after a close-fought 24 Hours of Le Mans. All three LMP1-H manufacturers led, and the final result was in doubt until the end.

another option, which is why we opted for using the energy from exhaust gases from the turbocharger."

Naturally, Porsche's rivals came to a different conclusion and execution.

"If you go for the turbo with exhaust gas recovery, it's lighter, but you do not receive a full charge and it drops efficiency from the combustion engine," counters Vasselon.

Three avenues taken, and each has proven to be the best fit for its marque. Audi even tried a shaft-driven turbo ERS system, but abandoned it in pre-season testing.

"If one car is two seconds faster, then the others must find two seconds. We will not give it to them"

VINCENT BEAUMESNIL

Using 6MJ ERS systems should have unlocked a number of fuel strategy options for Porsche and Toyota and disadvantaged the 2MJ Audis, but with efficiencies gained elsewhere, the R18s matched or exceeded their laps turned per stint at Le Mans. Which begs the question, is there such a thing as a wrong choice among the available LMP1-H options? Based on the results so far, the answer is a definitive no.

With much to showcase, the individual manufacturers are getting the message out about the new breed of prototypes and their ultimate relevance to road car technology.

"What's important for us is to promote the combination of hybrid systems and gasoline engines," Vasselon explains. "We have to be intelligent; it won't be a street engine optimized for racing. Toyota doesn't want to promote city cars with V8s..."


John Dagys/AdrenalMedia.com

Porsche engineers keep an eye on their highly complex baby, the 919 Hybrid. Unique among the three participating LMP1-H factory teams, Porsche uses kinetic *and* heat energy recovery systems.

Managing a tech-heavy fleet of LMP1-H cars also required growth within the ACO. "When I took my post in 2009, we had nine people for technical inspection at Le Mans," says Beaumesnil. "This year, I had 40."

From the ACO's Equivalence of Technology formula, LMP1-H cars are able to use different fuels, displacements, cylinder counts, induction methods and ERS, while posting similar lap times. Thanks to the EoT system – a wholly unrelated concept to Balance of Performance, manufacturers choose a path, build their cars, and are judged on their choices head to head on the race track. Simply put, LMP1-H is a contemporary take on motor racing's earliest principle: May the best car win.

"BoP should *never* be mentioned with LMP1-H," Beaumesnil states emphatically. "After they make their decisions, we do not interfere. They fight very hard to improve – if one car is two seconds faster, then it is faster. The other manufacturers must find two seconds. We will not give it to them. This is the spirit of racing we honor." ■

THREE-WAY BATTLE

LMP1: THE SEASON SO FAR


Gabi Tomescu/AdrenalMedia.com

(ABOVE) Sebastien Buemi, Anthony Davidson and Nicolas Lapierre celebrate a second consecutive 2014 victory at Spa.

Toyota began the 2014 FIA World Endurance Championship campaign with back-to-back wins for its TS040 HYBRID at the 6 Hours of Silverstone and Spa-Francorchamps, before Audi hit back with its 13th overall victory in the 24 Hours of Le Mans.

But with Porsche's all-new 919 Hybrid already earning a podium and a pole in its first three races, the season is turning into a three-way fight as the WEC heads to the Circuit of The Americas for round four, Sept. 20.

At the Silverstone season-opener, the No. 8 TS040 of Sebastien Buemi, Anthony Davidson and Nicolas Lapierre led a Toyota 1-2 in a race cut short by torrential rain. But the No. 20 Porsche 919 of Timo Bernhard, Brendon Hartley and Mark Webber put in an impressive cameo, finishing third on its debut.

Pole and an early lead for the No. 14 Porsche of Romain Dumas, Neel Jani and Marc Lieb served notice of intent, but the 6 Hours of Spa morphed into a more familiar Toyota-Audi duel, with Buemi, Davidson and Lapierre earning a second consecutive win, ahead of the R18 e-tron quattro of Lucas Di Grassi, Loic Duval and Tom Kristensen.

The 2014 24 Hours of Le Mans was a nail-biter, with multiple leaders and the result in doubt until the end. The No. 2 R18 of Marcel Fassler, Andre Lotterer and Benoit Treluyer finally led an Audi 1-2, ahead of Buemi, Davidson and Lapierre's delayed Toyota. Porsche, too, took a turn in the overall lead.


Gabi Tomescu/AdrenalMedia.com

(ABOVE) Audi's hard-fought 1-2 result at the 24 Hours of Le Mans was the 13th overall win at La Sarthe for the marque.

WORDS Gary Watkins | MAIN IMAGE John Rourke/AdrenalMedia.com

A TEST OF ENDURANCE

After saying goodbye to F1, Mark Webber is relishing the challenge of turning Porsche's all-new LMP1 into a winner.

Mark Webber walks and talks like a man happy with his lot right now. Less than a season out of Formula 1, and he's relishing the new challenge presented to him by Porsche in the FIA World Endurance Championship. Or, in words you might expect from a no-nonsense Australian, he's "bloody enjoying it."

"I couldn't be happier at the moment and F1 isn't something that I miss at all," he says. "I'm loving a new challenge and I'm loving being with a great marque like Porsche, and being part of its comeback with all the history that entails."

Getting more specific on the aspects of his new career path that give him the most satisfaction and he says he's "loving working with the engineers" as Porsche develops its new 919 Hybrid LMP1 contender. He finds "testing very rewarding, because of the progress we are making." And working closely with his two teammates in the No. 14 Porsche, Timo Bernhard and Brendon Hartley, is something he's "getting a real kick out of right now."

Then there's the chance "to do a stint and be within a tenth or two every lap for an hour." That's an oblique reference to his final seasons in F1 on the quirky, high-degradation Pirelli tire.

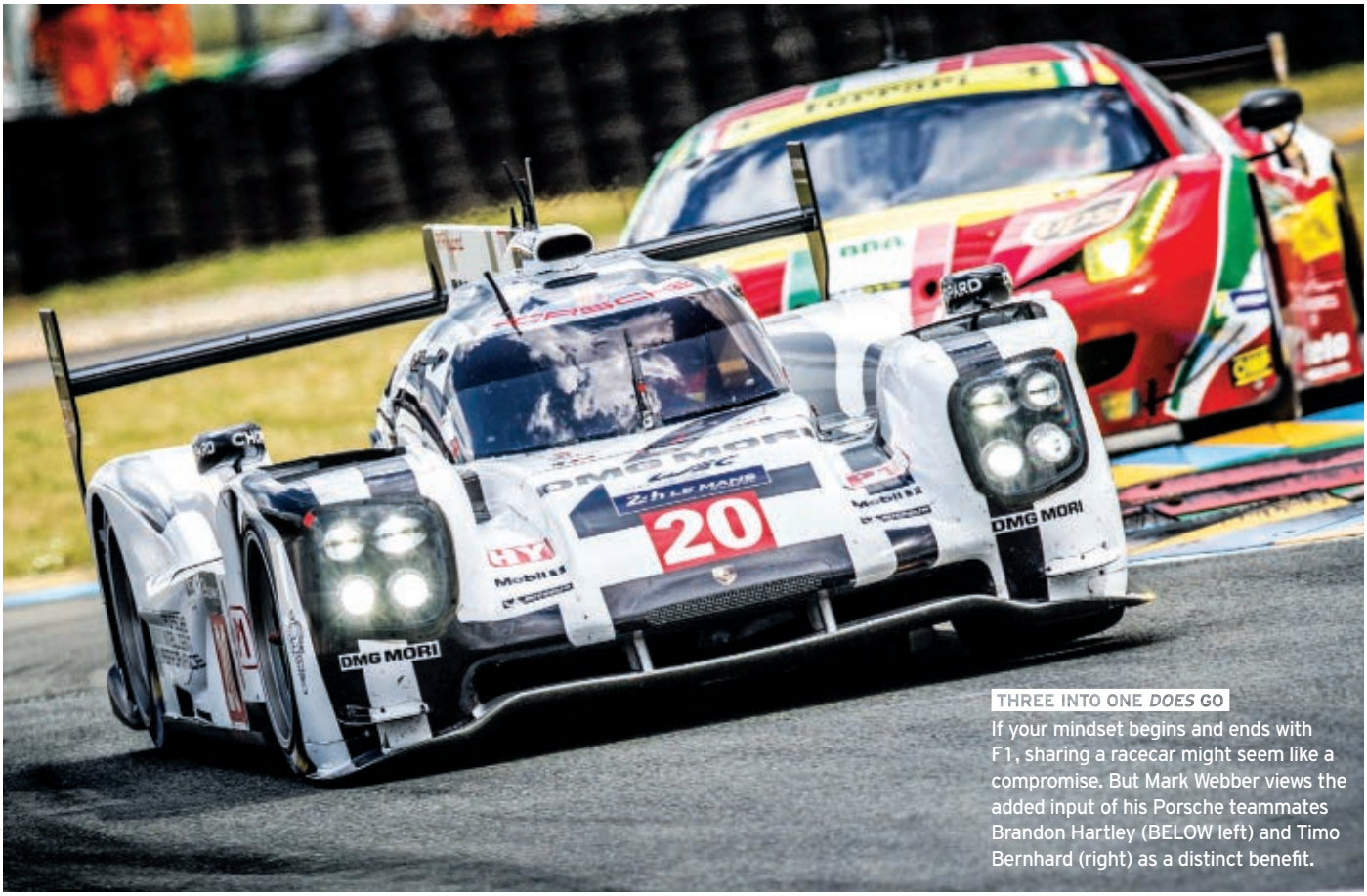
"It's like a tennis player trying to hit the white line every shot," he continues. "It was something I wasn't able to do in F1 at the end. I'm not knocking F1; it's just different. But it's really nice to be able to just focus on your driving and get great satisfaction out of it, and the way you do that is operating in a very tight window."

Webber's second sports car career – don't forget his two seasons with Mercedes in 1998-'99 and a near-miss in the FIA GT Championship in the first of those seasons – has proved rewarding so far.

"It's been a pretty reasonable start, I have to say," offers the 37-year old. "Our biggest achievement of the season by a long shot was our attempt on Le Mans."

The No. 20 Porsche driven by Webber, Bernhard and Hartley was leading the race in the 22nd hour – and on course for a second-place finish behind the chasing Audi that eventually won the race – when it retired with engine failure. That dramatically exceeded the expectations of a marque whose rhetoric was supremely respectful of the history of Le Mans and the reputations of LMP1-H rivals Audi and Toyota coming into the event.

"You have to take your hat off to everyone for leading laps so deep into the race," says Webber. "There was a bit of luck involved and a bit of attrition, but you don't get to be hanging around at the >



John Rourke/AdrenalMedia.com

THREE INTO ONE *DOES* GO

If your mindset begins and ends with F1, sharing a racecar might seem like a compromise. But Mark Webber views the added input of his Porsche teammates Brandon Hartley (BELOW left) and Timo Bernhard (right) as a distinct benefit.

A PODIUM RIGHT OUT OF THE BOX

A podium for Mark Webber (BELOW) on his FIA World Endurance Championship debut in April's 6 Hours of Silverstone was also a debut podium for Porsche's LMP1 919 Hybrid on the marque's return to the highest level of sports car racing.

Sharing with Timo Bernhard and Brendon Hartley, the ex-F1 racer started sixth. The trio's race consistency not only provided Porsche with precious mileage and data, but earned third, behind a Toyota 1-2.

GEPA/ Dutch Photo Agency

front with a couple of hours to go if you haven't got a lot of things right. That's the biggest feather in our cap so far."

The chances of a victory were remote, given that a handling imbalance that had afflicted the car since Saturday evening left it some way short of the pace of the winning Audi driven by Andre Lotterer, Marcel Fassler and Benoit Treluyer as it recovered from technical problems of its own. But Webber most definitely thought that a podium was on the cards when he climbed back aboard the 919 for the run to the finish on Sunday afternoon.

"When I got back in the car for the final stint, she was a bit sore and a bit tired, but I thought we had a good shot at making it home," says Webber. "But that's Le Mans – there's something waiting to trip you up around every corner."

Webber's own performance at Le Mans inevitably came under scrutiny: he was, after all, the newly arrived big shot from F1. The statistics reveal that he was slightly slower than co-drivers Hartley and Bernhard, who were in turn a pinch slower than their teammates in the No. 14 car, thanks to the handling problem mentioned earlier. But there's no worry on Webber's part there.

"I'm very relaxed on my contribution in terms of my driving," he says. "The track on which I have the least experience is Le Mans. I certainly wasn't keen on being super-adventurous during the race to see where I could improve. The goal was very clear: to keep the car circulating."

Rick Dole/LAT

"You don't get to hang around the front with a couple of hours to go if you haven't got a lot of things right"

MARK WEBBER

Webber, of course, has gone to Le Mans in the past. Twice he was on the entry list with Mercedes back in the late 1990s, but it should be pointed out that neither time did he actually take part in the race: in 1998 his Mercedes-Benz CLK-LM was out of the event with engine failure before he got to drive; and the following year, his Merc CLR was famously withdrawn after its second aerial incident of the event in the race-day warm up.

Webber thinks that his limited experience from 1998 and '99 was actually of no help at all in 2014.

"It wasn't worth having," he explains. "In actual fact, it was worse to have that experience because the braking points were so far off compared with today. It actually took me a bit of time to adjust properly."

Porsche returned to the pinnacle of sports car racing in 2014 proclaiming only modest ambitions. There was talk of the odd podium and proving that the 919 Hybrid was competitive, but victories? Such talk was noticeable by its absence – which was fair enough, given the complexity of the latest breed of LMP1 machines (see page 48) and Porsche's lack of recent experience in chasing overall victories.

As Fritz Enzinger, Porsche's vice-president LMP1, noted: "People are expecting victories from us, because we've won Le Mans 16 times, but we shouldn't forget that the last one was in 1998."

But three races down, and Circuit of The Americas next, those goals – a podium, proof of competitiveness – have been >

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Jeff Bloxham/LAT


Adam Warner/LAT


Paola Depalmas/AdrenalMedia.com

(ABOVE LEFT) For Webber, the challenge of optimizing car and driver for constantly evolving track conditions and temperatures – being versatile, in other words – is one he relishes. (ABOVE) Webber swaps with teammate Timo Bernhard at Le Mans. Sharing a racecar, and having to patiently watch and wait (LEFT) while the other guys take their turn, isn't a requisite in Formula 1...

achieved: the former, first time out at Silverstone in April when Webber, Bernhard and Hartley took third; the second at Spa, where the sister car earned pole, albeit in mixed conditions, and led the opening stint.

That's inevitably led to a tentative revision of those aspirations.

"It would be nice to win a race. We're keeping our feet on the deck, but we can't say any more that we are happy with just podiums, because we've already got one," says Webber. "We finished two laps down at Silverstone, so a third place finishing 10sec behind the winner would be a step forward.

"We need to be in a position to challenge for victories; we want to make our presence felt. I wouldn't say we are looking for victories in the plural, but we are aiming high. If everything comes together and we get a bit of luck, we're hoping to grab a win from Audi and Toyota over the final five races."

Webber stresses that Porsche, which has put together a new in-house squad for its top-flight sports car return, is still learning across the board. That includes the business of going racing.

"In terms of pit stops and strategy, we're still operationally massaging things together," he says. "Andreas [Seidl, Porsche's LMP1 team principal] told me a story about when the 14 car went off late in the race at Le Mans, the towing eye was bent, which made it hard to get the air gun in at the next pit stops.

"Those are the little things that you don't learn until you are out there. You have to learn them for yourself, because there's no manual. We have to keep learning, and I'm looking forward to contributing to that at the final five races of the WEC this year on tracks I know well, starting at the Circuit of the Americas."

Webber's short experience of the WEC so far has made him even more determined to succeed in his new challenge, and to win the 24 Hours of Le Mans.

"The emotions that come out at that event are something I've never seen at any other motor race," he says. "To see grown men cry because of the sheer effort and toil that you put in trying to get a car to survive for 24 hours was unbelievable. The emotions run high whether you win or lose.

"I think Le Mans is definitely the hardest race to win of them all, and having been through it now, that's something I appreciate even more.

"Would I say I'm not stopping until I win it?" muses Webber, who has a long-term contract with Porsche. "Not far off." ■

CHANGE OF MINDSET

A COLLECTIVE EFFORT

The most significant change for Mark Webber after calling time on his 12-season, 215-start Formula 1 career is having to share a racecar. "That's a big shift," he says. "Not having a car to yourself, particularly from the engineering perspective."

He knows he's still learning about that, but he's also enjoying it.

"I have been amazed at how open everyone is in terms of communication," he continues. "Timo and Brendon discuss how best to use the energy-recovery systems; we talk about how the tires will be at the end of a stint, and we look at each other's racing lines. It's great to work as a group to make the car go quicker."

Endurance racing, admits Webber, is a much more multi-faceted endeavor than F1. That's partly down to the technology: "This is more complicated than F1 when I left, though they have a lot of trick items this year, but in sports cars you can't be a one-trick pony.

"I got a taste for it when the night races came into F1 at Singapore and Abu Dhabi. In FP3 at Abu Dhabi, track temperature was probably 50deg C (120deg F) and then it would drop to only 30 (85). That's a big engineering challenge. In sports cars, we have that every event. You have to be versatile, because at two in the morning at Le Mans, the track will be very different to how it is in the heat of the day."

But driving a racecar is driving a racecar, be it an F1 open-wheeler, or an LMP1 coupe. "The extra weight of a 900kg (1,980lb) P1 car makes it different, and you certainly give up a lot of lap time there, but the rest is pretty similar: it's all about making the car go quicker."


Clive Mason/Getty Images

Webber's 12-season F1 career ended in 2013 (ABOVE), but earned him nine grand prix wins and 13 poles, all with Red Bull Racing.

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TWO PACK

The battle for LMP2 class honors will have an added twist at CoTA, with the Ligier JS P2 coupe competing in a six-hour WEC race for the first time.

WORDS Gary Watkins
MAIN IMAGE Camden Thrasher

Round 4 of the FIA World Endurance Championship at Circuit of The Americas might just be a watershed for the LMP2 class. The event marks the first time that one of the new breed of P2 coupes will race in a six-hour world championship race. But the true significance of the appearance of G-Drive Racing by OAK Racing's new Ligier, which made its race debut in the 24 Hours of Le Mans in June, will probably only become clear as the WEC heads into 2015.

The Ligier-Nissan JS P2, built by OAK Racing's sister company, Onroak Automotive, is the first of a new wave of P2 machinery conforming to the cost-capped regulations introduced in 2011. At CoTA, the solitary coupe will be raced by the G-Drive trio of Julien Canal, Olivier Pla and Roman Rusinov, in place of their familiar Morgan LMP2, but the likelihood is that closed-roof machinery will proliferate and provide the majority of the grid next year.

And the Ligier is only the tip of a coupe iceberg. The Strakka team has delayed the debut of its Dome S103, but will be out before the end of the 2014 WEC season, and Honda Performance Development's new ARX-04b, developed by Wirth Research in the UK, should be testing by

Sam Bloxham / LAT

CLEAN-SHEET COUPE

The Ligier JS P2 coupe is the first clean-sheet design from Onroak Automotive (its Morgan P2 car is a tweaked and renamed Pescarolo design). The JS P2 that ran at the 24 Hours of Le Mans and is entered for CoTA is Nissan powered, but HPD's P2 engine is also an option.

then, too. ORECA, the numerically-dominant marque in the P2 marketplace, also aims to have cars ready for customers in early 2015, while the Franco-Russian SMP Racing squad, which fields a pair of ORECA-Nissan 03s in this year's WEC, is building its own car for next season. Further out, Zytek has a coupe in the works, but it won't compete until 2016.

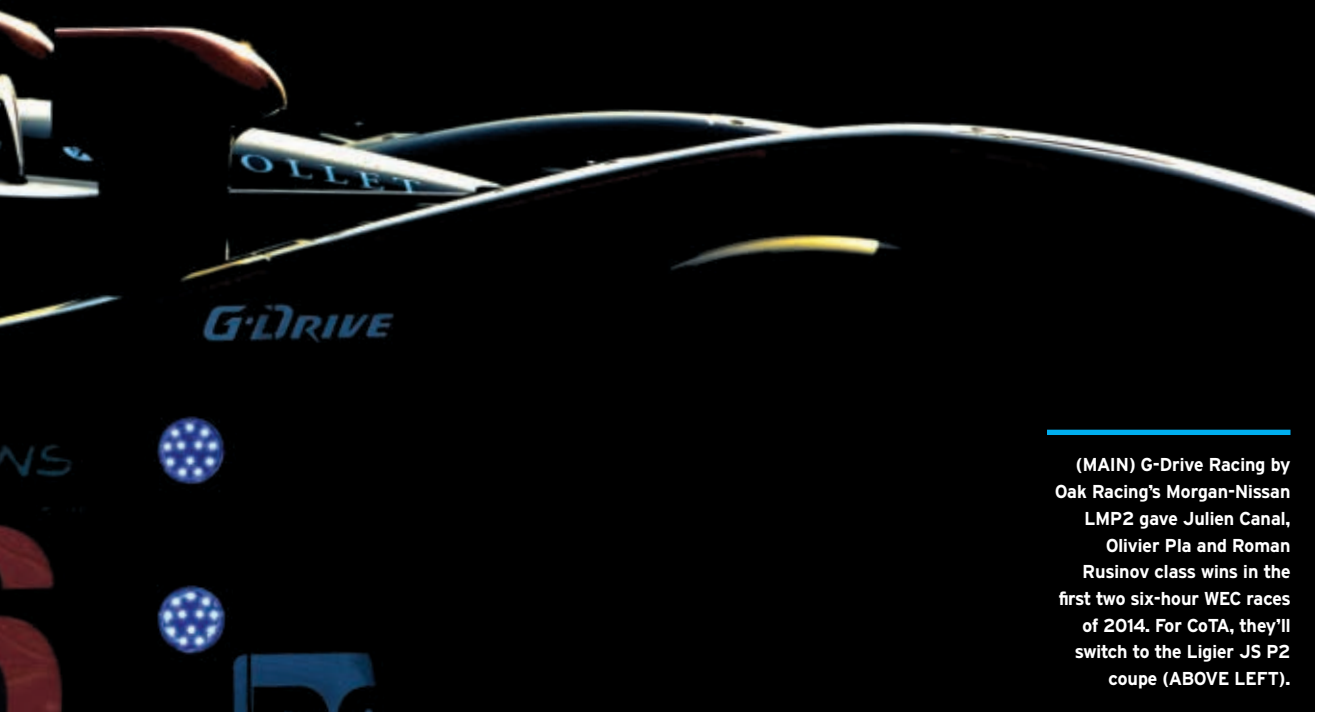
The Ligier's performance at Le Mans – the No. 35 car shared by Alex Brundle, Jann Mardenborough and Mark Shulzhitskiy arguably should have won the P2 class – suggested what many had suspected all along: that the latest breed of cars will raise the bar in LMP2. That's hardly surprising, given the age of existing open-top designs. The ORECA 03 and the Morgan, for example, are based on Courage and Pescarolo designs that started racing in 2006 and '07 respectively. But in a class that's intended to be a cost-effective destination for privateers, that doesn't mean the older cars will be instantly outclassed.

"It's impossible to build a chassis that is instantly two seconds a lap faster," says OAK Racing team principal Philippe Dumas, "and then there's the Balance of Performance." That's a reference to the *Automobile Club de l Ouest*'s aim to ensure that the old cars remain competitive through the life of the current P2 formula, which goes to the end of 2016.

The number of new chassis on the way suggests LMP2 is in a healthy place right now. P2 cars can race in WEC, the TUDOR United SportsCar Championship's Prototype class and the Asian and European Le Mans Series, and there were no fewer than 17 on the grid at Le Mans this year. On the other hand, only four WEC P2s will race at CoTA, although their ranks are bolstered by one of Extreme Speed Motorsports' HPD ARX-03bs, which has switched from the TUDOR Championship for the Lone Star Le Mans weekend.

As the promoter of the WEC, the ACO is not oblivious to the challenges facing the class. It revealed it was undertaking a root-and-branch review of P2 earlier in the season, looking at ways of reducing costs and also reviewing the pro-am structure that dictates a minimum of one silver-rated driver per car at the moment.

Although changes resulting from the review are unlikely to be implemented for 2015, the imminent proliferation of coupes and the ACO's continuing faith in the P2 class as a viable privateer platform point to a positive future. ■



(MAIN) G-Drive Racing by Oak Racing's Morgan-Nissan LMP2 gave Julien Canal, Olivier Pla and Roman Rusinov class wins in the first two six-hour WEC races of 2014. For CoTA, they'll switch to the Ligier JS P2 coupe (ABOVE LEFT).

LMP2: THE SEASON SO FAR

Back-to-back LMP2 victories in the 6 Hours of Silverstone and 6 Hours of Spa (BELOW) gave the G-Drive Racing by OAK Racing trio of Julien Canal, Olivier Pla and Roman Rusinov an early lead in the P2 drivers' points.

But with SMP Racing finishing best of the WEC-contending LMP2 entries at the 24 Hours of Le Mans, where double points were up for grabs, that's put the Franco-Russian ORECA-Nissan 03-equipped squad in the driving seat in both the drivers' and teams' points.

Sergey Zlobin currently holds a slight advantage over his SMP teammate, Anton Ladygin, the pair having raced separate entries in the first two races, before joining forces at Le Mans and adding former Ferrari F1 driver Mika Salo to their roster.

Gabi Tomescu/AdrenalMedia.com

WORDS Gary Watkins | MAIN IMAGE John Rourke/AdrenalMedia.com

GRAND PLANS

In the World Endurance Championship's super-close GTE class, making the right calls on strategy is crucial.

Five pit stops for a tank of fuel, four new tires and a driver change each time. That's likely to be the strategy played out by Aston Martin, Porsche, Ferrari and Chevrolet in the highly competitive GTE Pro class for the six-hour FIA World Endurance Championship race at the Circuit of The Americas. It is, however, rather more complicated than that.

There are safety-car caution periods to consider, which could alter the fuel or tire strategy. Teams might roll the dice and rewrite the gameplan, particularly if the conditions are wet. And before the cars even take to the grid, the two-driver, four-lap qualifying procedure that's been part of the WEC since its inaugural 2012 season has a strategy all of its own.

"In basic terms, it really is all about driving flat-out for every lap, then stopping for fuel at the end of each hour," says Aston Martin Racing's Darren Turner, who continues his long-running partnership with German Stefan Mucke in the No. 97 Vantage GTE in 2014. "Sometimes fuel-saving might come into it, but at the Le Mans 24 Hours, for example, where everyone was doing 14 laps per stint, it wasn't an issue, because there was no way we could do 15 laps in the dry."

That's the case right now, but it wasn't earlier in the season. Adjustments to the Balance of Performance in GTE affected the competitiveness of the Vantage and >

(MAIN, left to right) There's little to choose between GTE class contenders Aston Martin, Porsche and Ferrari on outright performance, so racing smarter and making good decisions can be the deciding factor when it comes to winning or losing.

John Rourke/AdrenalMedia.com

AF Corse driver Davide Rigon talks setup of his Ferrari 458 Italia in practice for the 24 Hours of Le Mans. With every WEC GTE race, regardless of duration, pretty much a series of all-out blasts interrupted by pit stops, optimizing setup is crucial.

a reduction in its fuel-tank capacity by five liters (1.3 U.S. gallons), applied before the end of last season, left AMR requiring an extra pit stop at the end of a race.

That resulted in the team gambling on double-stinting its Michelin tires at the Spa-Francorchamps WEC round in May.

"We had to throw everything at it to try to get a result," explains Turner. "If we'd just done things normally, we'd have been nowhere. We had nothing to lose, but it was still heart-breaking losing a good position by having to make the splash at the end."

Those five liters were given back to the Astons ahead of the Le Mans 24 Hours in June. The intention of the rule makers is to equalize stint length for all the GTE cars.

Double stinting the tires is not the norm in the six-hour WEC rounds. The gamble looked as though it might work for Aston at Spa, because Turner, Mucke and Bruno Senna, who joined them in preparation for Le Mans, were running second before their final, extra stop, but the benefits are limited.

"The drop off in the second stint is normally more than you gain in the pits by not changing tires," explains Turner. "The loss is even bigger in reality than in the simulations. On fresher rubber, you can be more aggressive in traffic and run off line, whereas older tires give you a much narrower operating window and you lose a lot more when you go off line."

GabiTomescu/AdrenalMedia.com

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(FAR LEFT) Wet conditions are often a chance to roll the dice on strategy. (LEFT) A plan comes together and the No. 95 Vantage V8 takes the GTE Am class win at Le Mans.

"The drop off in the second stint is normally more than you gain in the pits by not changing tires"

DARREN TURNER

Aston, like its rivals, generally single-stints its drivers, as well as the tires.

"It's easy to complete the driver change during the time you've got, so you might as well put in a fresh driver who's ready to push on," notes Turner.

A safety car, of course, can alter a team's plans. The strategic decisions will be made on the pitwall, but the guy behind the wheel has a role to play, too.

"We feed the guys on the pitwall with information to help them make their decisions," explains Turner. "You're the one actually driving past any incident, so you can see things that they might not be able to see from the TV monitors.

"Our job is to tell them what's going on out on the track: has the car that caused the safety car been removed? Who's going into the pits and who's staying out? You're telling them how quickly you think it's likely to go back to green-flag running, so they can keep adjusting their plan.

"It can actually be quite exciting driving around behind the safety car. There's some quick-fire communication going on and, quite often, a lot of swearing."

On one occasion, early in Turner's sports car career, it all got a little bit *too* exciting during a safety car, as he recalls... >

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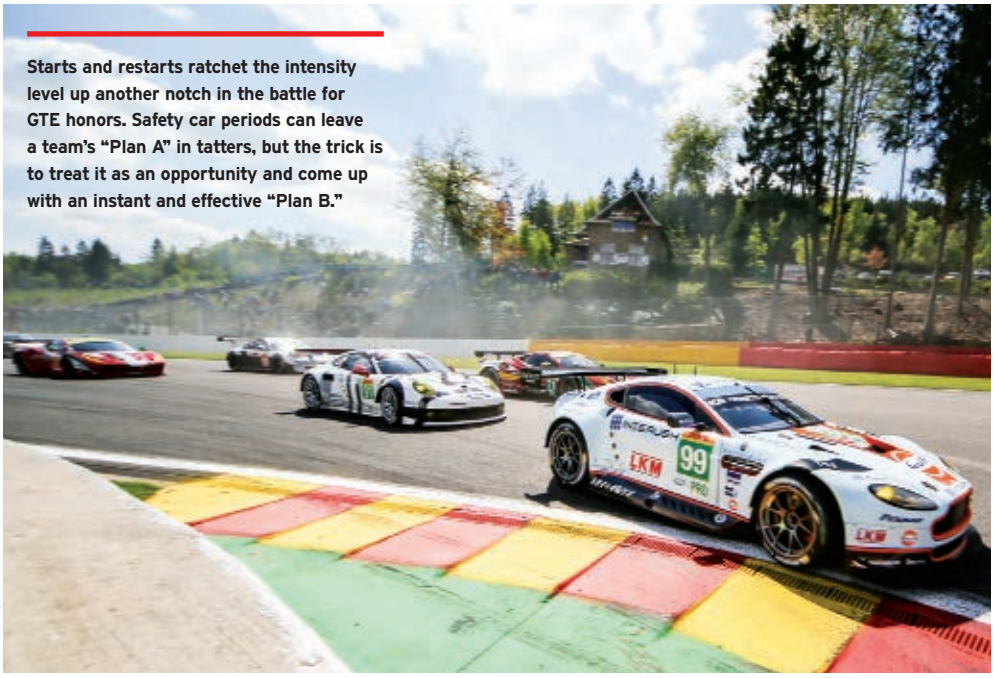

John Rourke/AdrenalMedia.com

Starts and restarts ratchet the intensity level up another notch in the battle for GTE honors. Safety car periods can leave a team's "Plan A" in tatters, but the trick is to treat it as an opportunity and come up with an instant and effective "Plan B."

Paola Depalmas/AdrenalMedia.com

Drew Gibson/Aston Martin Racing

(FAR LEFT) With teams so efficient at pit stops, the strategic benefit of double-stinting tires is a borderline one at best. (LEFT) Factory Aston Martin driver Darren Turner.

"Le Mans 2006 was a disaster for me," he says, "because I ended up ripping off an oil line jumping the curbs in the old DBR9 GT1 car to get into the pits when they called me in. Our radio was pretty intermittent between Mulsanne Corner and Arnage, which meant that when there was a safety car early in the race, I was in a communications black hole when I needed to be talking to the team.

"I'd asked them at the second chicane on the Mulsanne Straight what I should do, and they said, 'stand by, stand by.' I asked them again after Arnage and got the same response. Through the Porsche Curves, I said, 'Come on boys, what's happening?' and again I was told to stand by.

"Just as I'd passed the pit lane entry, the radio cracked open and it was, 'Box! Box!' I instinctively turned right and jumped the car over the curb to the detriment of the oil system. I ultimately reacted incorrectly in that split second. With the experience I have today, I'd have said, 'Sorry boys, too late, I'm staying out.'"

In the era of two-driver qualifying, Turner and Mucke have settled on a system that works for them. Mucke always goes out at the beginning of the 20-minute session on fresh rubber to set his two timed laps and then his teammate has to do his laps on the used tires.

"When a safety car is out, we feed the guys on the pitwall with information to help them make their decisions"

DARREN TURNER

"We came to the conclusion fairly early on that Stefan should go first," explains Turner. "He can probably grab a little bit extra on the brand new tires, whereas I'm better at getting a bit more out of them when they're not at their optimum. If it works, why not keep it that way?

"The other thing is that Stefan really enjoys qualifying, but it doesn't really do anything much for me."

That explains why it fell to Mucke to do the qualifying time at Le Mans, a race that Turner started. "We like to share things out a little bit," adds Turner.

Turner and Mucke generally take turns starting the races. "I went first at Silverstone, because it was my home race, for example," he says. "We know we're pretty much equal in everything, so it doesn't really matter too much."

Especially when every lap of every stint is driven to the maximum. ■

GTE: THE SEASON SO FAR

GTE PRO

With three races in the books prior to the 2014 FIA World Endurance Championship's visit to the Circuit of The Americas, the GTE Pro win tally stands at two for Ferrari and one for Porsche, with Aston Martin knocking hard on the door again, too. The factory-backed Porsche Team Manthey 911 RSRs finished 1-2 in April's Silverstone season-opener, with AF Corse's Gianmaria Bruni and Toni Vilander striking back at Spa in May. For the 24 Hours of Le Mans, Corvette Racing joined the fight with its new C7-R, but it was Bruni and Vilander, joined by Giancarlo Fisichella, giving their Ferrari 458 Italia a second straight class win.

Jeff Bloxham/LAT

(ABOVE) Silverstone winners Marco Holzer, Richard Lieb and Frederic Makowiecki.

GTE AM

Aston Martin Racing earned two GTE Am wins in the opening three races, including an emotional 24 Hours of Le Mans triumph. The all-Danish lineup of David Heinemeier Hansson, Kristian Poulsen and Nicki Thiim took a season-opening Silverstone win in the No. 95 Vantage V8, then victory at Le Mans a year on from losing fellow Dane Allan Simonsen in an accident at the 2013 24 Hours. The AF Corse Ferrari of Luis Perez Companc, Marco Cioci and Mirko Venturi edged the No. 95 Aston for the win at Spa, then followed up with a podium at Le Mans. The Danes lead the points, but there's everything to play for heading to CoTA.

Jeff Bloxham/LAT

(ABOVE) An emotional podium for Le Mans GTE Am winners Poulsen, Thiim and Hansson.

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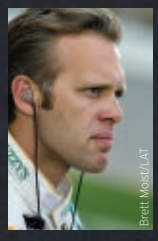
Ed Carpenter has put his team on the pole for the last two Indy 500s, but flat-out pace is just one part of his oval-racing skill set.

WORDS David Malsher | MAIN IMAGE Michael Levitt/LAT

SQUARING THE CIRCLE

Ed Carpenter Racing is the only team in the Verizon IndyCar Series run by an owner/driver, and the eponymous Ed is *the* acknowledged oval specialist, so ECR's four key point-men are the perfect candidates to explain the art, science and improvisational skills necessary to master the speedways.


Brett Moist/LAT

THE DRIVER
ED CARPENTER

In his team's third season of IndyCar racing, Ed Carpenter has seen the benefits of standing down from road and street course racing to concentrate on the speedways. Not only has his road-course ringer, Mike Conway, won twice this year, but Ed himself appears to be an even more accomplished oval racer as he focuses on a skill set developed and honed over two decades of left-turn competition.

Carpenter, ECR strategist Tim Broyles, engineer Matt Barnes and spotter Lee Bentham describe the multiple factors to consider and the multiple talents to perfect in order to be a frontrunner at every oval...and how to remain unfazed at whatever a race might throw their way.

Part of becoming a better driver is to try and learn something every time you have the chance to be in a racecar – every test, every session, every race. There'll always be some knowledge to take away regarding the track, the car, the tires, or maybe just the way a race plays out.

Milwaukee's a good example because, historically, it hasn't been one of my better tracks, but I recognized that and realized I had to work on my craft to be better there and, sure enough, we're much stronger there these days.

Some of this improvement comes from maturity and experience, which means you can take a logical and rational approach to issues. And, of course, some of it comes from having a good group of people around me for support, but also to push me at the same time.

Adapting your technique to a totally new car is one of those times where you're learning a lot all at once, because going from the old car to the DW12 in 2012 was a big adaptation on the ovals. But the way the DW12 behaves on ovals is a good example of the smaller adaptations a driver has to make all the time. With much less downforce, the DW12 is moving around a lot more, so you're looking at ways to keep the tires under you for a whole stint, yet still go faster than anyone else.

I think my background in sprint cars and dirt cars helped with that learning process because, in those cars, you're always looking for a better place to be on the track, and the conditions are changing all the time – literally lap by lap – >

OWNER/DRIVER/WINNER
Ed Carpenter scored a win in his team's very first season, in the 2012 finale at Fontana. That was the first win for an Indy car team owner/driver since Adrian Fernandez at the same track in 2004.

so you've always got to be comfortable with the idea of checking out a different line to find the grip you need. So I had that experience and technique, but it was from a long time ago, meaning I had to tune myself back into that way of thinking to start exploring the limits of the DW12.

There's another thing I think my background of dirt cars helped with, and that's bumpy tracks. Generally I've always gone well at Iowa and Fontana, and also at Kentucky and Chicago, which were bumpy in the last couple of years we ran there. It's harder at those tracks to get the right combination of damping, springs and ride height in order to maximize grip. You have to find compromises with the car that still allow you to be quick, but also manage the grip, because the more the car's moving around, the more variables there are. I think that being more comfortable in those situations goes back to racing on the dirt, where you have to improvise so much.

Because we learn all the time, I don't think I can look back and put a finger on one particular moment where suddenly oval racing just totally clicked. But I'd say it was probably 2008 [Ed's fifth complete season in IndyCar] when I started to feel more settled, understanding the car better, and doing a better job at communicating to the engineers what I was feeling.


Michael Levitt/LAT

Choosing the optimum line as conditions constantly evolve is key to being competitive on ovals. Here, Ed Carpenter takes the low line as he races with Josef Newgarden.

That allowed them to improve the car and we had some good runs, but I don't think the team [Vision Racing] had the cars to be regularly competing for wins. I've been lucky since then to get in the situation where my growth, experience and maturity has coincided with having better resources and therefore more competitive cars, to showcase what I'd always believed I would be capable of.

"The best oval racers have a strong feel for the car, can analyze what's going on and can relay it to the engineers"

ED CARPENTER

Because of how competitive the Verizon IndyCar Series is, and how vital it is to get the right setup for any given track-tire combination, the best oval racers these days are the guys who have a really strong feel for the cars and can analyze what's going on and relay that information to the engineers. That maximization and fine-tuning of the setup is key, and I think that's one of my strengths. I can feel and differentiate between what is the ultimately fastest setup and what is the setup that will allow us to go fastest for a whole race stint.

Certainly, experience is a big part in being able to make those predictions – "If we make this change, we know it will have this effect toward the end of the stint." If you have that knowledge already, that's something you don't need to try out when >

THE STRATEGIST
TIM BROYLES

IT'S A MATTER OF TRUST

TALES OF THE UNEXPECTED

Thinking on the fly is second nature to even a well-prepared strategist.

Strategizing is about trying to prepare for every possible situation...and then being able to rapidly adjust your plans because something unexpected happens.

Getting better at this comes down to everyone gaining confidence in each other, and that can only come from experience and familiarity with each other. Think of the most successful IndyCar driver/team combinations and they're ones who have worked together a long time. The various individuals trust each other's information – the driver's feedback to the team, the team's strategizing and engineering ideas, the spotter's information. Well, at Ed Carpenter Racing we're in our third season with a core group of people, and we're starting to see that familiarity pay off.

It's hard for a driver to build that level of trust, because just as we're not able to feel what he's feeling from the car and are having to rely on his information, he's also only seeing his own race, and can't see the big picture. So he has to buy into what we're selling and accept that we're looking two stints further down the road, whereas he's having to focus on the here and now because he's racing at 220mph.

Strategies have to remain flexible for a variety of reasons. For example, you may be quicker than you expected or you may be slower; a timely yellow may have played into your hands and put you unexpectedly up front, or an untimely one may have shuffled you backward.

There's also a huge difference in tactics between the various ovals. At Indy, you work out how few pit stops you can get away with over 200 laps, but at a track where grip is critical like Texas, you'll grab almost every opportunity you can to get fresh rubber. Generally, if there's a yellow and you haven't stopped recently, you're going to pit for new tires.

"We're in our third season with a core group of people and we're starting to see that familiarity pay off"

But you've also seen the dilemma created by a late caution – whether you stop for fresh tires and lose track position, or stay out and gain track position, but on older rubber. At times like those, there's a lot of dialogue between myself, Matt, Ed and Lee. Are we confident that we can make up those positions on fresh tires, or are we confident we can hold on in front on old tires? Again, it comes back to that trust in each other's instincts at critical moments.

Timing of pit stops under green-flag conditions is about fuel mileage, whereas under caution a strategist can roll the dice.

F. Peirce Williams/LAT

TEXAS SHOOTOUT!

The win at TMS showed ECR to have all the qualities for oval racing success. In these last two laps, Will Power (extreme high line, fourth car back) used new tires to carve through to second place, but couldn't quite catch Carpenter on old tires.

Nigel Kinrade/LAT

you get to the race track; it frees you up to focus on other areas that you might not have such a handle on. So you keep building up your experience and data that way. Like I said, you never stop learning.

Understanding the car and, again, experience also really help me maximize the in-cockpit tools for fine-tuning the handling. I can make the right choices, find the right combination for the circumstances, whether it's to help cope with the effects of reduced downforce running in dirty air, ease tire degradation, and so on. These days, I'm not just a lot more aware of what the changes I make are doing to help me, but also the physics of the car. I understand *why* what I'm doing with the weight jacker or the rollbars is altering the handling.

Sometimes those tools aren't enough, and if you've run out of options and combinations, you need to make a more radical change during a pit stop. Matt and Tim will see from their computers what I've been doing with the tools, so they automatically know what I might be struggling with and what I'm trying to get the car to do. They – and Lee up in the spotters' stand – will also have seen the trends among the other cars, particularly our main rivals, over the course of a stint, to see how we measure up. Maybe they've seen one of our main competitors is slower than us at the start of a stint, but stronger at the end, so Matt's already got ideas of his own about how to improve that situation.

F. Pierce Williams/LAT

Carpenter doesn't micromanage his team; he employed them because he trusts them to do their jobs well.

Generally on the ovals, the only real options the crew has are to alter the front wing angle and the tire pressures, although at Indy, Pocono and Fontana, you're also allowed to adjust rear wing angle. Obviously, the tire pressures need to be altered well in advance of a pitstop, so there will usually be a group discussion and the team will come to an educated decision based on what feedback I've given them, what I feel I might be lacking.

"I'm not only aware of what the changes I make are doing to help me, but also the physics of the car"

ED CARPENTER

Coming out of the pits, Lee will be warning me of who's rapidly closing at full race speed and where I can expect him to draw alongside, or whether I can reach the blend line before that, or even whether it's someone I need to worry about, or someone who has yet to stop.

To be honest, the amount of information I want from Lee varies according to the day. If you're struggling, you may want more information, and if things are going well, you may want less. As conditions change, one of Lee's greatest assets as an ex-racer is being able to see if others are finding something extra somewhere else >

Michael Levitt/LAT

THE ENGINEER **MATT BARNES**

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ANALYZING THE VITAL INFO

Pre-season work is the foundation; then it's about number-crunching

There are two keys to having a quick car on an oval: one is off-season work, focused on drag reduction, getting friction out of the car, and making sure as much horsepower as possible is transferred to the wheels. The second part that's more important now than ever before is grip. With the previous-gen car, it was 100 percent throttle, 100 percent of the time. Since the Dallara DW12 arrived, there's far more emphasis on Ed's driving and on us engineers improving grip and balance, based on feedback he's giving us.

During test and practice sessions, it's so easy to chase speed without regard to what the car does to its tires over the course of a stint. It's important to not freak out if we're only halfway up the charts in practice; what we're going for is consistent pace over a stint by reducing the rate of grip dropoff.

It's tricky though, because qualifying has become *more* important on the ovals than it was, because you can't just draft to the front. These days, drivers don't just find a groove and stick to it. To save tires, they use more of the track, so it's harder to make passes. And, of course, the harder you work to get to the front, the more you use your tires.

Indy is a bit different, because generally the cars are flat-out all the way around – in clean air, anyway – and getting the tow is how you move forward. It's less about grip and handling, more about flat-out speed. Any adjustments you make to handling will come at a detriment to speed, so it's up to the driver to deal with what he's got. At Pocono, you can only get the handling really good for one of the turns, because each one is so different, and it's best to go for a compromise so that it's reasonable at both ends.

Indy and Pocono are smooth, though. Fontana is a whole different story, because there the bumps are in a straight line and if your damping is too stiff, you can go light enough to send your revs into the hard limiter, so your main priorities are bump absorption and grip in the turns.

"Qualifying's become more important...The harder you work to get to the front, the more you use your tires"

During a race, I monitor our speed and our tire drop-off compared with our rivals, and I present Tim [Broyles, strategist] with all the facts so he can maximize our time on track in terms of whether we should or shouldn't take our tire life to the end of our fuel load. I'm also listening to Ed's feedback to decide what adjustments he might need to the car or the pressures on the next tire set.

Indianapolis Motor Speedway remains a temple of speed, and Ed Carpenter Racing has taken pole for the past two Indy 500s.

Michael Levitt/LAT

Russell LaBounty/LAT

CARPENTER COMES FULL CIRCLE

No one who was there will forget it: Kentucky Speedway, Oct. 2, 2011, and Ed Carpenter held on around the outside of Dario Franchitti (BELOW) to clinch both his and Sarah Fisher Hartman Racing's first IndyCar victory.

That was Ed's last race for SFHR. But as this issue was going to press, we were breaking the story on RACER.com that he and Sarah Fisher will merge their teams next year. Is IndyCar about to see a new superteam emerge?


Phillip Abbott/LAT

Coming just a couple of weeks after a very strong, but accident-curtailed run at the Indy 500, Carpenter's win at Texas Motor Speedway (ABOVE) was proof of ECR's oval prowess.

"I don't micromanage. I let the guys do their jobs because I know they're great at what they do"

ED CARPENTER

on the race track that we maybe haven't tried yet. It's because I can trust his judgment and know that his suggestions can make a positive difference for us that, car permitting, I'll try out his ideas.

Sometimes I ask for more, depending on the track. At Iowa, for example, it's only an 18-second lap, and you've always got something to deal with, ahead or behind, so it would be easy for Lee to end up talking all the time. But at Indy, Pocono and Fontana, the straightaways give you more room to take in extra information, beyond the usual stuff about people trying to get around you or dive inside.

I try and just focus on my job and don't overthink what I've been told by Tim or Matt, because I trust them. I guess as team owner, I *could* overrule what they might be advising – in fact, they may say I *have* done a couple of times in the past, I'm not sure.... Actually, I guess at Iowa this year, I did do that; they were wanting to leave me out during that late caution, and I convinced them we should pit for tires because I didn't feel we'd be able to improve our position otherwise.

But generally, I don't call those shots, I don't micromanage; I let the guys do their jobs because I know they're great at what they do. And anything that requires more than one opinion, we all know to turn to each other and make the decision together, as a team. That's how it works. ■

THE SPOTTER **LEE BENTHAM**

GIVING ED THE INSIDE LINE

SPOTTING, BUT TAKEN TO THE NEXT LEVEL

I think that, as an ex-racer, I can provide more information than just "car high, car inside," and so on. I try to keep Ed ahead of the conditions, because they just change constantly, throughout a weekend, throughout a day, throughout a race.

The optimum line may be changing, the grip level may be changing, there may be a guy coming up through the pack who is soon going to be a threat. So as well as watching Ed's progress, I'm watching what other drivers are doing, trying to give Ed as much information as possible on how we might improve pace, or keep the same pace but take less life out of the tires.

I try not to just download all the advice at a tricky moment when he's lapping a bunch of cars, or if he's wrestling the car when it's a bit of a handful. Now and again Ed has told me, "Oh man, that's too much information!" I'm aware that if things are getting busy, then it's best to just let him alone to allow him to hit his marks and do everything on instinct. I'll just turn into a regular spotter, warning him if there's a car alongside or about to make a move.

"As well as watching Ed's progress, I'm keeping an eye on what the other drivers are doing"

But if a backmarker is running off the pace and is using the same line as the one Ed's using, then I'll let him know to prepare to run lower on the track and duck under this guy. If we're being chased hard, then it's vital to warn him of everything, be it a slow car emerging from the pits, or a fight between three or four backmarkers that might slow our momentum, and so on.

As a team, we've also got our timing down well, where Tim or myself won't be speaking to Ed at the same part of the track; we take it in turns. And when there's a caution, I keep quiet and let Ed talk to the team about the car and about the tactics.

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WORDS Mark Glendenning
MAIN IMAGE Camden Thrasher

SAME... BUT DIFFERENT

Driving a GT car in a sprint and an endurance race are two totally different things, right? Well, not so much actually...

There aren't many classes in racing that rival GT cars when it comes to versatility. Put one on the track for a cut-and-thrust Pirelli World Challenge race and it's up to the job. Ask it to run twice around the clock at Le Mans and it'll happily do that, too.

The demands of the two disciplines could scarcely seem further removed. Endurance racing – be it as long as 24 hours, or as short as a 2h45m "sprint" in the TUDOR United Sportscar Championship involves pit stops, driver changes and, so you'd think, a "big picture" mentality. A 50-minute PWC sprint event, on the other hand, suggests an all-out thrash from flag to flag.

Not surprisingly, there are differences in how each style of racing is approached. But there are more similarities than you might expect, too. Dodge SRT Motorsports factory driver Kuno Wittmer is well placed to draw comparisons. The Canadian is a TUDOR Championship GT LM class frontrunner in his GTE Viper, but has also raced a GT3 version of the car in the Toronto round of the PWC. According to him, the paths between the two split as soon as the driver arrives at the track.

"The intensity level's different right from when the weekend starts," he says. "In the endurance races, every session's vital because you have two drivers and two or three practice sessions of about an hour, so you've got to divide up your time so both drivers have a chance to get accustomed to the track and setup changes, and all that.

"But at a PWC event? OK, the sessions are shorter, but you never have to get out of the car. You're the one who's tuning >

Camden Thrasher

100 PERCENT

2014 Pirelli World Challenge races competed in: two. 2014 Pirelli World Challenge races won: two. Those were the stats for Ryan Dalziel as *RACER* went to press. Not bad at all.

Kuno Wittmer's Viper is chased by fellow TUDOR Championship GT LM regular Nick Tandy's Porsche GT3 R in the Pirelli World Challenge on the streets of Toronto. The pair came away from their one-off outing with a win apiece in the Canadian double header.

Richard Dole/LAT

the car to yourself, without having to think about a teammate's preferences. So they both have their own levels of intensity."

Ryan Dalziel is usually strapped into an Extreme Speed Motorsports Acura Prototype in TUDOR Championship races, but the Scot has also made recent PWC appearances in an EFFORT Racing Porsche GT3. He echoes Wittmer's take on the overall feel of a weekend.

"For me, the big difference is that, in multi-driver endurance racing, there's no place for being selfish," he says. "In sprint racing, it's all about being selfish, because everything revolves around what you want."

All fairly obvious so far, but when you dig a little deeper, the lines begin to blur. For example, you might expect some degree of restraint during longer races in the interests of tire life and mechanical sympathy. But, says Wittmer, this isn't the case.

"In the TUDOR Championship, the only time you have to look after the tires is if you're the starting driver, because you start on the ones you qualified on," he says. "If we did three laps in qualifying, then the tires are still pretty good and we can lean on them pretty hard. But say your fastest lap was on lap nine because of something like weather – if you look at Road America, those five or six extra laps are an extra 15

Camden Thrasher

(ABOVE) A TUDOR Championship race is punctuated by pit stops, but the bits in between are like a series of sprints. (LEFT) Canadian Kuno Wittmer goes for it in Toronto.

minutes or so on those tires. But when you put the stickers on for the second stint, you just drive as hard as you can.

"Two hours and 45 minutes is a sprint race in the TUDOR Championship, but even a six-hour race, or 12-hour, or 24-hour, are all treated the same way. They're completely flat out, every single stint. Let's say a driver is in an endurance race and the strategy is that he does one tank of fuel. Well, a fuel load only lasts about 55 minutes, which is equivalent to a sprint race in the PWC. So they're comparable in that regard. They are both pretty intense."

Consequently, there are also similarities in the way the cars are set up for the various distances, with the philosophies leaning heavily in the direction of sprint racing. But if the varying styles of race impose similar demands on the car, it's a different story when the focus moves to the physical and mental stresses that the longer races place on the drivers themselves.

"I don't think in the shorter endurance races there's much of a difference from PWC," says Dalziel. "The six-, 12-, 24-hour races, those are a big challenge. For me, it's about how you recuperate between stints, not just physically, but emotionally. You have to get back to 100 percent between stints. But if it's just a one-stint-in-the-car race, whether that's a TUDOR sprint race or PWC, I know that by the end of that one stint, I'm done."

According to Dalziel, one unexpected area in which the psychological challenges diverge is during cautions. Or, more specifically, remaining focused and ready for the restart.

"Not having pit stops in the race, any PWC cautions are so short," he says. "In a TUDOR Championship race, it can be a challenge at times to get yourself back into it after seven or eight laps under caution. A lot of 'yellows breed yellows' comes from drivers switching off because they've been under caution for so long."

This difference in intensity can also be a factor at the start of a race. Almost without exception, enduros begin with rolling starts,

INTENSITY LEVEL

For Ryan Dalziel, the mental and physical effort involved in a PWC sprint or a stint in a TUDOR Championship race is similar. The trick with the latter is getting yourself back to 100 percent and ready for your next stint...

Camden Thrasher

Richard Dole/LAT

Michael Levitt/LAT

In enduros, racing with other GTs (FAR LEFT) is with one eye in the mirror for faster classes. (LEFT) Wittmer and his GT LM Viper teammate Jonathan Bomarito celebrate an Indy win.

"Rolling starts are fun, but there's nothing like the adrenaline rush of a standing start"

RYAN DALZIEL

but standing starts can be a feature in PWC.

"Rolling starts are fun, but there's nothing like the adrenaline rush of a standing start," says Dalziel. "In endurance racing, you do your recon laps, then you're green, and there's not really a huge amount of position changes in rolling starts. With standing starts you're wondering what the guys around you are going to do – whether the guy in front is going to stall, or whatever. It's a short burst of anxiety, anticipation, excitement and fear. In endurance racing, that same amount of drama is spread out over a longer timeframe.

"The old drivers' saying is that you can't win the race at the start, but you can certainly lose it. But I feel that in a sprint race standing start, you certainly can win the race in the first corner. If you have a car that's really good over the first couple of laps and you get off the line well, you can just spend the next 45 minutes driving defensively."

Another difference is in the types of cars that GT machinery shares the track with in the TUDOR Championship and PWC. In PWC, they sit at the top of the food chain, cheerfully weaving their way around the slower GTS class cars. But in the TUDOR Championship, GT drivers have to keep an eye on their mirrors for the much faster Prototypes.

"In PWC, you're trying to cut through traffic and you're not worried about anything behind you except for guys trying to pass," says Wittmer. "But in the TUDOR Championship, the Prototype cars close up pretty quickly, and when they want to get past they'll put their nose anywhere.

"When I first made the jump from PWC to ALMS, the biggest step was getting used to the faster cars coming from behind, and where to let them by without hurting your own race. You need to know where a P1 or a P2 car is fast – is it fast in a braking zone? Is it fast in Turn 7?"

If it's a stretch to think of endurance races as a group of PWC races run back-to-back, a closer look reveals more in common than first apparent. And this is why manufacturers that race in GTs place such a premium on the likes of Wittmer, or a Johnny O'Connell, or a Patrick Long, who've proven their mastery of both. ■

DOUBLE-HEADER LOGIC

TWO CHANCES TO WIN

A feature of PWC that brings its own unique demands is the double-header weekend format. It's one thing to talk about being at maximum attack in a sprint race, but does that change if you know you still need to keep the car in running order for the following day?

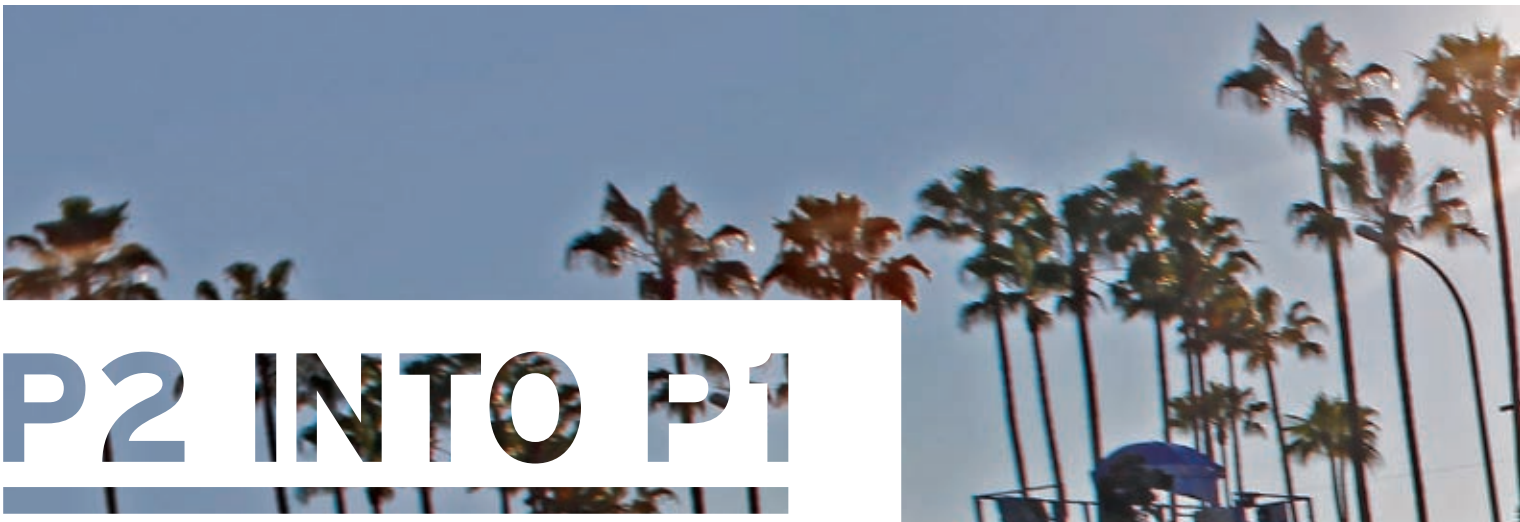
"To go slower in the first race and settle for a top five and then go for a win on Sunday? I don't think that's a great way to approach it," muses Kuno Wittmer. "Personally, the way I've always approached a double-header weekend is, it's two races and I want to try to win both of them."

A caveat here is that Wittmer's one-off PWC appearance at Toronto in a GT3-spec Viper was a one-off, so he didn't have to take championship ramifications into account when sizing up a move. He admits that this did influence the way he tackled the weekend, but a second-place finish in race one (behind another one-off visitor, Porsche factory GT driver Nick Tandy), followed by a race two victory on the tight and tricky street course still added up to an impressive showing for the Canadian.

"If we were doing the whole championship we'd probably have attacked it a little bit differently," he concedes. "If, say, weather conditions are a factor for the first race, you might think, 'Wait a second, we do have another race tomorrow. So let's go for a strong position and get as many points as we can now, and if the weather improves tomorrow, *then* we can go harder.'"

Camden Thrasher

It wouldn't be Pirelli World Challenge racing without a little bit of close action. Kuno Wittmer shrugged it off to win in Toronto.



P2 INTO P1

Balancing the one-lap pace of the TUDOR Championship's P2 and DP ranks isn't so hard. The challenge is trying to do it over the ebb and flow of a race, where DPs still hold the advantage.

WORDS Marshall Pruett | MAIN IMAGE Phillip Abbott/LAT

The better part of a year has been spent trying to bring ACO-based P2s and Daytona Prototypes devised by Grand-Am into a competitively harmonious package within the TUDOR United SportsCar Championship's headlining Prototype class.

Based on the number of race wins accrued by both styles of Prototypes (through Road America in early August the tally was 7-2 in favor of DPs), it's fair to say the DP side of the field holds the upper hand at most tracks visited by the TUDOR Championship.

Talk to P2 team owners and they'll say reaching Victory Lane is a statistical afterthought, but it's worth asking whether the damning 7-2 divide is irrefutable evidence that IMSA badly missed the performance balancing mark, or whether true parity can ever be had with just a few minor tweaks.

Both types of prototype are capable of setting nearly identical times over a single lap at most tracks – and in pole positions, P2s actually have the edge (5-4 after Road America). But despite their potency over a single lap, the conversation on outright P2 speed changes once starts, restarts and multi-lap averages during a typical stint are taken into account, leaving IMSA with a complex issue to resolve for non-DP entrants.

The first touch point for Prototype disparity has been the single-spec Continental rubber that the P2s and DPs are required to use. Thanks to the extra 300lb carried by DPs, their tires come up to temperature faster and gaps are rapidly built whenever the green flag waves, yet this DP advantage can only be regarded as a situational nuisance for the P2s. Bigger concerns stem from sizeable top speed differences at longer tracks like Daytona, Sebring, Watkins Glen and Road America, and with a shortcoming in initial torque production, P2s are left at a standstill in the lower gears.

Being overrun by DPs on starts/restarts and out of slow corners is only half the speed problem, however. The pole-winning DP was a full 8.6mph faster than the best P2 on the banking at Daytona, and while the separation had narrowed by Road America, pole-sitter Ryan Dalziel's Extreme Speed Motorsports HPD ARX-03b P2 car was still 6.6mph down to the fastest DP.

Left with three keystone issues to fix >

"The DPs have a big advantage in traffic [over the P2 cars], and that is a problem at the moment"

PHILIPPE DUMAS

Richard Dole/LAT

OAK Racing's Morgan-Nissan (MAIN) and Extreme Speed Motorsports' pair of HPD ARX-03b machines (LEFT) fly the P2 flag in the TUDOR Championship's Prototype class. Although both teams have won in 2014, race-by-race momentum remains with the dominant Daytona Prototypes.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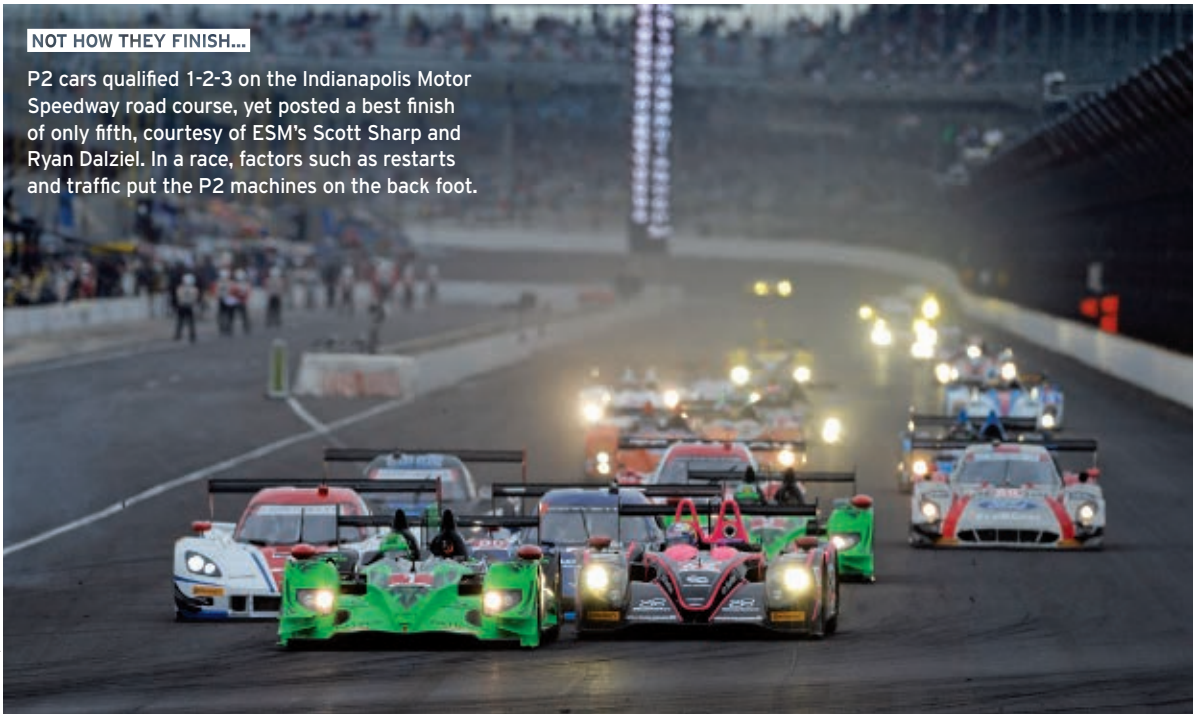


NOT HOW THEY FINISH...

P2 cars qualified 1-2-3 on the Indianapolis Motor Speedway road course, yet posted a best finish of only fifth, courtesy of ESM's Scott Sharp and Ryan Dalziel. In a race, factors such as restarts and traffic put the P2 machines on the back foot.

Richard Dole/LAT

Michael Levitt/LAT

SCOTT SHARP

Extreme Speed Motorsports' owner/driver Sharp likens trying to balance P2 and DP race performance to comparing apples with oranges...

before equal opportunities can be provided at every track, some of the P2 contingent are unsure if they'll see the day when the shoe is on the other foot and their DP rivals are looking for Balance of Performance breaks.

"If they're going to continue to try to keep us in one class, which I'm sure they are, what really needs to happen is finding a way that we can, lap in and lap out, just race each other better," says ESM co-owner/driver Scott Sharp. "The series has done a great job of increasing the speed of the DPs pretty seriously from last year. And I figured going into this year that we were going to have an advantage – they were going to keep trying to slow us down to help make the DPs more competitive. In fact, they went too far with the DP upgrades, and now we're the underdogs almost everywhere we go."

OAK Racing won the 24 Hours of Le Mans' P2 class and the WEC P2 title with its Morgan-Nissan package in 2013, but has found its first full-time venture competing in America against DPs a much greater challenge than expected.

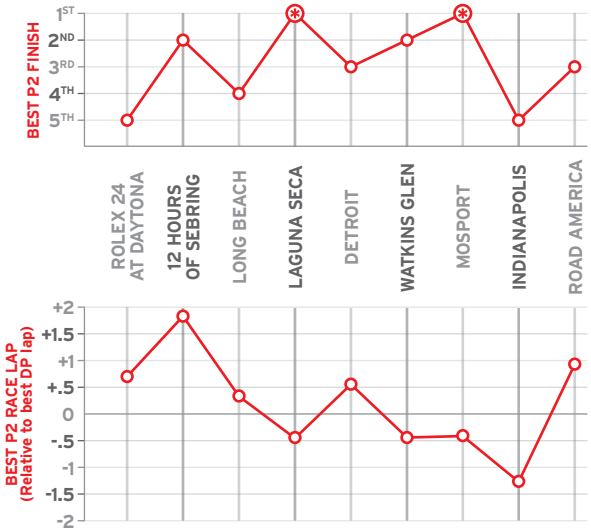
"It is more difficult to win with the P2 compared to the DPs, and especially for two specific reasons," says OAK team manager Philippe Dumas. "The DPs have a big advantage in traffic, and that is a problem at the moment. And at restarts after Safety Car periods, they pull away and the P2s look like they are stuck in first gear. At the moment, it's not a problem of balancing the car over one lap; it's more of concept to balance the car in race conditions, and this is not a simple task for IMSA to make better."

Richard Dole/LAT

(LEFT) OAK Racing's Olivier Pla and Gustavo Yacaman celebrate their Mosport win. But the P2s' shortcomings in traffic and at restarts mean the cards have to fall right for such an outcome.

NOT THE WHOLE STORY...

On single-lap speed (BOTTOM), the P2s are up there with the Daytona Prototypes, taking fastest race lap at four of the first nine 2014 TUDOR Championship races. But just two wins from those nine races (BELOW), at Laguna Seca and Mosport, confirm that there's more to being competitive than just one-lap pace.



With the problems clearly identified, solutions remain somewhat elusive at the moment, but Dumas has ideas on a few potential starting points.

"It would be better for the P2 cars to run with the Le Mans aero kits everywhere," says the Frenchman, referring to the low-downforce bodies IMSA mandated for the Rolex 24 at Daytona. "Sure, we will have less downforce in the corners, but at top >

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Michael Levitt/LAT

(MAIN) Owner/driver Scott Sharp climbs aboard his Extreme Speed Motorsports HPD ARX-03b P2. (BELOW) Daytona Prototypes, which have proved dominant so far in the 2014 TUDOR Championship's Prototype class, exit the scene after 2016.

Michael Levitt/LAT

GUSTAVO YACAMAN

OAK Racing's anchor man took a win at Mosport with Olivier Pla. Alex Brundle and Yacaman earned successive poles at Watkins Glen and Mosport.

P2 PURSUING OVERALL WINS: THE PREQUEL

Prior to Extreme Speed Motorsports duo Ed Brown and Johannes van Overbeek winning at Laguna Seca this season, the last outright win for a P2 car in U.S. sports car racing was Mosport's 2010 ALMS race, courtesy of Muscle Milk Team Cytosport's Porsche RS Spyder (BELOW).

ALMS performance balancing put P2s on a near-equal footing with P1 cars between 2005-'10.

Dan Boyd/LAT

speed it will make a difference. It's only my opinion, but if we could also work with the series to let the engine manufacturers increase power and say that it's OK if they reduce the engine life [between rebuilds], this would make it more equally matched, too. Right now, without this, it's tough, it's a little crazy."

IMSA won't ask Continental to supply softer P2-specific tires, leaving Scot Elkins, IMSA's vice president of competition and technical regulations, to look elsewhere for potential solutions.

"We'll have to look at everything over the course of the winter," says Elkins. "Running the Le Mans kit is a possibility next year; addressing top speed is a lot easier than torque because we can help with aero and restrictors. The torque side is a lot harder, and we don't have a lot of answers on that right now, although we are asking our engine manufacturers to help with suggestions on that topic."

Finding ways to make turbocharged and naturally aspirated DPs conform to the same performance levels as turbocharged and naturally aspirated P2s has, at least in 2014, been a fruitless endeavor. With four distinct P2 and DP engine variations, a single class-wide answer doesn't exist. At best, and with the variable of traffic to consider,

Scott R LePage/LAT

"Each track is different, and each lap tells us more about what's needed to improve next year"

SCOT ELKINS

Elkins is learning how the cars differ competitively at each event in order to make another round of changes for 2015.

"We're multi-class racing, and the other three classes are slower than the Prototype cars, so raceability isn't only P2 and DP; it's how they interact in and out of traffic," he explains. "If all we had to do was balance the Prototypes, things would be much easier. The lap times are pretty solid, even over a long run, but cars make their speed so differently that we're learning at every race about what happens when they meet up in the corners with the other classes. Each track is different, and each lap tells us more about what's needed to improve next year."

Once the season concludes at Petit Le Mans in early October, IMSA's technical team will use the information gathered throughout the year to take bigger swings at aligning the performance capabilities of both prototypes.

"All the simulation we do and all the data we have collected gives us a huge database to work from over the winter going into next year, and we're confident the Prototypes will be closer when the season begins," Elkins declares.

It's also worth questioning whether it's even possible to establish race day parity between prototypes born from such disparate philosophies. Regardless of how sophisticated and case-specific they might be, might IMSA's BoP efforts be in vain?

"As it turns out, I really think you're getting to the point of comparing apples and oranges right now," Sharp asserts. "I support IMSA and everything they're trying to do 100 percent, but the cars are just too different. Until we all switch to the same car in 2017, I just can't see the playing field being level for everyone." ■

PROTOTYPE RATIONALIZATION

GETTING READY FOR THE REBOOT

In 2017, P2s will be the only show in town for the TUDOR Championship's Prototype class.

Details are sparse on the finer aspects of what lies ahead for IMSA's Prototype class in 2017, but we do know the TUDOR United SportsCar Championship will conform to the new global P2 specification currently being devised by the ACO and FIA.

The French-based sanctioning bodies also have a new P2 specification coming in 2015 – one where coupes replace the cadre of open-top offerings from Onroak, ORECA, Honda Performance Development, and others – which makes the move to another spec in '17 a somewhat anxious time for constructors and their customers.

"We've maintained a dialogue with the ACO and FIA on where things are headed, but we haven't been given any guarantees that what we're building for 2015 will automatically carry over into 2017," says HPD vice president Steve Eriksen. "The market for P2 cars is small, so building new cars every two or three years isn't something we'd consider sustainable from a financial standpoint. And it would also be asking a lot of our clients."

The 2017 rules are still in the early planning stages, but Eriksen says indications are that the next-gen P2 is likely to draw upon the foundation of the '15 coupes.

"What we'd like to see, and I'm sure many of the manufacturers have conveyed this, is for the 2017 car to use what we're all building for next year, and build off of that chassis," he says. "It's a lot easier to use what's beneath the bodywork – the carbon tub, the drivetrain and most of the car's core – and create new bodies or add whatever changes they are looking for to the 2015 design. There are no guarantees at this moment, but they've indicated this is a sensible direction to go."

With IMSA committed to a P2-based Prototype class in 2017, the DP era is winding down, and for one of its most loyal supporters, saying goodbye to tubeframes and hello to carbon-fiber coupes isn't a bad thing.

"We'll go to this clean-sheet car and it appears things are going in the right direction," says DP owner Michael Shank. "[TUDOR Championship founder] Jim France would like to have brandable bodies like we do now in DP. I hear the ACO isn't as inclined, but we definitely want that. If a European team wants to race here, we need to make sure they have a generic body to use, and same thing if we want to race over there.

"I also like having just one style of car instead of two, because it's easier to create a separate Prototype championship for Pro-Am drivers like we had in Grand-Am. We lost that in the merger, but it's key to the series moving forward. Take care of the Pro-Am guys, give them their own race wins with the new cars, and we all win."

HPD

LITTLE DEUCE COUPE

P2 coupes such as HPD's all-new ARX-04b are *de rigeur* for the 2015 WEC, but are likely to be seen in next year's TUDOR Championship Prototype class, too.

Open-top P2 cars (ABOVE) exit the WEC for 2015, replaced by coupes. P2 manufacturers are cautiously opimistic that the new breed will be the basis of the TUDOR Championship's 2017 Prototype reboot.

JohnRourke/AdrenalMedia.com

VAUTIER'S VOTE IS VALID

Tristan Vautier is the perfect development driver for the Dallara IL-15, coming armed with recent experience of the Mazda Road To Indy (he's the 2011 Pro Mazda and '12 Indy Lights champ) *and* the Verizon IndyCar Series, where he took 2013 Rookie of the Year honors.

INDY LIGHTS DALLARA IL-15
INDY LIGHTS PRESENTED BY COOPER TIRES

LIGHT WORKOUT

The all-new 2015 Indy Lights Dallara IL-15 first hit the track for testing in August, and is already ticking the right boxes.

WORDS David Malsher IMAGES Marshall Pruett

That old adage "If it looks right, it is right," has been applied to racecars for decades, yet hasn't always proven accurate. But the inevitable worries before a new design first hits the track proved groundless in the case of the handsome Dallara IL-15, the car that will populate the grids of the Indy Lights Presented by Cooper Tires series next year.

The shakedown, held at Mid-Ohio SportsCar Course a day after IndyCar and the entire cadre of Mazda Road To Indy series raced there in early August, was potent proof of concept. The IL-15, designed and built by Dallara, with Andersen Promotions' project manager Tony Cotman overseeing its gestation, was fast with a capital F. By the end of the day, the AER-powered machine had set a time 0.6sec quicker than pole for the Indy Lights race held two days earlier.

Least surprised by this was the guy who set the time, 2012 Indy Lights champion and '13 IndyCar Series Rookie of the Year Tristan Vautier. The 24-year-old Frenchman, whose full-time role this year is racing the Mazda SKYACTIV-D Prototype in the TUDOR United SportsCar Championship, is the ideal man for the job of developing the IL-15, given his experience of the old car and his familiarity with the next step up. The fundamental purpose of the new Lights car is to prepare next-gen racers for IndyCar, so Vautier knows exactly what's required of Dallara's latest *bambino*.

"I guess the current Indy Lights car was probably good preparation for the previous generation IndyCar," says Vautier during the lunch break at a test on the road course at Indianapolis Motor Speedway. "But the IL-15 will be perfect for drivers moving up to the latest DW12 IndyCar. The design philosophies are the same.

"The overall balance is similar, and so is the grip/power ratio. The current Indy Lights car is quite understeery, and the IndyCar is not at all, so the rear of the >

UP TO SPEED ON THE FAST TRACK TO INDY

For the latest from the Mazda Road to Indy ladder, go to indylights2014.com for Indy Lights Presented by Cooper Tires, promazdachampionship.com for Pro Mazda Championship Presented by Cooper Tires and usf2000.com for the Cooper Tires USF2000 Championship Powered by Mazda.

Marshall Pruett

Marshall Pruett

(RIGHT) Even in plain carbon fiber, Dallara's IL-15 looks stunning. (FAR RIGHT) Its lowline, turbo, 2-liter AER engine makes 450hp and has done so reliably, which has allowed speedy development.

(LEFT) On its first test day, the Dallara IL-15 ducked well under pole time for the previous weekend's Lights race. Similar gains were seen at Indy on both the oval (BELOW LEFT) and the road course.

IL-15 is more lively, which will relate better to the DW12. And on an oval, it's harder and more challenging to be fast in it. The current Indy Lights car wasn't underpowered, but this new one has 450hp, so it's going to be more difficult to be flat, especially once you're around other cars and their dirty air."

Conor Daly, an Indy Lights race winner, GP3 race winner and current GP2 driver, has also been assisting the development of the IL-15, which can only help. He set a time around Indy's oval quicker than this year's pole time for the Freedom 100, the Indy Lights series' most prestigious event, and was impressed with the rapid progress made in the handling development from the start to the end of the day.

"At first, the rear was wandering a little bit on turn-in," says Daly, "but we made a bunch of adjustments stiffening up the settings as a whole and that improved it a lot. Our last run proved to be our quickest, which is how you want it to be.

"And it's going to get quicker. I think our top speed was 199mph, and we hadn't even touched sixth gear. In sixth and with a tow, I think this car should be able to do over 205, which should mean it's not flat all the way around IMS. It will require driving into the turns."

And that's exactly what the DW12 has done to the oval racing in the Verizon IndyCar Series – brought the driver, rather than the aerodynamicist, to the forefront of importance. So while the Dallara IL-15 cannot yet claim "mission accomplished," it appears that it will fulfill its brief: to prepare the world's most versatile junior drivers for the world's most diverse top-level racing series, IndyCar.

Andersen Promotions

"I think our top speed was 199mph and we hadn't even touched sixth gear. With a tow, this car should do 205"

CONOR DALY

"It's been satisfying to see that the speed's already there," says Cotman, "but we weren't too worried, because computer projections at the design phase are very accurate. Still, we were really anal about making sure IL-15 was stronger, yet considerably lighter than the old car, and achieving that is a pretty good feeling.

"Actually, what's really impressed me is that we've already had the chance to *prove* the car's speed because it's been so reliable. The AER engine was only fitted 48 hours before the test. We dropped the car off the stands, and away we went. Each test, we run all day, no real issues. Electrics, gearbox [six-speed paddle-shift] ...they're fine too. That's encouraging."

It's *not* the duty of the test team, comprising people from IndyCar, Dallara, AER and other suppliers, to fine-tune the car's handling. It's down to the teams and drivers who will race the IL-15 to tailor their cars to suit, within the framework of the technical regulations.

"That's right, these tests are about setting the parameters of setup windows and continuing to test durability," says Cotman. "We need to be sure the technical information we hand over along with the cars is validated, 100 percent accurate."

An interesting sidenote is that, while a wet practice session on a race weekend often sees teams reluctant to put their cars at extra risk by sending them out on track, Cotman says a wet test session for the IL-15 prototype will be welcomed.

"It'll be good to know the balance of the car in the wet," he says, "but also Cooper Tires has got a new wet compound for this car that they really want to log data on."

It's another example of the thoroughness with which the Indy Lights test team tackles its job. The IL-15 looks right, and its creators were confident it would perform well, but miles on the track are the real proof. ■

THE CHAMP GOES BACK TO HIS ROOTS

Three-time IndyCar champion Scott Dixon (BELOW) was also the 2000 Indy Lights champ and he, along with Lights and IndyCar ace James Hinchcliffe, gave develoment of the Dallara IL-15 another boost by agreeing to test it.

Said Dixon: "It's an important stepping stone on the Mazda Road to Indy. I look forward to driving the IL-15 on the IMS road course."

Added Hinchcliffe: "Indy Lights made me the driver I am. This car is a big step in revitalizing the series, so this is a cool opportunity."

Brian Cleary/LAT

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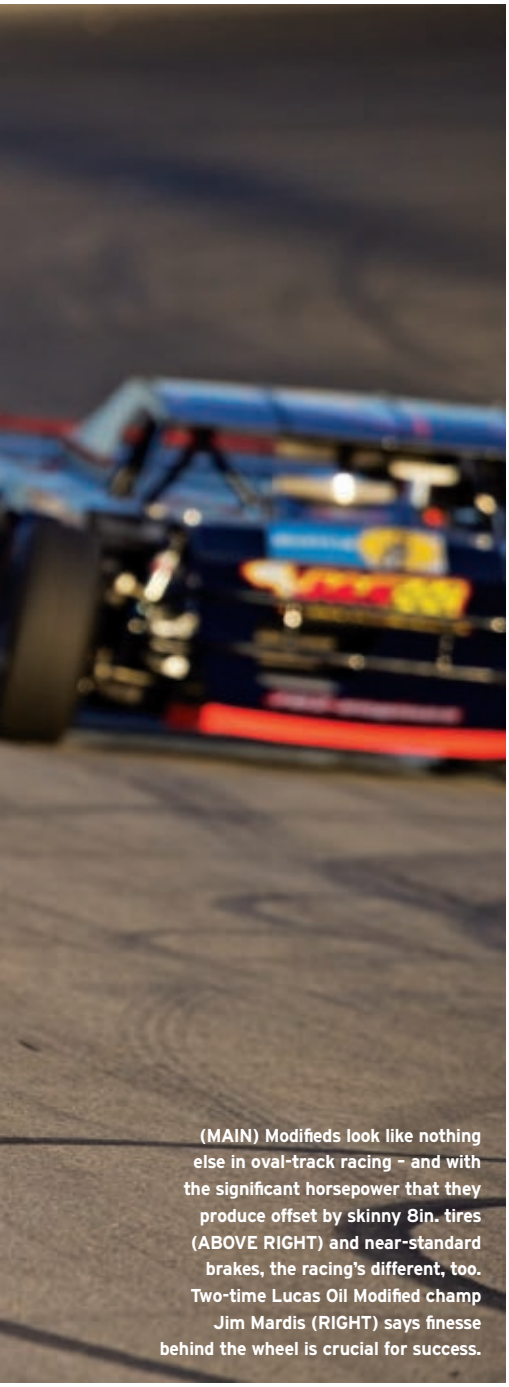
WORDS & IMAGES Richard S. James

Racing on short tracks in the Lucas Oil Modified Series requires critical thinking in both car physics and driver dynamics.

SETUP AND PSYCHOLOGY



(MAIN) Modifieds look like nothing else in oval-track racing – and with the significant horsepower that they produce offset by skinny 8in. tires (ABOVE RIGHT) and near-standard brakes, the racing's different, too. Two-time Lucas Oil Modified champ Jim Mardis (RIGHT) says finesse behind the wheel is crucial for success.

Big horsepower and small tires are either a recipe for disaster or great entertainment. In the case of the Lucas Oil Modified Series Presented by LoanMart, it's definitely the latter.

It's a style of short track racing that differs from the typical stock car formula of lots of power, but plenty of grip. Take away a lot of tire and a lot of brake, as is the case with the Modifieds, and the driving and racing change significantly.

"The biggest thing with these cars is they're high horsepower to low tire," explains two-time Lucas Oil Modifieds champion Jim Mardis. "You don't have aftermarket brakes, so you can't whoa them down all that well. The tire's good for a couple of laps, but you're on an eight-inch treaded tire, so it doesn't have the grip like some of the bigger late model stock cars do. So you're running a real fine balance, trying to find the right horsepower and trying to get it down to the ground. It's just a high horsepower car with no tire, and it's real finicky, so you've got to have finesse behind the wheel."

A modified looks like nothing else in racing. More open-wheeler than closed-body stock car, only one of the wheels sits inside a fender; the rest are out in the airflow. Rules are minimal; the engine rule, for example, is basically that it's iron block, American-made, limited to 410cu.in. and capable of being mounted in a production car. That gives a lot of room to produce a *lot* of horsepower.

In contrast to the freedom on the engine side, brakes must be OEM calipers with steel rotors. The 8in., grooved Hoosier 700 tire only adds to the dichotomy of putting a heap of power into a car that's limited in several key areas in its ability to properly use it – which is half the challenge.

Those limitations mean that the chassis and suspension are absolutely critical to building a car that will get around a quarter-, third- or half-mile track as quickly as possible. Steve Teets of Short Track Race Cars has built a whole bunch of Modifieds – about half the field on any given Saturday.

He sets up quite a few of them at the track and provides shock packages for many more. He is, in short, the Modified guru.

"The tire doesn't have a real good sidewall, so you've got to play with the pressures and stuff," he says. "The idea with the chassis is to make those four tires work as well as they can, and this tire is a lot different from a lot of others.

"We try to get the cars down as low as we can and get the CG down to transfer the least amount of weight off the left side," he adds. "Whoever uses the left-side tires the best is going to have the best racecar."

One of Teets' customers is defending champion Chris Gerchman. The youngest in a line of short track racers, Gerchman led most of the race at a recent outing at Irwindale Event Center, before being passed in the closing stages by Dylan Capello, who led the 2014 points as of mid-August. For a driver, Gerchman notes, trying to achieve Teets' goals in a limited amount of track time comes down to experience.

"Trying to figure out what the car needs is where the experience comes in," Gerchman says of trying to set it up for the race in only a few laps of practice. "You've got to know what the feeling is. The more you achieve it, the more you're going to know what it feels like. I've only >

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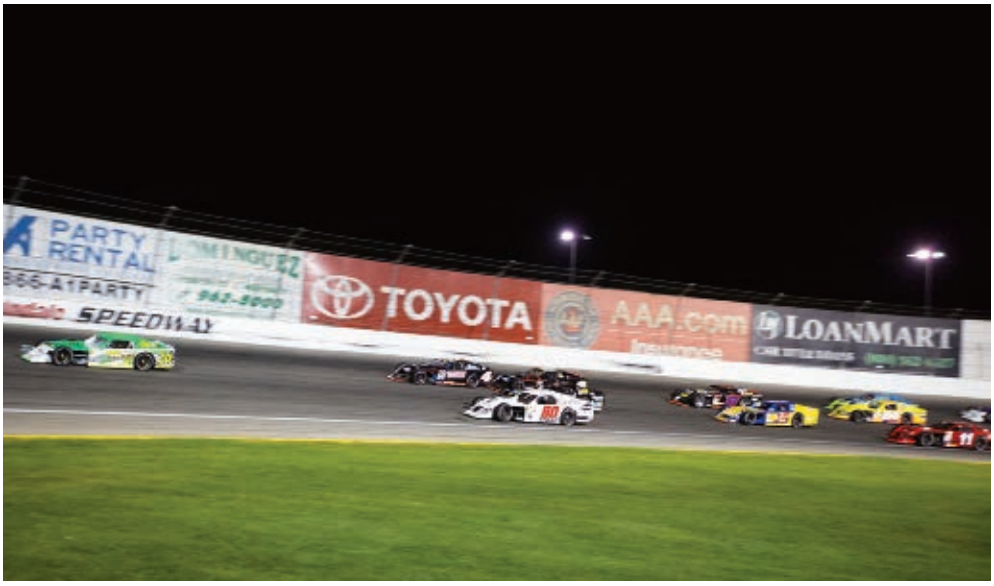
After making stops in Arizona, California, Nevada and Utah along the way, the Lucas Oil Modified Series culminates in The LoanMart West Coast Short Track Championship Presented by iON Camera, at Las Vegas Motor Speedway, Nov. 22.

You can catch highlights from the Lucas Oil Modified Series on MAVTV.

Check out **lucasoilmodifieds.com** for news, results, upcoming events, tracks and TV schedules.



felt it two or three times in my whole career when I've said, 'The car is perfect.'"

At Irwindale, Gerchman felt his car was a little too free, too loose in the first practice session. In the second, it was still not tight enough. Add to that his relative unfamiliarity with the track, and Gerchman had his work cut out for him.

"I've been driving different lines this weekend more than ever," he says. "I've been working more on that than actual car setup. It's a balance of trying to get the car right and figure out the track."

"I've learned the key phrase 'just enough.' How much of anything do you need? It's just enough"

JIM MARDIS

To get zoned in on a setup, there are only so many parameters to play with. One area, though, is wide open.

"The shock package, the roll centers and the A-arm angles...it's all the stuff that I think that I'm a little behind on right now that will make or break you," says Mardis. "It's really all you've got, because everybody makes a lot of horsepower and everybody is on the same tire. [Suspension] geometry is free and shock absorbers aren't. It gives you some room to think."

Mardis has learned, though, that it's easy to go overboard with these cars. Oftentimes, restraint is the key.

"I've learned the key phrase 'just enough.' How much of anything do you need? It's just enough. How much horsepower do you need? It's just enough. How much shock tie-down do you need? It's just enough. Those numbers can move around. But it's one of the biggest things I've learned, because the mind wanders and you maybe want to do more than you need to. The other lesson is patience, because they're longer races with no tire. The guys that save their stuff to the end, it normally works out for them."

(ABOVE) Early going in the A-Main at Irwindale. As the race progresses, cars will tend to migrate to the high groove. (LEFT) Champ Chris Gerchman and Modifieds "guru" Steve Teets talk setup.

It was a lesson well illustrated at Irwindale, where Gerchman dominated most of the 75-lap, no pitstop race on the half-mile track. But, in the end, he had nothing left to fight off Capello. Fact is, a good setup still needs a good driver to make it work for not only a lap, but the whole race. The type of track doesn't matter; the driver's brain and contact points are still key.

"I tend to read my competition not only as a person, but how they react in a car," says Gerchman. "That's the biggest thing you've got to learn. We judge people sometimes by certain things that they do. It's almost like their own gestures, but you're seeing it through their car. You've got to know what they're thinking."

It's a game not only of physics, but psychology, too. Short track or superspeedway, that's one of the things that never changes about the sport. ■

SHORT AND SHORTER

TRACK LENGTH IS KEY IN SETUP AND THE NATURE OF THE RACING

The differences between speedways and short tracks seem obvious. But just like the subtleties between a two-mile track and a 1.5-miler, the differences in setup and driving for a quarter mile such as I-10 Speedway in Blythe, Calif., or a three-eighths like Tucson Raceway Park, or Irwindale's half-mile track can be significant.

"We can run a lot more motor [at a half-mile]," says Steve Teets of Short Track Racecars. "The shock package is different also. We can run a lot more rebound, because aero is more important, just to keep them tight. On the small tracks, you come off the rebound and let the car move around and work a little bit more."

A high-horsepower, low-grip car like a Lucas Oil Modified can make passing tricky at best. The type of track changes the equation as well.

"Blythe is a one-groove bullring; it's tough to pass," says two-time champ Jim Mardis. "Vegas is a one-groove track. Irwindale's wide, but because of the small tire, everybody migrates to the top of the racetrack, and it's very hard to get by people on the bottom."

And, unsurprisingly, the racing style changes with the speeds the cars are moving as the tracks get longer and cornering speeds go up.

"At the shorter tracks, there's a little more rooting and banging. It's more forward drive issues and trying to get the car pointed in the center," Mardis explains. "At the bigger racetracks, it's really about rolling the center, and you kind of give each other a little more room and respect. I personally like the smaller bullrings, but to each his own."

Half-mile Irwindale sees aero and outright power coming more into play.

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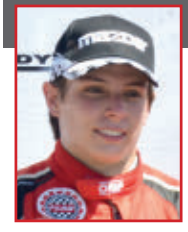

GABBY CHAVES

2014 Champion, Indy Lights Presented by Cooper Tires

AGE	21
BIRTHPLACE	Bogotá, Colombia
TEAM	Belardi Auto Racing

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SPENCER PIGOT

2014 Champion, Pro Mazda Championship Presented by Cooper Tires

AGE	20
BIRTHPLACE	Orlando, Fla.
TEAM	Juncos Racing

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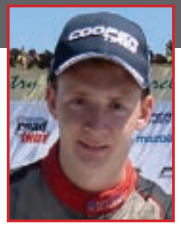

FLORIAN LATORRE

2014 Champion, Cooper Tires USF2000 Championship Powered by Mazda

AGE	17
BIRTHPLACE	Libourne, France
TEAM	Cape Motorsports with Wayne Taylor Racing

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READY TO ENGAGE

Could K1 Speed be the answer to growing the motorsports fan base?

WORDS **George Tamayo**

It's no secret that motorsports as a whole is seeing a decline in its fan base. Depending on who you speak to, it's either on the verge of apocalyptic or it's merely a natural cycle of ebb and flow. K1 Speed indoor karting centers, on the other hand, are enjoying strong growth. Since 2008, it's doubled the number of locations to 22 across nine states and put over 3.7 million people in its karts, with 1.3 million of them identified as core customers. Crucially, an estimated 45 percent are under age 35.

K1 Speed was founded in 2003 by David Danglard and road racing ace, Boris Said. Just a decade later, the company has blossomed to become the national leader in indoor karting centers.

Each center is unique in both setup and track layouts, but the ambiance, amenities and type of karting on offer are the same. Layered with a variety of motorsport memorabilia ranging from Formula 1 to off-road race trucks, every location includes cafes, lounges and meeting rooms, all within viewing range of meticulously crafted and maintained tracks.

Gleaming electric karts with their instant torque and high grip provide "arrive and drive" customers with 14 laps of fun and thrills within minutes of arriving at the center, with high-tech timing and scoring for every participant. Cost is just $19.99 per session – although it must be said, the experience is so addicting, it's hard to walk out after only one session.

The Irvine, Calif., center's general manager, Uli Perez, estimates that half of its arrive and drive customers, meaning those not participating in organized events or leagues, are between 15 and 35 years old, yet only one or two percent could be described as "racing fans."

"When customers come in, many of them are interested in the race cars we have on display and some will ask questions about what kind of racecar it is

Junior League action at K1 Speed in San Diego, Calif. – one of 22 current locations across nine states.

JOIN THE LEAGUE

If you really want to get into your racing groove, K1 Speed offers both adult and junior racing leagues at all its locations.

Most centers hold races one night per month in the ChallengeGP 2K14 series that wraps up in December. Each race night is $50 (or $55 at the longer super tracks), including two qualifying sessions and a 14-lap race. (Seven at super tracks.)

Racecraft and kart control make the difference as the fast-paced heats and twisting tracks reward smoothness and penalize all but the smallest mistakes.

Junior League races are open to kids between 4ft and 4ft 9in tall, while the Youth League is for kids over 4ft 10in. A Junior/Youth League season consists of five rounds, priced at $40 each.

All race gear is provided, so get off the couch and get behind the wheel.

and who drove it," he says, "but hardly any of them have any prior awareness."

So, given motorsports' relative weakness in attracting a younger audience, is the sport as a whole missing out on an opportunity to recruit new fans? K1 Speed creative director Marcus Stokes certainly thinks so. He points to the strength of racing leagues that feature packed entry lists and account for about five percent of their business, most of whom are in the age sweet spot.

"In that regard, the beauty of what we do at K1 Speed is that we put people into a competitive and thrilling environment that's immediately relatable to a performance metric," says Stokes. "They get in a kart and drive their hearts out, and then they see the scoring sheet and know right away where they stand – and that's a part of what motivates them to do it again. That part of it is something that helps gain a greater appreciation for what the pros do, if only at a higher level. What it will take to use us as an audience builder is a willingness from the professional series to collaborate.

"We're not competitive at all with their interests," he adds. "On a weekend, we have all the races on the TVs around the center, and we do get people who come in and hang out to watch the races and drive themselves, so there is something to it. The sport as a whole, though, needs to engage more people at this level."

It's Stokes' job to create the kind of ambiance and setting in each of the centers that helps to deliver the racing experience. In a "multi-denominational" way the signs are all around, yet the bridge between kart centers and the professional race series has yet to be built. What's clear is that there is a significant pool of people who are engaged in a genuine racing activity and are on the hook ready to be reeled in. ■

Nigel Kinrade/LAT

KARTS OR CARS, IT'S ALL RACING

K1 Speed co-owner Boris Said, who's been racing professionally in North America and Europe for more than 20 years, remains a huge fan of the karting experience:

"I've been racing for a long time and I still get as much of a thrill on kart tracks as I do on a big race track. The experience is different, but it doesn't make one better or more real than the other. At K1 Speed, you're racing wheel-to-wheel, sometimes with people you know and sometimes people you don't. But in the end it's a genuine, hands-on racing experience, and exposing people to that is ultimately exposing them to our sport."

To learn more about the K1 Speed indoor karting experience and find the location nearest to you, check out **K1SPEED.COM**

WORDS Richard S. James
IMAGES Headonphotos.net

NASA RACING FIRST STEPS: PREPARE FOR LIFTOFF

The path from couch to race circuit is not always clear. Even for someone who's discovered the joys of track driving, the way to go from there to wheel-to-wheel racing is not always obvious. That's why the National Auto Sport Association (NASA) aims to make the path from point A to point B more evident.

"If you've never been to a road race track before," says Will Faules, NASA's Championships event manager and regional director for the Texas region, "on Day 1, first time on the track, we take you through four different levels in the High Performance Driving Event, all the way to advanced run groups."

From there a driver who wishes to can move into Time Trials – competition against the clock – and then on to door-to-door racing. Says Faules: "It's a full ladder program designed to take the enthusiast as far as they want to go in road racing."

"A driver who wishes to can move into Time Trials – competition against the clock – and then on to door-to-door racing"

For those with more experience, the trip may be shorter, as they may be able to start with advanced groups in HPDE or Time Trials. Those with a competition license from another organization may be able to obtain a NASA license by filling out a few forms.

For those just starting out, though, NASA offers a simple progression – or they may choose to use the Ford Racing School at Miller Motorsports Park, NASA's official school (see sidebar).

Before you decide

Before a prospective racer goes about choosing a class – and NASA has many unique offerings such as Spec E30 (BMW), (Porsche) 944 Spec, American Iron, Camaro/Mustang Challenge, Honda Challenge and Performance Touring, along with one of America's most popular racing classes, Spec Miata – and taking those first important steps, Faules recommends simply going to a local event and checking it out.

"You'll notice, looking at entry lists or results across different regions, that there are certain cultures that are big in certain regions," he says. "One region might have a

You want variety? NASA's definitely got it. For example, check out Super Touring 1 Chevrolet Silverados sharing the asphalt with Oli Thordarson's Super Touring 2 Corvette at Mazda Raceway Laguna Seca.

FOR MORE ON NASA, HEAD TO **NASAPRORACING.COM**

MIXING IT UP
(MAIN) The 25 Hours of Thunderhill enduro is a showpiece for the sheer range of cars that come under NASA's remit. Here, an E1 class Lexus IS 250, E3 Mazda Miata and ERS Wolf mix it up. (BELOW RIGHT) Amir Haleem's ST2 class Mazda RX-7 at Mazda Raceway Laguna Seca.

(BELOW) GTS3 class BMW M3 racer Scott Smith preps his car at Mazda Raceway Laguna Seca. Seems obvious, but when it comes to scoping out potential classes to race in, there's nothing like heading to your local track and talking with the guys already competing.

huge Spec E30 field; another region might not, but they'll have a big CMC or AI field. I recommend going to an event at your local region and seeing what's big there.

"Talk to the guys who are running in it and they'll tell you straight up what kind of costs you're looking at to run one of the cars and what it takes. A lot of frontrunners will even give tips to the new guys to help get them up to speed. We all do this to be competitive, so folks want competition and to be in the biggest field possible that their resources will allow them to run in."

A popular choice

One of the more popular NASA classes is Performance Touring, which allows almost any car to run. Each car is given a base class, and each modification is assessed a certain number of points. As competitors make changes to their car, each change adds points; once they reach a certain number of points, they move up to the next class.

"It's proven over the years that it's an even and fair platform," says Faules.

"There are some creative ways to play with those points. It may not be worth it to put on a spoiler that's not going to be extremely effective, but it might be worth it to take the points for a really good set of tires, for example."

While Performance Touring is only one – albeit popular – option for racing in NASA, the best first step is to attend an event and get a feel for it. From there, HPDE to Time Trials to door-to-door road racing is the path most people will take.

"We love to hear from people who have never done it before," says Faules. "It's easy to teach good habits to people who have no habits. It's always great to take new people and put them in our High Performance Driving Events program and progress them through the ranks." ■

THE FORD RACING SCHOOL, THE OFFICIAL SCHOOL OF NASA

While the proven progression from High Performance Driving Events, to Time Trials, to road racing is the route most NASA drivers will take, for those seeking a faster, more direct route to a competition license, there's the Ford Racing School at Miller Motorsports Park, Utah.

"They've got a unique four-day program where those who excel or show good skill in the first two days will end up racing in a NASA weekend in the Ford School cars for the last two days," says Will Faules, NASA's Championship events manager. "This is the only school in the country where people will leave with a NASA provisional license that can then be used in any one of our regions.

"We've worked really hard to build this program at Miller Motorsports Park to teach all the NASA-specific things," he adds. "That's why it's been so successful."

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2013 HONDA CIVIC SI

IMSA CONTINENTAL TIRE ST/ SCCA WORLD CHALLENGE TC / TCA / NASA PT-TT. Built by RSR Motorsports. 10 races only in 2013. Car completely freshened before 2014 season, 0 races in 2014. Built from body in white, Pro cage by Matt Chambers, HPD engine with only 3 hours, HPD differential and fourth-gear upgrade, Accusump, HPD header and custom exhaust, AST coilover shocks, HPD sway bar, TSX brakes with alum cooling ducts and carbon fiber air ducts, C&R radiator and oil cooler, full MOTEC dash, Recaro seat with slider and all belts, fuel cell, Enkei wheels with spares. Total turnkey price: $75,000 obo. **Contact Joe (602) 618-6137 or joe@aandcproperties.com**. [25069-10]

IMSA CONTINENTAL TIRE ST / SCCA World Challenge TC/TCA / NASA PT-TT. 2013 body in white with roll cage and seam-welded chassis by Mark McMahan, AST shocks, HPD suspension including rear camber arms and ride-height adjusters, HPD/Stop Tech 4-piston WC front calipers and rotors with full brake-cooling tubes and carbon fiber air ducts, Recaro seat with slider brackets, safety belts and window net, MOTEC sport dash and Race Keeper system, 10 Enkei wheels 8x17-inch, flat black body wrap. Only needs engine and transmission to race. $37,500 or best reasonable offer. **Contact Joe (602) 618-6137 or joe@aandcproperties.com**. [25070-10]

2013 HONDA CIVIC SI ROLLER

VAN DIEMEN F2000 RF02

For sale. Race Ready, Prep by HP-TECH. **For more information: hptechmotorsport@gmail.com or (786) 525-1524**. [25075-10]

Prepared by James Lee. Quicksilver Ford Zetec, WRD Gearbox, Prince frame upgrade, Dynamic Shocks, AiM Data w/GPS. New Fuel cell. Entire spares package. 100th Series race-winning car. **Contact Kyle Connery. (772) 538-5048**. [25064-11]

2006 F2000 VAN DIEMEN

2004 BMW E46 M3

SCCA / BMW CLUB / NASA ST2/ST3. 3.2L blueprinted engine, CP pistons, Schrick cams, Euro header, VAC carbon fiber plenum, Dinan throttle bodies, Accusump, Turner Motorsports oil cooler, alum radiator, Clutch Masters flywheel and clutch, Blanton 4:10 diff, TC Kline Konis, suspension bushings upgraded, front/rear rollbars by Ground Control, alum rear control arms, diff cooler, splitter, rear wing and carbon fiber roof, race seat, slider and belts, AIM dash, removable steering wheel, fiberglass doors, fiberglass trunk, front carbon fiber bumper, two sets of wheels, Lexan rear window, Stop Tech calipers front and rear, many spares, low hours. $58,000 obo. **Contact Joe at (602) 618-6137 or joe@aandcproperties.com**. [25071-10]

Same as 2nd place Runoffs car that led many laps. Loyning engine. Expensive mods and spares worth over $20,000. Price: 15,000 OBO. **Cotact Jerry at (530) 367-3899**. [25061-09]

RF VAN DIEMEN FF

RF 99 ZETEC FOR SALE

Chassis 2595. All wide track. Zetec motor. New Aim EV04. Pennon diffuser. Penske 8760s. Bosch fuel pump. Log book. $42,900 **Tony Smith (920) 210-2169**. [25087-09]

Chassis #009 Engine #2116 (Hasselgren) EFI Data/Ohlin Dampers. Very Low mile FA developed by Dorricott Racing. **Contact: sjcollias@tummycompany.com or call (310) 562-5110**. [25084-09]

SWIFT 014(A)

2004 STOHR-WEST

VIN 001 GENI P-2. 06 Suzuki GSX-R 1000. Upgraded wiring, new paint, 2 new sets of Hoosier tires, MOTEC ADL, paddle-shift, current logbook, professionally sorted, ready to race. Fast, beautiful car, $36k. **For more info, call Ron (530) 836-1198**. Interstate Pro series fully-equipped car trailer also available 6k everything to go racing. [25067-10]

DIARY
SEPTEMBER 2014


Matthew Thacker/LAT

AJ Allmendinger outgunned NASCAR's resident road race ace Marcos Ambrose at Watkins Glen to finally notch up his first victory in the Sprint Cup ranks for JTG Daugherty Racing.


Michael Levitt/LAT

ACTION EXPRESS RIDE TO THE FRONT

The Action Express Corvette Daytona Prototype squad appeared to be gaining the upper hand in the Prototype division as the TUDOR United SportsCar Championship entered its home stretch. Joao Barbosa and teammate Christian Fittipaldi scorched to back-to-back victories at the Indianapolis Motor Speedway and Road America to head Wayne Taylor Racing's Jordan and Ricky Taylor by 16 points with just three races to go.

F1 WORLD CHAMPIONSHIP

March 16	Australia	Nico Rosberg
March 30	Malaysia	Lewis Hamilton
April 6	Bahrain	Lewis Hamilton
April 20	China	Lewis Hamilton
May 11	Spain	Lewis Hamilton
May 25	Monaco	Nico Rosberg
June 8	Canada	Daniel Ricciardo
June 22	Austria	Nico Rosberg
July 6	Britain	Lewis Hamilton
July 20	Germany	Nico Rosberg
July 27	Hungary	Daniel Ricciardo
Aug. 24	Belgium	Daniel Ricciardo
Sept. 7	Italy (Monza)	
Sept. 21	Singapore (Marina Bay)	
Oct. 5	Japan (Suzuka)	
Oct. 12	Russia (Sochi)	
Nov. 2	United States (CoTA)	
Nov. 9	Brazil (Interlagos)	
Nov. 23	Abu Dhabi (Yas Marina)	

VERIZON INDYCAR SERIES

March 30	St. Petersburg	Will Power
April 13	Long Beach	Mike Conway
April 27	Barber	Ryan Hunter-Reay
May 10	Indy GP	Simon Pagenaud
May 25	Indy 500	Ryan Hunter-Reay
May 31	Detroit 1	Will Power
June 1	Detroit 2	Helio Castroneves
June 7	Texas	Ed Carpenter
June 28	Houston 1	Carlos Huertas
June 29	Houston 2	Simon Pagenaud
July 6	Pocono	Juan Montoya
July 12	Iowa	Ryan Hunter-Reay
July 20	Toronto 1	Sebastien Bourdais
July 20	Toronto 2	Mike Conway
Aug. 3	Mid-Ohio	Scott Dixon
Aug. 17	Milwaukee	Will Power
Aug. 24	Sonoma	Scott Dixon
Aug. 30	Fontana, Calif.	

IMSA TUDOR UNITED SPORTSCAR CHAMPIONSHIP

Jan. 25-26	Daytona	S. Bourdais/ J. Barbosa/C. Fittipaldi
March 15	Sebring	Pruett/Rojas/Franchitti
April 12	Long Beach	S. Pruett/M. Rojas
May 4	Monterey	J.V. Overbeek/E. Brown
May 31	Detroit	J. Taylor/R. Taylor
June 7	Kansas (PC)	C. Braun/J. Bennett
June 29	Watkins Glen	M Valiante/ R. Westbrook
July 13	Mosport	G. Yacaman/O. Pla
July 25	Indianapolis	J. Barbosa/ C. Fittipaldi
Aug. 10	Elkhart Lake	J. Barbosa/ C. Fittipaldi
Aug. 24	VIR, Alton, Va.	
Sept. 20	Circ. of The Americas, Austin, Texas	
Oct. 4	Road Atlanta, Ga. (1000m/10hrs)	

NASCAR SPRINT CUP SERIES

Feb. 23	Daytona 500	Dale Earnhardt Jr.
March 2	Phoenix	Kevin Harvick
March 9	Las Vegas	Brad Keselowski
March 16	Bristol	Carl Edwards
March 23	Fontana	Kyle Busch
March 30	Martinsville	Kurt Busch
April 7	Texas	Joey Logano
April 12	Darlington	Kevin Harvick
April 26	Richmond	Joey Logano
May 4	Talladega	Denny Hamlin
May 10	Kansas	Jeff Gordon
May 25	Charlotte	Jimmie Johnson
June 1	Dover	Jimmie Johnson
June 8	Pocono	Dale Earnhardt Jr.
June 15	Michigan	Jimmie Johnson
June 22	Sonoma	Carl Edwards
June 28	Kentucky	Brad Keselowski
July 6	Daytona	Aric Almirola
July 13	Loudon	Brad Keselowski
July 27	Indianapolis	Jeff Gordon
Aug. 3	Pocono	Dale Earnhardt Jr.
Aug. 10	Watkins Glen	AJ Allmendinger
Aug. 17	Michigan	Jeff Gordon
Aug. 23	Bristol	Joey Logano
Aug. 31	Atlanta, Ga.	
Sept. 6	Richmond, Va.	
Sept. 14	Chicagoland, Ill.	
Sept. 21	Loudon, N.H.	
Sept. 28	Dover, Del.	
Oct. 5	Kansas City, Kan.	
Oct. 11	Charlotte, N.C.	
Oct. 19	Talladega, Ala.	
Oct. 26	Martinsville, Va.	
Nov. 2	Fort Worth, Texas	
Nov. 9	Phoenix, Ariz.	
Nov. 16	Homestead, Fla.	

FEATURE RACE

SINGAPORE GRAND PRIX
WHEN Sept. 21
WHERE Singapore

The rare spectacle of F1 under the lights and a Jennifer Lopez concert to boot!


Steve Etherington/LAT

TICKET INFO

Order race tickets directly at **www.singaporegp.sg**

WHERE & HOW

This tourist mecca has plenty to see within easy reach of the Marina Bay street circuit.

COAST IS CLEAR

It might have come too late for another points comeback, but Scott Dixon added an epic chapter to his legend at Mid-Ohio with a fuel-saving run to victory in which he matched the laps of rivals with plenty of gas to burn.


Phillip Abbott/LAT

"Having a car that's neutral under coast helps a lot to control the car when you're saving fuel because you can make it do whatever you need"

SCOTT DIXON revealing some of his fuel-saving speed secrets to RACER.com's Marshall Pruett


Brian Cleary/LAT

Russell LaBounty/LAT

"It's a very antiquated racetrack and the safety is not at all up to NASCAR standards"

RYAN NEWMAN **steaming after his encounter with Watkins Glen's guardrails**

Robert Kubica reluctantly vowed to change his all-out approach to rallying, but it's not paying off yet. The ex-F1 star crashed in pre-runs and during Rally Finland...

NASCAR NATIONWIDE SERIES

Feb. 22	Daytona	Regan Smith
March 1	Phoenix	Kyle Busch
March 8	Las Vegas	Brad Keselowski
March 15	Bristol	Kyle Busch
March 22	Fontana	Kyle Larson
April 4	Texas	Chase Elliott
April 11	Darlington	Chase Elliott
April 25	Richmond	Kevin Harvick
May 3	Talladega	Elliott Sadler
May 18	Iowa	Sam Hornish Jr.
May 24	Charlotte	Kyle Larson
May 31	Dover	Kyle Busch
June 14	Michigan	Paul Menard
June 21	Elkhart Lake	Brendan Gaughan
June 27	Kentucky	Kevin Harvick
July 4	Daytona	Kasey Kahne
July 12	Loudon	Brad Keselowski
July 19	Chicagoland	Chase Elliott
July 26	Indianapolis	Ty Dillon
Aug. 2	Iowa	Brad Keselowski
Aug. 9	Watkins Glen	Marcos Ambrose
Aug. 16	Mid-Ohio	Chris Buescher
Aug. 22	Bristol	Ryan Blaney
Aug. 30	Atlanta, Ga.	
Sept. 5	Richmond, Va.	
Sept. 13	Chicagoland. Ill.	
Sept. 20	Sparta, Ky.	
Sept. 27	Dover, Del.	
Oct. 4	Kansas City, Kan.	
Oct. 10	Charlotte, N.C.	
Nov. 1	Fort Worth, Texas	
Nov. 8	Phoenix, Ariz.	
Nov. 15	Homestead, Fla.	

NASCAR CAMPING WORLD TRUCK SERIES

Feb. 21	Daytona	Kyle Busch
March 29	Martinsville	Matt Crafton
May 9	Kansas	Kyle Busch
May 16	Charlotte	Kyle Busch
May 30	Dover	Kyle Busch
June 6	Texas	Matt Crafton
June 14	Madison	Darrell Wallace Jr.
June 26	Kentucky	Kyle Busch
July 11	Iowa	Erik Jones
July 23	Eldora	Darrell Wallace Jr.
Aug. 2	Pocono	Austin Dillon
Aug. 16	Michigan	Johnny Sauter
Aug. 21	Bristol	Brad Keselowski
Aug. 31	CTMP, Bowmanville, Ontario	
Sept. 12	Chicagoland, Ill.	
Sept. 20	Loudon, N.H.	
Sept. 27	Las Vegas, Nev.	
Oct. 18	Talladega, Ala.	
Oct. 25	Martinsville, Va.	
Oct. 31	Fort Worth, Texas	
Nov. 7	Phoenix, Ariz.	
Nov. 14	Homestead, Fla.	

FIA WORLD ENDURANCE CHAMPIONSHIP

April 20	Silverstone	A. Davidson/ N. Lapierre/S. Buemi
May 3	Spa	A. Davidson/ N. Lapierre/S. Buemi
June 14-15	24 Hours of Le Mans	M. Fassler/ A. Lotterer/B. Treluyer
Sept. 20	Circ. of The Americas, Austin, Texas	
Oct. 12	Fuji, Japan	
Nov. 2	Shanghai, China	
Nov. 15	Sakhir, Bahrain	
Nov. 30	Sao Paulo, Brazil	

PIRELLI WORLD CHALLENGE

March 30	St. Petersburg, Fla. (GT)**
April 13	Long Beach, Calif. (GT)
April 27	Barber, Birmingham, Ala. (GT, TC)**
May 16	CTMP, Bowmanville, Ont. (TC)**
June 1	Detroit, Mich. (GT)**
June 1	Millville, N.J. (TC)**
June 21	Elkhart Lake, Wis. (GT, TC)**
July 20	Toronto, Ontario (GT)
Aug. 3	Mid-Ohio (GT, TC)**
Aug. 24	Sonoma, Calif. (GT)**
Aug. 31	Brainerd, Minn. (TC)**
Sept. 13	Miller Park, Tooele, Utah (GT, TC)**

** double-header event

Ebrey/LAT

FEATURE RACE

LONE STAR LE MANS

WHEN Sept. 19-20

WHERE Austin, Texas

The only appearance of the cars and stars of Le Mans – and the TUDOR Championship in one action-packed weekend.

TICKET INFO

Order race tickets directly at **www.circuitoftheamericas.com**

WHERE & HOW

A short drive from downtown, Circuit of The Americas offers a world-class race experience to match cosmopolitan Austin.

NHRA MELLO YELLO SERIES

Feb. 9	Pomona
Feb. 23	Phoenix
March 16	Gainesville
March 30	Las Vegas
April 13	Charlotte, N.C. (PSM)
April 27	Houston, Texas
May 18	Atlanta, Ga. (PSM)
May 25	Topeka, Kan.
June 1	Englishtown, N.J. (PSM)
June 15	Bristol, Tenn.
June 22	Epping, N.H. (PSM)
June 29	Chicago, Ill. (PSM)
July 6	Norwalk, Ohio (PSM)
July 20	Denver, Colo. (PSM)
July 27	Sonoma, Calif. (PSM)

FORCE PLAYS

Courtney Force added another star to her tiara with a victory over papa John at Sonoma, to become the winningest female in NHRA Funny Car history. Dad rebounded next time out at Seattle, scoring his 141st win in 251 career event starts.

Aug. 3	Seattle, Wash.
Aug. 17	Brainerd, Minn.
Sept. 1	Indianapolis, Ind. (PSM)
Sept. 14	Charlotte, N.C. (PSM)
Sept. 21	Dallas, Texas (PSM)
Sept. 28	Madison, Ill. (PSM)
Oct. 5	Reading, Pa. (PSM)
Nov. 2	Las Vegas, Nev. (PSM)
Nov. 16	Pomona, Calif. (PSM)

FIA WORLD RALLY CHAMPIONSHIP

Jan. 19	Monte Carlo	Sebastien Ogier
Feb. 9	Sweden	Jari-Matti Latvala
March 7-9	Mexico	Sebastien Ogier
April 4-6	Portugal	Sebastien Ogier
May 9-11	Argentina	Jari-Matti Latvala
June 1	Italy	Sebastien Ogier
June 27-29	Poland	Sebastien Ogier
Aug. 1-3	Finland	Jari-Matti Latvala
Aug. 22-24	Germany	Thierry Neuville
Sept. 12-14	Australia	
Oct. 3-5	France	
Oct. 24-26	Spain	
Nov. 14-16	Britain (Wales)	

COOPER TIRES INDY LIGHTS CHAMPIONSHIP

March 30	St. Petersburg	Z. Veach
April 13	Long Beach	G. Chaves
April 26	Barber 1	Z. Veach
April 27	Barber 2	G. Chaves
May 9	Indy GP 1	M. Brabham
May 10	Indy GP 2	L. Razia
May 23	Indianapolis	G. Chaves
July 6	Pocono	G. Chaves
July 20	Toronto	A. Baron
Aug. 2-3	Mid-Ohio 1&2	J. Harvey
Aug. 17	Milwaukee	Z. Veach
Aug. 23-24	Sonoma 1&2	J. Harvey

PRO MAZDA CHAMPIONSHIP

Mar. 29-30	St. Petersburg 1&2	S. Pigot
April 26-27	Barber 1&2	S. Pigot
May 9-10	Indianapolis 1&2	S. Hargrove
May 23	Indianapolis (oval)	G. Grist
June 28	Houston 1	S. Hargrove
June 29	Houston 2	S. Pigot
Aug. 2	Mid-Ohio 1	N. Costa
Aug. 3	Mid-Ohio 2	G. Grist
Aug. 17	Milwaukee	S. Pigot
Aug. 23	Sonoma 1	K. Kaiser
Aug. 24	Sonoma 2	J. Gutierrez

GABBY GRABS GOLD

Gabby Chaves held on and drove smart in the final rounds to claim the 2014 Indy Lights championship. It also meant Belardi Auto Racing broke the stranglehold that Schmidt and Andretti drivers have had on the Lights title since 2006.

Andersen Promotions

USF2000 CHAMPIONSHIP

Mar. 29	St. Petersburg 1	V. Franzoni
Mar. 30	St. Petersburg 2	RC Enerson
April 26-27	Barber Park 1&2	RC Enerson
May 9	Indianapolis 1	W. Owen
May 10	Indianapolis 2	A. Starrantino
May 24	Indianapolis (oval)	A. Telitz
July 19	Toronto 1	J. Eidson
July 20	Toronto 2	F. Latorre
Aug. 1	Mid-Ohio 1	RC Enerson
Aug. 2	Mid-Ohio 2	J. Eidson
Aug. 3	Mid-Ohio 3	F. Latorre
Aug. 23	Sonoma 1	RC Enerson
Aug. 24	Sonoma 2	F. Latorre

RACER.com

RACER.com has the latest racing news, views and features, plus Robin Miller's answers to your questions. Write to **MillersMailbag@racer.com**

TV
SEPTEMBER 2014


Jed Leicester/LAT

Remember to channel-hop during the Singapore Grand Prix weekend, as the qualifying session on Saturday, Sept. 20 airs on CNBC, with Friday's practice and Sunday's race on NBCSN.

SEPT. 12

SPARKING INTO LIFE

After more than a year of buildup as the technology was fine-tuned, the curtain is finally raised on the all-electric FIA Formula E Championship. The globe-trotting series – which runs at Long Beach next spring – starts its season in China's capital, Beijing, and all Formula E races will be on street courses as the series aims to maximize exposure to non-traditional racing audiences.

The new series has attracted top open-wheel teams and drivers from around the world, including current and former IndyCar squads Andretti Autosport and Dragon Racing (with French ex-Formula 1 driver Franck Montagny and British IndyCar winner Mike Conway, respectively) and prominent team backers like Virgin's Richard Branson and actor Leonardo DiCaprio. Can it live up to the hype?

DETAILS

3:30am FS1: The first race airs live from the streets of Beijing.

ALL TIMES ARE EASTERN (ET)

MONDAY SEPTEMBER 1

12:00pm ESPN2: NHRA Mello Yello Drag Racing Series, eliminations, Indianapolis, Ind. (L)

7:30pm FS1 (Sept. 1)
Red Bull Air Race, Ascot, UK
High speed, low altitude and extreme maneuvers challenge the world's top pilots.


Lukas Nazdracezew

TUESDAY SEPTEMBER 2

7:00pm NBCSN: Mecum Dealmakers, Indianapolis, Ind.
8:00pm NBCSN: Verizon IndyCar Series, Fontana, Calif. (R)
10:30pm NBCSN: Verizon IndyCar Series, Awards Banquet

WEDNESDAY SEPTEMBER 3

6:30pm NBCSN: Mecum Auctions, Indianapolis, Ind.

THURSDAY SEPTEMBER 4

6:30pm NBCSN: Mecum Auctions, Dallas, Texas
10:00pm NBCSN: Mecum Dealmakers, Harrisburg, Pa.

FRIDAY SEPTEMBER 5

12:30am NBCSN: Pirelli World Challenge, Sonoma, Calif. (R)
8:00am NBCSN: FIA Formula 1, Italian Grand Prix, practice, Monza (L)
1:00pm ESPN2: NASCAR Sprint Cup practice, Richmond, Va. (L)
3:30pm ESPN2: NASCAR Nationwide Series qualifying, Richmond, Va. (L)
5:30pm ESPN2: NASCAR Sprint Cup qualifying, Richmond, Va. (L)
6:30pm NBCSN: Mecum Auctions, Dallas, Texas
7:30pm ESPN2 NASCAR Nationwide Series, Richmond, Va. (L)

SATURDAY SEPTEMBER 6

8:00am NBCSN: FIA Formula 1, Italian Grand Prix, qualifying, Monza (L)
3:30pm NBCSN: TORC off-road racing, Crandon, Wis. (D)
7:30pm ABC: NASCAR Sprint Cup, Richmond, Va. (L)

SUNDAY SEPTEMBER 7

7:30am NBCSN: FIA Formula 1, Italian Grand Prix, Monza (L)
10:30am NBCSN: Off The Grid, Budapest, Hungary
2:00pm NBCSN: GP2 Series, Monza, Italy (SDD)

MONDAY SEPTEMBER 8

No racing scheduled at press time

TUESDAY SEPTEMBER 9

8:00pm NBCSN: Auctions America, Auburn

WEDNESDAY SEPTEMBER 10

No racing scheduled at press time

THURSDAY SEPTEMBER 11

9:00pm NBCSN: Mecum Dealmakers, Kissimmee, Fla.
10:00pm NBCSN: Mecum Dealmakers, Houston, Texas

FRIDAY SEPTEMBER 12

12:00pm FS1: NASCAR Nationwide Series practice, Joliet, Ill. (L)
1:00pm FS1: NASCAR Sprint Cup practice, Joliet, Ill. (L)
3:00pm FS1: NASCAR Camping World Truck Series qualifying, Joliet, Ill. (L)
4:30pm FS1: NASCAR Nationwide Series practice, Joliet, Ill. (L)
6:30pm ESPN2: NASCAR Sprint Cup qualifying, Joliet, Ill. (L)
8:30pm FS1: NASCAR Camping World Truck Series, Joliet, Ill. (L)

SATURDAY SEPTEMBER 13

11:00am FS1: NASCAR Sprint Cup practice, Joliet, Ill. (L)
3:30pm ESPN2: NASCAR Nationwide Series, Joliet, Ill. (L)

SUNDAY SEPTEMBER 14

7:00am FS1: MotoGP Championship, San Marino (L)
2:00am ESPN2: NHRA Mello Yello Drag Racing Series, qualifying, Charlotte, N.C. (SDD)
1:00pm FS1: Formula E, Beijing, China (R)
2:00pm ESPN: NASCAR Sprint Cup, Joliet, Ill. (L)
2:30pm NBCSN: Mecum Auctions, Dallas, Texas
8:30pm ESPN2: NHRA Mello Yello Drag Racing Series eliminations, Charlotte, N.C. (SDD)

Charles Coates/LAT

"I feel that now is the time. I wouldn't have made this jump if it didn't feel right or it wasn't a good opportunity"
SIMONA DE SILVESTRO **on the timing of her switch to an F1 test drive with Sauber**

Red Bull GRC

Red Bull's title sponsorship ensures prominent promotion for Global Rallycross, which attracted more than 700,000 viewers on NBC for its July event in New York City.

Malcolm Griffiths/LAT

MONDAY SEPTEMBER 15

8:00pm	NBCSN: Mecum Dealmakers, Kansas City, Mo.
9:00pm	NBCSN: Mecum Dealmakers, Indianapolis, Ind.
10:00pm	NBCSN: Mecum Dealmakers, Seattle, Wash.

TUESDAY SEPTEMBER 16

No racing scheduled at press time

CHANNEL GUIDE

ABC	ESPN on ABC
CBS	CBS Broadcasting, Inc.
CNBC	NBC Business News
NBC	NBC Universal
NBCSN	NBC Sports Network
ESPN	ESPN networks
ESPN-N	ESPN News
FOX	FOX Broadcast Network
FS1	FOX Sports 1 (formerly SPEED)
FS2	FOX Sports 2 (formerly FUEL)
TNT	Turner Network Television
VELOCITY	Velocity Channel
L	Live Program
R	Repeat Program
TBD	Start Time to Be Determined
D	Delayed from Earlier Day
SDD	Same Day, Delayed

All listings subject to change. Networks may broadcast programs at different times in different time zones. Check local listings.

WEDNESDAY SEPTEMBER 17

No racing scheduled at press time

THURSDAY SEPTEMBER 18

No racing scheduled at press time

FRIDAY SEPTEMBER 19

8:00am	NBCSN: FIA Formula 1, Singapore Grand Prix practice, Singapore (L)
12:00pm	FS1: NASCAR Sprint Cup practice, Loudon, N.H. (L)
1:30pm	FS1: NASCAR Camping World Truck Series practice, Loudon, N.H. (L)
4:30pm	FS1: NASCAR Sprint Cup qualifying, Loudon, N.H. (L)
6:30pm	FS1: NASCAR Nationwide Series practice, Loudon, N.H. (L)

SATURDAY SEPTEMBER 20

8:00am	CNBC: FIA Formula 1, Singapore Grand Prix qualifying, Singapore (L)
9:00am	FS1: NASCAR Sprint Cup practice, Loudon, N.H. (L)
10:00am	FS1: NASCAR Camping World Truck Series qualifying, Loudon, N.H. (L)
11:30am	FS1: NASCAR Sprint Cup practice, Loudon, N.H. (L)
1:00pm	FS1: NASCAR Camping World Truck Series, Loudon, N.H. (L)

SUNDAY SEPTEMBER 21

3:30am	ESPN2: NHRA Mello Yello Drag Racing Series, qualifying, Dallas, Texas (SDD)
7:30am	NBCSN: FIA Formula 1, Singapore Grand Prix, Singapore (L)
2:00pm	ESPN: NASCAR Sprint Cup, Loudon, N.H. (L)
5:00pm	NBC: Red Bull Global Rallycross Championship, Los Angeles, Calif. (L)
8:30pm	ESPN2: NHRA Mello Yello Drag Racing Series eliminations, Dallas, Texas (SDD)

TBA FOX (Sept. 21)
IMSA TUDOR Championship
The TUSCC race at CoTA airs Sunday on FOX; check your local listings for air times.

Jon R. Boris/LAT

MONDAY SEPTEMBER 22

7:30pm	FS1: Red Bull Air Racing, Fort Worth, Texas

TUESDAY SEPTEMBER 23

No racing scheduled at press time

WEDNESDAY SEPTEMBER 24

No racing scheduled at press time

THURSDAY SEPTEMBER 25

No racing scheduled at press time

FRIDAY SEPTEMBER 26

10:00am	FS1: NASCAR Nationwide Series practice, Dover, Del. (L)
11:00am	FS1: NASCAR Sprint Cup practice, Dover, Del. (L)
12:30pm	FS1: NASCAR Camping World Truck Series qualifying, Dover, Del. (L)
2:00pm	ESPN2: NASCAR Nationwide Series qualifying, Dover, Del. (L)
3:30pm	ESPN2: NASCAR Sprint Cup qualifying, Dover, Del. (L)
5:30pm	FS1: NASCAR Camping World Truck Series Dover, Del. (L)

SATURDAY SEPTEMBER 27

11:00am	FS1: NASCAR Sprint Cup final practice, Dover, Del. (L)
3:30pm	ESPN: NASCAR Nationwide Series, Dover, Del. (L)

SUNDAY SEPTEMBER 28

3:30am	ESPN2: NHRA Mello Yello Drag Racing Series, qualifying, St. Louis, Mo. (SDD)
7:00am	FS1: MotoGP Championship, Aragon, Spain (L)

2:00pm NBCSN (Sept. 28)
Pirelli World Challenge
A spectacular season concludes at Miller Motorsports Park with double-headers for GT and TC.

Richard Prince Cadillac Racing

4:00pm	ESPN2: NHRA Mello Yello Drag Racing Series eliminations, St. Louis, Mo. (SDD)
4:30pm	NBC: Red Bull Global Rallycross Championship, Seattle, Wash. (L)
5:00pm	FS1: IMSA Continental Tire SportsCar Challenge, Austin, Texas (D)

MONDAY SEPTEMBER 29

No racing scheduled at press time

TUESDAY SEPTEMBER 30

No racing scheduled at press time

MULTIMEDIA

THE RACER CHANNEL

YouTube: "Miller's Escape"

Ride with CJ Wilson Racing's Marc Miller in his Mazda MX-5 in the Continental Tire Series race at Road America as he gets hit from behind, dodges crashes and shoots a perilously narrow gap...

MEDIA-MELDING

YouTube: "Le Mans 24 Hours in Photos"

RACER photographic contributor Camden Thrasher brings his still images from this year's 24 Hours to vivid life in this innovative video for the /DRIVE network.

ON TWITTER

Four-time F1 World Champion Alain Prost has joined Twitter (**@Prost_official**), and while not yet hugely active, this will surely change once the Formula E season gets going. He and DAMS have joined forces to run the e.dams-Renault FE team.

Charles Coates/LAT

RACER.com

As well as Robin Miller's Mailbag, RACER.com now features Marshall Pruett's answers to your tech questions. Write to PruettsTechMailbag@Racer.com

IndyCar star Josef Newgarden called his run from last on the grid to win Barber Motorsport Park's Formula F 45th Anniversary race "the most fun I've had all year!"

Phillip Abbott/LAT

OUT TAKE

Juan Montoya and Tony Kanaan force feed creme puffs to Milwaukee winner Will Power. They did such a comprehensive job, Will needed cream syringed from his ears by IndyCar Medical...

pic cred?

FIRSTS
JOSEF NEWGARDEN

> FIRST RACING HERO Dan Wheldon was the guy who intrigued me the most. He was the complete professional driver, both on and off the track.
> FIRST STREET CAR Subaru Impreza STI. Second was a '94 Caddy Eldorado!
> FIRST RACECAR A Formula Ford at the Bridgestone School up at Mosport.
> FIRST RACE That was a kart race at Lime Rock Park's karting school, when I raced against Jerry Nadeau...
> FIRST VICTORY ...Same event!
> FIRST ACCIDENT Karts at New Castle Motorsports Park. I launched off someone's rear wheel, flew into the dirt.
> FIRST PAYCHECK Well, you could say from Sam Schmidt, some of the purse money from winning Indy Lights in 2011. But in terms of an actual salary, that would be from Sarah Fisher in '12.

ANNIVERSARIES

SEPTEMBER BIRTHDAYS

SIR STIRLING MOSS

Jeff Bloxham/LAT

Robbie Buhl, 9/2/65; Olivier Panis, 9/2/66; Michel Jourdain Jr., 9/2/76; Alex Gurney, 9/4/74; David Brabham, 9/5/65; Kenny Bernstein, 9/6/44; Rob Wilson, 9/6/52; Brian Hart, 9/7/36; Donnie Allison, 9/7/39; Stefan Johansson, 9/8/56; Felix Sabates, 9/9/42; Jeff Hammond, 9/9/56; Bruno Giacomelli, 9/10/52; Ricky Rudd, 9/12/56; **STIRLING MOSS, 9/17/29**; Damon Hill, 9/17/60; Boris Said III, 9/18/62; Cruz Pedregon, 9/19/63; Cristiano da Matta, 9/19/73; Juan Pablo Montoya, 9/20/75; Richard Childress, 9/21/45; Arie Luyendyk, 9/21/53; Gerhard Berger, 9/27/59; Mika Hakkinen, 9/28/68; **MEMO GIDLEY, 9/29/69**; Jochen Mass, 9/30/46.

MemoGidley.com

MEMO GIDLEY
b. 9/29/69

Sports car and Indy car veteran racer Memo continues his recovery from serious leg and back injuries suffered in a crash during the Rolex 24. At MemoGidley.com, Gidley is frank about the pain and frustration he has endured, but his characteristic optimism remains.

WOLFGANG VON TRIPS

LAT archive

WE REMEMBER

Harry Endicott, 9/5/13; Howard Wilcox, 9/4/23; Joe Boyer, 9/1/24; Dario Resta, 9/3/24; Professor Sid Watkins, 9/12/12; Jimmy Murphy, 9/15/24; Rudolf Caracciola, 9/28/59; **WOLFGANG VON TRIPS, 9/10/61**; Jochen Rindt, 9/5/70; Harry Weslake, 9/2/78; Ronnie Peterson, 9/11/78; Johnnie Parsons, 9/8/84; Stefan Bellof, 9/1/85; Al Holbert, 9/30/88; **RICHIE GINTHER, 9/20/89**; Ralph Seagraves, 9/27/98; Gonzalo Rodriguez, 9/11/99; Paul Newman, 9/26/08, Scott Roembke, 9/9/12; **GEORGE BIGNOTTI, 9/27/13**.

Murenbeeld/LAT

G. BIGNOTTI
d. 9/27/13

The legendary Indy chief mechanic, who passed away last year at the age of 97, tuned or engineered seven Indianapolis 500 winners between 1961 and 1983, including victories with A.J. Foyt, Graham Hill, Al Unser, Gordon Johncock and Tom Sneva.

RICHIE GINTHER

LAT archive

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REAR VIEW
SEPTEMBER 2014

WHAT **Six-hour sports car races**
WHERE **Watkins Glen**
WHEN **The World Championship years, 1968-'81**

LAT archive

Mark Donohue's Penske-run Ferrari 512M leads at the start of the '71 Six Hours of the Glen, but it would be the Alfa Romeo of Ronnie Peterson and Andrea de Adamich that eventually prevailed.

In some ways, you could argue that sports car fans in America have never had it so good. For 2014, U.S. sports car racing's factions unified to form IMSA's TUDOR United SportsCar Championship, clarifying the scene and bringing many of the best teams and drivers together. That's had the welcome effect of putting three classic U.S. enduros – the Rolex 24 at Daytona, the 12 Hours of Sebring and Petit Le Mans – all on the same schedule.

Plus, we also get to enjoy *two* six-hour races on American soil – the TUDOR Championship at Watkins Glen, N.Y., and the hi-tech, high-powered prototypes of the FIA World Endurance Championship at Circuit of The Americas. Good times.

As last year, both series share the bill at the Austin, Texas, track in what's been dubbed Lone Star Le Mans weekend. This time around, the added bonus is that they'll race on the same day, Sept. 20.

The irony is that the WEC's six-hour race in Texas is the spiritual successor to the Six Hours of The Glen which, from 1968 until 1981, was the American round of the World Sportscar Championship in its various guises. After Ford won the initial event, the race became the happy hunting ground for legendary marques from the other side of the Atlantic – Porsche (inevitably), Alfa Romeo, Ferrari, Matra and Lancia all went to Victory Lane at The Glen.

LAT archive

The Jacky Ickx/Lucien Bianchi-driven Ford GT40 run by John Wyer Automotive was the inaugural winner at the Six Hours of The Glen.

LAT archive

Thirteen years later, WGI held its final World Sportscar round, Michele Alboreto and Riccardo Patrese winning in a Lancia Beta Montecarlo.

Watkins Glen's bankruptcy saw Formula 1 make its final visit in 1980 and, inevitably, the WSC followed suit a year later. With no U.S. replacement, the closest Group C got to these shores was Canada and Mexico – not that American fans missed out, thanks to IMSA's own spectacular breed of GTP cars.

When the Six Hours returned to The Glen in 1984, it was as part of the IMSA GT Championship...and it wasn't really six hours, as IMSA regularly tweaked the format of what was now called the Camel Continental. Again, some magnificent machinery won there – Porsche, Nissan, Eagle-Toyota, Ferrari and Riley & Scott – but it wasn't until '96 that it returned to its six-hour format.

Since then, The Six Hours of The Glen has run under the auspices of the United States Road Racing Championship, Grand-Am and now the TUDOR Championship. But, as noted, the true spiritual descendant of the original event will be racing 1,500 miles to the south-west, Sept. 20... ■

SIX HOURS OF GREAT CARS RACING CoTA

Circuit of The Americas held its first Formula 1 race in 2012, followed by the inaugural MotoGP and sports car events in 2013, including a six-hour World Endurance Championship race.

Toyota (BELOW) put up a strong fight in '13, but it was Audi's eventual championship-winning lineup of Allan McNish, Tom Kristensen and Loic Duval taking a win.

This year, Porsche is added to CoTA's WEC prototype mix.

Ebrey/LAT

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– Patrick Long

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The new Porsche 911 RSRs that took 1st in class at Daytona and Sebring — the first two races of the TUDOR United SportsCar Championship — are part of an historic team that has dominated endurance racing for years. Working with Porsche through all the grueling TUDOR USCC races this year will be the Michelin engineers who helped keep the winning car firmly on the track and ahead of the pack.

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